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Environmental Management Accounting Development :
Institutionalization, Adoption and Practice

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Par

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JURY

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Le Groupe HEC Paris n'entend donner aucune approbation ni improbation aux opinions émises dans les thèses ; ces opinions doivent être considérées comme propres à leurs auteurs.

A mes soleils, Meallan, Adélie et le petit prince,
A Roger,
A mes parents,
A mes grands-parents.

“Not everything that can be counted counts,
and not everything that counts can be counted.” (Cameron, 1963)

“Entre le pessimisme désespéré et l'optimisme satisfait, la seule certitude raisonnable est le volontarisme.” (Jacquard, 2006)

"Former les Hommes, ce n'est pas remplir un vase, c'est allumer un feu.” (Aristophane)

Abstract

This dissertation explores the notion of management accounting innovation from the perspective of its creation, its adoption and practice. The innovation under study is the development of environmental management accounting, more particularly the tools known as "écobilan" (later "life cycle assessment") and "carbon accounting". The aim of the dissertation is to explain how environmental management accounting innovations are created in the French context, if they are adopted or not into companies and the consequences thereof, and finally how internal practices of companies are impacted by environmental management accounting innovations. Research methods combine participant observation over two years (2010-2012) in a single case company, semi-structured interviews and secondary data.

This dissertation is composed of three articles that together explore the different facets of management accounting innovations. The first article tackles the question of how innovations get created and on the path to institutionalization. The perspective taken is to focus on the actors and their strategies, the who and how of the institutionalization process. The article demonstrates that in the French context, elites were the main actors in the institutionalization process of the tool "écobilan". It contributes to institutional theory by defining what institutional work elites use to maintain power, despite the threat exercised by a new phenomenon, here environmental concerns, on their dominant position. It further contributes to the literature on genealogies of management accounting innovations by not only focusing on the cultural, geographical and historical context of the innovation process, but by introducing a perspective on strategies of actors. By explaining the role of particular agents in the making of an environmental management accounting tool, this article furthers our understanding of how environmental issues are shaped and accepted in the French context. Moreover, uncovering the strategies deployed to create the tool gives a particular insight on how environmental accounting tools play a crucial role in power relations, rendering environmental performance visible to some but invisible to others. The second article provides an understanding of the particular moment in the institutionalization process, which connects the innovation created with the potential users, that is the moment of adoption of the innovation. Through an in-depth case study of one organization, the article uncovers the process of the non-adoption of a carbon accounting methodology.

The article contributes to institutional theory by stating the role played by internal legitimacy in the decision of non-adoption, and how it was recombined with external legitimacy to reinforce organizational legitimacy of the organization. It contributes to the literature on management accounting innovations by introducing the crucial role played by internal legitimacy in the adoption process of innovations, and also by stating that internal legitimacy could also be the foundation of legitimacy and thus a factor of success in the adoption process of innovations. The third article analyzes the practices surrounding an accounting innovation in a multinational. Through the analysis of practices at local and central levels, the article allows to understand further how accounting practice contributes to strategy emergence. Furthermore, the article makes a contribution to the literature by showing how strategy can emerge both at local and global levels simultaneously, showing that strategy-making can be a co-emergence process especially at the stage of the introduction of an innovation.

Keywords: management accounting innovation (MAI) – environmental management accounting – France – elites – institutional work – internal legitimacy – organizational legitimacy – institutional theory – epistemic practices – strategy emergence – carbon accounting – practice theory

Résumé

Cette thèse explore la notion d'innovation en contrôle de gestion environnemental et vise à explorer la façon dont elles sont créées, si elles sont adoptées ou non dans les entreprises et les conséquences de l'adoption, et enfin comment elles sont pratiquées. L'innovation à l'étude est le contrôle de gestion environnemental, et plus particulièrement les outils nommés « écobilan » (et plus tard analyse de cycle de vie) et « comptabilité carbone ». L'objectif de la thèse est d'expliquer comment les innovations en contrôle de gestion environnemental sont créées dans le contexte français, si elles sont adoptées ou non dans les organisations, et les conséquences de cette adoption, et enfin comment les pratiques internes des entreprises sont impactées par les innovations en contrôle de gestion environnemental. Les méthodes de recherche combinent l'observation participante sur deux ans (2010-2012) dans une étude de cas unique, les entretiens semi-directifs et des données secondaires.

La thèse est composée de trois articles qui explorent ensemble les différentes facettes de l'innovation en contrôle de gestion. Le premier article aborde la question de comment les innovations sont créées et leur processus d'institutionnalisation. L'accent est mis sur les acteurs et leurs stratégies, le qui et le comment du processus d'institutionnalisation. L'article montre que, dans le contexte français, les élites ont été les principaux acteurs dans le processus d'institutionnalisation de l'outil « écobilan ». Il contribue à la théorie institutionnelle en définissant le travail institutionnel utilisé par les élites pour se maintenir au pouvoir, malgré la menace exercée par un nouveau phénomène, les préoccupations environnementales ici, sur leur position dominante. Il contribue également à la littérature sur les généalogies des innovations en contrôle de gestion, en mettant non seulement l'accent sur le contexte culturel, géographique et historique du processus d'innovation, mais en introduisant une nouvelle perspective sur les stratégies d'acteurs. En expliquant le rôle particulier de certains agents dans la fabrication d'un outil de contrôle de gestion environnemental, cet article favorise notre compréhension de la façon dont les questions environnementales sont mises en forme et acceptées dans le contexte français. Par ailleurs, en découvrant les stratégies déployées pour créer l'outil, l'article donne un aperçu sur la façon dont les outils de contrôle de gestion environnemental jouent un rôle crucial dans les relations de pouvoir, ce qui rend la performance environnementale visible pour certains, mais invisible aux autres. Le

deuxième article permet de mieux comprendre le moment particulier, dans le processus d'institutionnalisation, qui relie l'innovation créée, avec les utilisateurs potentiels, c'est à dire le moment de l'adoption. Grâce à une étude de cas approfondie d'une organisation, le deuxième article révèle le processus de non-adoption d'une méthodologie de comptabilité carbone. L'article contribue à la théorie institutionnelle en affirmant le rôle joué par la légitimité interne dans la décision de non-adoption, et comment il a été recombiné avec la légitimité externe pour renforcer la légitimité organisationnelle. Il contribue à la littérature sur les innovations en contrôle de gestion en introduisant le rôle crucial de la légitimité interne dans le processus d'adoption des innovations, et aussi en affirmant que la légitimité interne pourrait également être le fondement de la légitimité organisationnelle et donc un facteur de succès dans le processus d'adoption des innovations. Le troisième article analyse les pratiques entourant une innovation en contrôle de gestion dans une multinationale. Grâce à l'analyse des pratiques aux niveaux local et central, cet article permet de mieux appréhender comment les pratiques comptables contribuent à l'émergence d'une stratégie. En outre, l'article apporte une contribution à la littérature en montrant comment la stratégie peut émerger à la fois aux niveaux local et central en même temps, ce qui montre que la fabrication de la stratégie peut être un processus de co-émergence, en particulier au stade de l'introduction d'une innovation.

Mots-clés: innovation en contrôle de gestion – contrôle de gestion environnemental – France – élites – travail institutionnel – légitimité interne – légitimité organisationnelle – théorie institutionnelle – pratiques épistémiques – Emergence d'une stratégie – comptabilité carbone – théorie de la pratique

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List of acronyms

ABC: Activity Based Costing

ABM: Activity Based Management

ADEME: French Environment and Energy Management Agency (Agence de l'environnement et de la maîtrise de l'énergie)

AFITE: French association of engineers and technicians of the environment (Association Française des Ingénieurs et Techniciens de l'Environnement)

AFNOR: The French national organization for standardization (Association Française de Normalisation)

Aiche: American Institute of Chemical Engineers

AM: Activity Management

ANRT: National Association of Research and Technology (Association Nationale de la Recherche et de la Technologie)

ANT: Actor Network Theory

AVNIR: Platform for life cycle assessment (Plateforme pour l'analyse du cycle de vie)

BP: British Petroleum

BSC: Balanced Scorecard

BSI: British Standards Institute

CBU: Country Business Unit

CD2E: Association for Development of eco-enterprises (Association Création Développement EcoEntreprises)

CDM: Clean Development Mechanism

CDP: Carbon Disclosure Project

CDSB: Carbon Disclosure Standards Board

CEO: Chief Executive Office

CERNA: Centre of Industrial Economy of Ecole des Mines (Centre de recherche en économie industrielle de l'Ecole des Mines)

CFO: Chief Financial Officer

CIFRE: Industrial conventions of training by research (Conventions Industrielles de Formation par la REcherche)

CIMA: Chartered Institute of Management Accountants

COO: Chief Operating Officer

COP: Conference of the Parties (supreme body of the United Nations Framework Convention on Climate Change)

CREER: Cluster Research Excellence in Ecodesign & Recycling

CSR: Corporate Social Responsibility

DEFRA: (United Kingdom) Department for Environment, Food and Rural Affairs

DJSI: Dow Jones Sustainability Index

DLSC: Dialogue Forum for Low Carbon Society

EA: Environmental Accounting

ECA: Environmental Cost Accounting

ECOSD: Research network on eco-conception of durable systems (Eco-conception de systèmes durables)

ELSA: Environmental Lifecycle and Sustainability Assessment (Research Group)

EMA: Environmental Management Accounting

EMS: Environmental Management Systems

ENA: National School of Administration (Ecole Nationale d'Administration)

ERP: Enterprise resource planning

ETS: Emission Trading Scheme

EU: European Union

FAO: Food and Agriculture Organization

FASB: Financial Accounting Standards Board

FCA: Full Cost Accounting

FDES: Environmental and Health declaration forms (Fiches de Déclarations Environnementales et Sanitaires)

FEE: European Federation of Chartered Accountants (Fédération des Experts-Comptables Européens)

FMCG: fast moving consumer goods

FT: Financial Times

GAAP: Generally Accepted Accounting Principles

GHG: Greenhouse Gases

GHGP: GHG Protocol Corporate Standard

GP: Georges Perrin (for GP method)

Green HDPE: HDPE made from 100% renewable raw materials

HDPE: High-density polyethylene

IDF: International Dairy Federation

IFAC: International Federation of Accountants

IIRC: The International Integrated Reporting Council

INIES: The French database of reference on the environmental and sanitary characteristics of construction products (La base de données française de référence sur les caractéristiques environnementales et sanitaires des produits de construction)

IPCC: Intergovernmental Panel on Climate Change

ISO: International Organization for Standardization

IUCN: the International Union for Conservation of Nature

JI: Joint Implementation

KOL: Key Opinion Leader

KPI: Key Performance Indicator

LCA: Life Cycle Assessment

LCC: Life Cycle Costing

MAI: Management Accounting Innovation

MERVC: Monitoring, Evaluation, Reporting, Verification, Certification

MFCA: Material Flow Cost Accounting

MNE: Multinational Enterprise

NGO: Non-Governmental Organization

OECD: Organisation for Economic Cooperation and Development

OEF: Organizational Environmental Footprint

OREE: Organization for respecting the environment in organizations (Organisation pour le Respect de l'Environnement dans l'Entreprise)

PAS (2050): Publicly Available Specification

PCF: Product Carbon Footprint

PCR: Product Category Rules

PEF: Product Environmental Footprint

P&L: Profit and Losses (account)

PLA: Polylactic acid or polylactide (plastic made out of renewable resources)

RAB: Resource Accounting and Budgeting

R&D: Research and Development (Department)

REPA: Resource and environmental profile analysis

ROI: Return On Investment

RPET (R-PET): Recycled Polyethylene Terephthalate (plastic used in the making of bottles)

SD: Sustainable Development

SEA: Social and Environmental Accounting

SETAC: Society of Environmental Toxicology and Chemistry

SME: Small and Medium Sized Enterprises

SPOLD: the Society for Promotion of Life-cycle Assessment Development

TCA: Total Cost Assessment

TQM: Total Quality Management

TSC: The Sustainability Consortium

UNEP: United Nations Environment Programme

US EPA: United States Environmental Protection Agency

WBCSD: World Business Council of Sustainable Development

WBU: World Business Unit

WMO: World Meteorological Organization

WWF: World Wildlife Fund

WRI: World Resources Institute

Introduction

The environmental catastrophes (acid rains, the ozone hole, climate change, oil spills, chemical leaks) that have punctuated the last 40 years have driven sustainable development at the centre of the world's agenda. Alternative indicators of progress regularly show that the status of environmental degradation and social inequalities reach new heights every year, while the "quality of life" has been stagnant for numerous decades, despite GDP growth. Moreover, the Earth's resources have been depleted at an unprecedented rate since the beginning of the 20th century. In 2013 the "Earth Overshoot Day", calculated based on the ecological footprint indicator, was on August 20th. It is the approximate date humanity's ecological resource consumption exceeded what Earth can renew in a year, exhausting nature's budget for the year[1]. In 1993, Earth Overshoot Day fell on October 21. In 2003, it was on September 22. The global Living Planet Index from WWF (2012) declined by almost 30 per cent between 1970 and 2008. The genuine progress indicator[2] (GPI) as an alternative to the dominant indicator of progress GDP shows that according to its calculation, economic growth has been stagnant since the 70s.

In their Living Planet Report (2012), WWF states that their freshwater index declining by 37 per cent. At the same time, the world's natural forest cover declined by 3% in the period between 1990 and 2005, and today we are losing about 200 square kilometres of forest each day (UNEP, 2009). The World Resources Institute (WRI, 2000) reports that two-third of agricultural land has had its soil degraded in the last 50 years, and 70% of all species are overfished. Our concept and economic tools have been conceived in an "empty world" (Costanza et al., 2013), where the limits were infrastructure and material, and natural capital was present in abundance. Today the world has entered the anthropocene era, to denote the new era where humans constitute a geological force capable of acting and changing the ecological system that sustains life on earth (Costanza et al., 2013), and where the "new" limits are now those of natural capital.

[1] http://www.footprintnetwork.org/en/index.php/GFN/blog/earth_overshoot_day_2013_around_the_world September 24th 2013

[2] http://rprogress.org/sustainability_indicators/genuine_progress_indicator.htm accessed September 23th 2013

The main driver of this unsustainable course of action that these set of indicators are pointing to, is economic growth as the "fundamental cause" of the myriad of social and environmental problems (Johnson, 2012). Our world has become a technical abstraction, completely separated from the concrete activities, when economic activity is viewed through financial numbers such as profit, cost, income and GDP (Johnson, 2012). The use of long-term debts and equity instruments in limited-liability corporations has accelerated economic growth since the late 19th century to the point where financial capital grew faster than physical capital (Johnson, 2012). Therefore, evidence favours the judgement that capitalism is not ecologically sustainable and "if there is there any evidence that this is possible, it is an elusive evidence" (Gray & Bebbington, 1998).

Capitalism and accounting are two intertwined notions in both the technical sense as suggested by Weber (2003, 1927) who presupposes that "for the existence of this present-day capitalism is that of rational capital accounting as the norm for all large industrial undertakings which are concerned with provision for everyday wants", and in its crucial rhetorical role that the double-entry method had in "legitimating an expanding capitalist economic system" (Carruthers & Espeland, 1991). As capitalism is indicated as the main source of unsustainability, the very processes of conventional financial accounting also seem to be "amongst the most likely causes of the environmental desecration" (Gray, 2013). If we were to deduct the sustainable cost from convention profit of organizations, Gray (1992) suggests that "the probability is that no Western company has made a sustainable profit for a very long time, if at all". Additionally, accounting has allowed "to report that such and such an industrial enterprise has contributed significantly to the wealth of a nation whilst, in broader context, the same enterprise has inflicted the most appalling damage to social, psychological, spiritual and environmental health" (Birkin, 1996). Indeed, mainstream accounting, based on neo-classical economic roots, views sustainability issues primarily in terms of externalities, market failures, price signals and economic incentives and has been slow to recognise sustainability as an accounting issue at all (Brown & Dillard, 2013; Gray, 2013).

Innovation and capitalism have also been intertwined notions ever since Schumpeter. Industrial benefits appear in the capitalist economy, according to Schumpeter (1918), at the time of introduction of a new method of production, new commercial policy or a new form of organization. Schumpeter marked the transition from technical-scientific inventions to economic innovations (Marco, 1985).

Capitalism, growth, market-based economy are all targeted as the roots of the unprecedented environmental degradation that has happened since the beginning of the 20th century. Environmental crisis is a symptom of capitalism gone wrong. One might think that taking steps to study the environment using both an accounting lens and an innovation lens might be contradictory, since they both are tightly linked to the very root cause of natural resources' rapid exhaustion. Some even consider that the reflexion on the environmental crisis should be engaged by stepping back from a "too quantitative" and "too accounting-based" approach of our collective performances[3]. Gray (1992) even states that "there are clearly profound dangers in trying to employ calculation in a world where (1) the calculation can be identified as a root cause and (2) any calculation must run the risk of reinforcing analytic and scientistic solutions".

However, the modalities of management will never be reconsidered, if no profound changes are made to the accounting of organizations (Richard, 2008). It is interesting to consider social and environmental accounting in the light of, and in relation to the patterns of social and economic development since the 70s (Hopwood, 1978). Already in 1978, Hopwood mentioned, "the widespread experimentation with social accounting does suggest that it is a response to social and institutional changes in many industrialized nations". Moreover, the development of social and environmental accounting is rather "surprising" in its pace, as noted by Hopwood already in 1978: "for someone accustomed to the rather slow pace of development in accounting this is itself a surprising phenomena". This suggest that studying social and environmental accounting as an accounting innovation could shed some lights on both the institutional context in which it has appeared in the last 40 years and the potential evolutions that it

[3] Sarkozy, cited in Le Monde, January 28th 2008 http://www.lemonde.fr/economie/article/2008/01/28/de-nouveaux-outils-pour-la-mesure-du-bien-etre_1004357_3234.html accessed September 24th 2013

is bringing to traditional accounting, as in this dissertation, I work "with the system" and not around it (Gray, 1992).

Innovation and processes of innovation

The object of research "environmental management accounting" is being considered through the lens of innovation studies, more particularly as a management innovation.
Innovation has been linked to capitalism only since the beginning of the 20th century. However, the initial definition of innovation was linked to political order and not to economic realm (Monzani, 1985). Considering environmental management accounting (EMA) through the lens of innovation as a political tool is another way to envision the project of social and environmental accounting (SEA) and how its goals can be achieved.
Balancing innovation in its more recent economic vision as a source of competitive advantage and the original political meaning as "subversive", and "a shock against the established order" (Monzani, 1985) allows looking at EMA from "within the system" (Gray, 1992) as well as considering it has a part of the wider social and environmental (SEA) project (Gray, 2002).
Rather than looking at EMA innovations as outcomes, I will take a process approach to studying innovation. The process of innovation is defined as starting from an idea (invention) to the practice of the innovation (Garud et al., 2013). Through the three papers of the dissertation, I will explore the complexities of innovation processes which co-evolve, as they simultaneously implicate multiple levels of analyses; relational, as they involve a diverse set of social actors and material elements; inter-temporal, as temporal events and sequences are experienced in multiple ways and cultural, as they unfold within contextualized settings (Garud et al., 2013).

Environmental management accounting as an accounting innovation

As described above, the 20th century has seen an unprecedented depletion of environmental resources leading to the current environmental crisis, punctuated by more or less visible phenomena's such as acid rains, the ozone hole and oil spills. Often, perceptions of social and economic decline have been important factors in the development of accounting innovation (Miller & O'Leary, 1990). Miller and O'Leary

(1990) suggest for example that discounted cash flow techniques for investment appraisal in the UK in the 1960s was closely linked to the relative failure of economic growth in that country. The 1970s saw the international recognition of the need to tackle both social and environmental unsustainability through the publication of "The Limits to Growth" report in 1972 and the UN conference of Stockholm on the human environment. Consequently, social accounting has developed rapidly in the 70s (Hopwood, 1978), closely followed by environmental accounting and environmental management accounting (Rikhardsson et al., 2005).

As it might appear on the surface to be a stretch from huge sustainability challenges (United Nations, 2005) to the practices of accounting, there is a pressing need to understand the "creation of systems and methodologies by which governance for sustainability can be achieved" (Porritt, 2007). Given the central role of accounting in the management and accountability of organizations, new forms of accountings will affect our ability to pursue sustainable development (Unerman et al., 2007).

Rikhardsson et al. (2005) define EMA as "a managerial technology, which combines knowledge, methodology and practice and applies these to linking environmental management and economic results". EMA can be considered as a management innovation in the sense of the definition given by Hamel (2006), where it is described as a "marked departure from traditional management principles, processes, and practices or a departure from customary organizational forms that significantly alters the way the work of management is performed". My research focuses on the management control tools linked to environment. Social accounting is not here part of this research, even though the two fields are often linked. My research is characterized by a focus on management control and does not try to analyze external reporting and green communication towards external stakeholders; however I acknowledge the influence external reporting has on the development of internal management control tools and processes. In this dissertation, I will focus more particularly on two particular examples of EMAs in the name of life cycle assessment (LCA) and carbon accounting.

Institutionalism and practice theory as theoretical frameworks

The process of innovation in this dissertation will be analyzed through the lens of institutionalization and practice theory. There is an inherent tension between the

newness of an innovation and its characteristics and the state where it gets institutionalized (Kimberly, 1979). An innovation first navigates in unfamiliar surroundings, its role in society is "in negotiation" and the institutional environment surrounding the innovation does not know what to expect and seeks greater predictability. The process of institutionalization lends stability and predictability to social relationships and enables them to persist, to the point when an innovation becomes incorporated within the framework of existing patterns of norms, values, and structures, thereby loosing part of the "innovative" characteristics of the creation phase (Kimberly, 1979). Using institutionalization as the framework for the processual approach to innovation will allow the unpacking of the black-boxes of taken-for-granted practices (Lounsbury & Crumley, 2007). This dissertation will focus specifically on three steps of the institutionalization process, the creation of an accounting innovation (Article 1), the adoption of an accounting innovation (Article 2) and the practice of the innovation (Article 3). Institutional theory has been criticized for a lack of focus on the micro-foundations of institutionalization through practices (Lounsbury & Crumley, 2007). Therefore, this dissertation will combine institutional theory with practice theory to study both the wider social processes as well as organizational practices (Lawrence & Suddaby, 2006; Arjalies, 2010; Labatut et al. 2012; Vaara & Whittington 2012). As innovation is social - it does not easily occur as a stated and pre-planned outcome, but as emergent in the social relations and contexts within which they occur (Pitsis et al., 2012), the third paper mobilizes practice theory to study the accounting innovation through its practice. Practice theory allows retracing the steps, strategies and events that led to the emergence, stabilization, or failure of specific assemblages (Nicolini, 2012). Looking at how innovations are practised allows seeing the durability of new practices and how they carry traces of institutionalization (Nicolini, 2012).

Research questions under study

To gain a better understanding of the institutionalization processes at play in environmental management accounting innovations from ideas to practice, the dissertation aims at answering the following research questions:

- How can environmental management accounting tools be created, by whom and with what strategies?

- What is the process of adoption and the consequences on the adopting organization? How can an accounting innovation become the centre of a conflict of legitimacies at the time of adoption?
- How do EMA tools translate into organisations' practices?

The research questions are answered through three articles. The first paper focuses on the innovation life cycle assessment and its creation phase. It mobilizes the concept of elite as actors of innovation, and institutional work to describe the purposive and intentional set of actions performed in the creation of a new accounting tool. The second article looks at carbon accounting in the specific moment of adoption, and from the point of view of a corporation adopting the innovation. The last paper engages with the practice of the innovation carbon accounting. It focuses on the emerging practices in accounting and strategy related to the management of carbon.

Presentation of the content of the dissertation

Chapter one of the dissertation addresses the literature in innovation, and more particularly in management accounting innovations. The literature review focuses on both the different theoretical lenses that have been used to shade a light on accounting innovations, and on the different steps of the process of innovation.

Chapter two of the dissertation is devoted to the description of the object of research, environmental management accounting, and the specificities of life cycle assessment and carbon accounting.

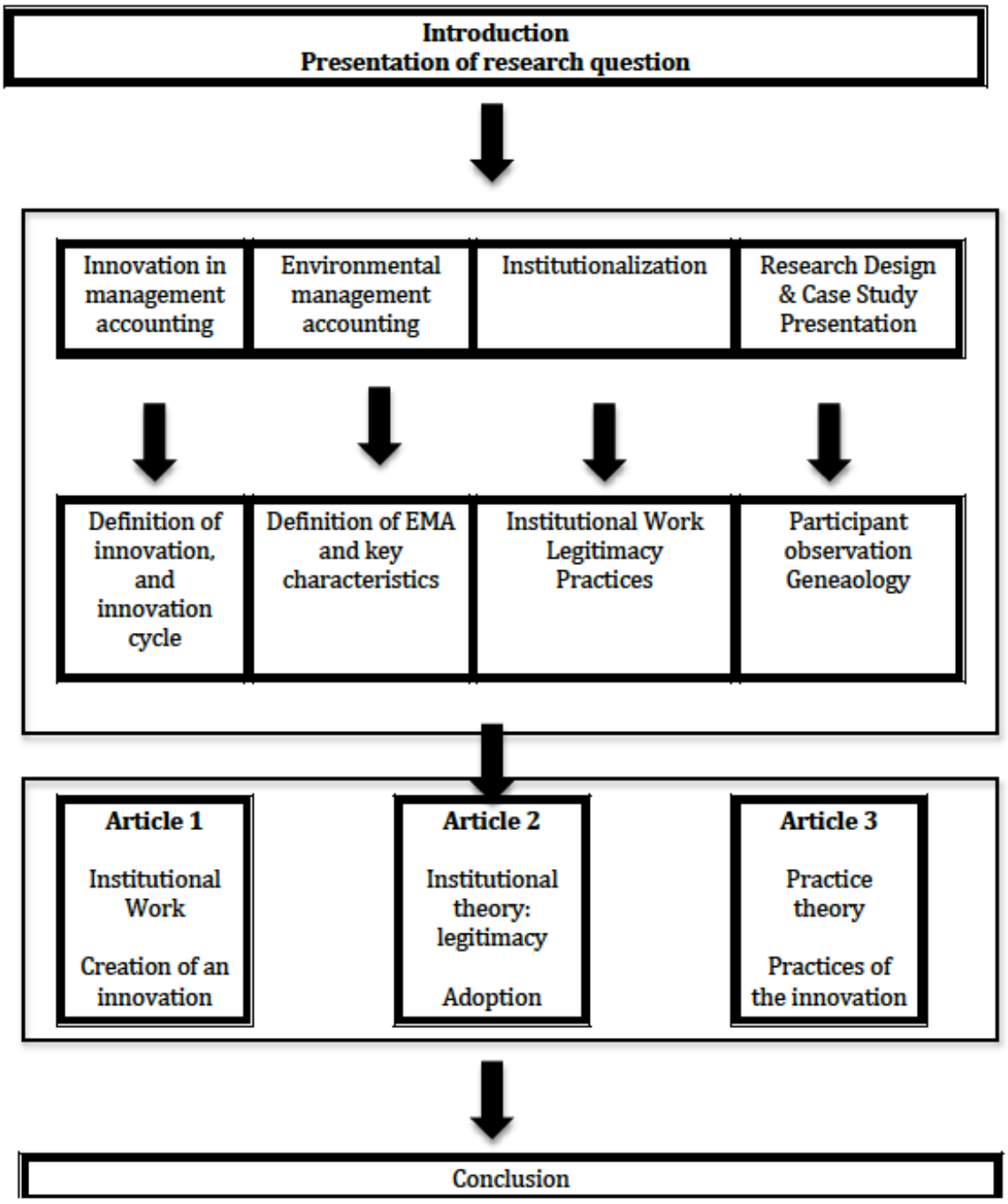
Chapter three presents the two theoretical frameworks in which the study of environmental management accounting innovations is inscribed, namely institutionalism and practice theory, and the institutionalization process integrating the two.

Chapter four presents the epistemological position, the research design and chapter five the case study of the dissertation.

Subsequently, the empirical research is presented through three articles.

The final section concludes and addresses the contributions and limitations of the dissertation.

Figure 0.1: General Content of the Dissertation



Chapter 1: Literature Review: Management Accounting Innovation and Innovation Processes

1 Introduction

The object of research "environmental management accounting" is being considered through the lens of innovation studies, more particularly as a management innovation.

EMA has only been approached as an innovation in rare occasions. For example, Rikhardsson et al. (2005) explored whether EMA could be a fad or a fashion, wondering what could be the conditions for EMA to "stay". Lafontaine (2003) had also tried to characterize environmental accounting as a managerial innovation or an accounting innovation, deciding that EMA could not be defined as an accounting innovation because of the lack of involvement of the accounting profession in the definition of those innovations. The literature on EMA has been focused in majority on normative and conceptual work (Schaltegger et al., 1996; Schaltegger & Burritt, 2000; Christophe, 1995; Christophe & Antheaume, 2005; IFAC, 2005), surveys of the extent of practices (Burritt et al., 2011; Xiao, 2006), and "stories" of implementation worldwide (Schram, 2003; Venturelli & Pilisi, 2003; Lee et al., 2002; Hyrslova & Hajek, 2005; Jasch & Danse, 2005). Recently, there has been work on sustainability management controls (Pérez et al., 2007; Riccaboni & Leone, 2010; Gond et al., 2012; Rodrigue et al., 2013; Arjalies & Mundy, 2013). Therefore, I believe analyzing EMA through the lens of innovations could be of interest for several reasons. First sustainability innovations, of which EMA is part, are often institutionalized but scarcely diffused and adopted; therefore more investigation is needed into that phenomenon. Indeed, there is a need to understand the potential supporting, or lack of support from infrastructure, regulations or user demand (skills to used) (Brown & Dillard, 2013) for EMA innovations. Furthermore, studying EMA as innovation would allow understanding how some innovations are more "incremental" in nature, understanding the lock-ins and tight links between some innovations and the current "regime", and how they could be "unlocked" (Brown & Dillard, 2013). Additionally, Bell and Hoque (2012) challenge researchers to critically assess the inertia created by existing accounting structures, processes and techniques and mainstream those conversations that provide challenges to the status quo. Looking at EMA as an innovation allows to look at the spaces they are built in, the networks they do or could depend on to develop, and the technologies they must compete with in the

current regime (Brown & Dillard, 2013). Analyzing EMA as innovations allows considering for many dimensions (technical, cultural, behavioural, policy, infrastructure) and different levels (institutions/organizational field, the organization and the practices) of these management accountings which contribute to our understanding of how accounting can or might contribute to sustainability transitions. There is a need to understand how certain ways of posing general problems (the environmental crisis) such as those related to accounting for the environment comes to attain the status of self-evidence; or why it doesn't, and reciprocally, how it is that particular calculative technologies come to be seen as the appropriate way to solve these particular problems (Miller, 1991). Moreover, studying EMA as innovations is firmly entrenched in the view that accounting can be changed (and should evolve), and therefore that we cannot mistake "contingent accounting ideas, practices and institutions, local in space and time, as self-evident, universal and necessary" (Gomes et al., 2011).

In this chapter, I will review the definition of the concepts of innovation, management innovation and management accounting innovation. Then I will survey the traditional theoretical lenses that have been used in the past to look at management accounting innovations, while trying to understand both their strengths and shortcomings. This will introduce the theoretical approach of this dissertation, namely the institutional and practice theories.

Finally I will take a process approach to innovation, in opposition to looking at innovation as solely an outcome. I will therefore review the different phases of the life cycle of an innovation through a literature review of the three phases that are then approached in the three articles of this dissertation, namely the creation, adoption and practice phase of the innovation cycle.

2 Defining innovation, management innovation and accounting innovation

2.1 Definition of innovation

2.1.1 Origin of the word "innovation"

Innovation comes from the Latin word "innovare", which means coming back to, to renew, to bring "newness". "Innovare" is composed of "novare" and "in", indicating a

movement towards the inside. Innovation is a movement, a process from its Latin origin.

Innovation in the 18th century was linked to political government and religion. Innovation was not seen as a good thing and dictionary definitions give examples such as "innovations are dangerous" (Monzani, 1985). In the dictionary of Trévoux, you can find the definition to "innovate": "to live in peace, it must not be innovated, nor in the state, nor in the religion" (Monzani, 1985). Novelty had a positive meaning but innovation was close to "subversion" (Monzani, 1985). In the 18th century, it already integrated a shock against the established order and was not a subtle process of integration (Monzani, 1985). Until the eighteenth century, a "novator" was still a suspicious person, one to be mistrusted, and innovation was seen as a heresy (Godin, 2008).
Later, innovation became "controllable" by being associated with economic rationalization, innovation could be "tried" under the government of the monarch (Monzani, 1985). Innovation however still carries in its ambiguous status the "good in itself" (Monzani, 1985).

Schumpeter introduced innovation to economics. He identified five types of innovation (Schumpeter, 1934): introduction of a new good; introduction of a new method of production; opening of a new market; conquest of a new source of supply of raw materials or half-manufactured goods; and implementation of a new form of organization. The distinction with invention is radical: invention is an act of creativity and is without importance to economic analysis, while innovation is part of economic life (Schumpeter, 1939). Innovation is an endogenous factor of capitalism (Schumpeter, 1939). Innovation as a widely used category during the twentieth century is witness to a certain context or era, that of capitalism (Godin, 2008).

In sociology, the meaning of innovation is that of one that is adopted and used, while for economists it has to be commercialized by industry (Godin, 2008). Both accept the definition of innovation as a process, where both the production and its use are addressed.
The discourses on innovation in the 20th century have been of three kinds: innovation as a factor for change in society, innovation as progress and innovation for its own sake,

such as for personal recognition or prestige (Godin, 2008). Innovation is associated with novelty, creativity and a break from the past (Godin, 2008). Today, innovation is linked to mostly positive social representations (Gaglio, 2011). It is both a risk and an opportunity. Others like Crozier (1980) state that "innovation, like a squirrel in cage, supports the social system in which it brings its energy without being able to change it" (Crozier, 1980, cited by Alter 1993).

2.1.2 Innovation, invention and imitation

Innovation is closely related to the terms imitation and innovation (Godin, 2008). To better understand innovation as a category, one needs to understand how invention and imitation's own definitions have evolved over time, and how innovation situates itself compared to both terms.

Until the mid-eighteenth century, imitation was presented as a positive practice; a way of teaching and it represented economic opportunities as copies of luxury goods (Godin, 2008). Imitation was very close to invention as a recombination of existing elements, and patents were given to importers of existing innovations in the sixteenth and seventeenth centuries and not to inventors (Godin, 2008). Therefore, imitation, which has today a more negative meaning, was more positive than innovation in the past. Later imitation gave rise to the notion of diffusion, which is now considered a step of the innovation process. Imitation also leads to the idea of adoption of an innovation, in opposition to mere copying (Godin, 2008).

Innovation is also often defined in opposition to an invention. In the mid-fourteenth century invention was a finding or discovery; from the sixteenth century, invention was used more and more to apply to newly created things (Godin, 2008). Then invention came to be associated with discovery, and the making of new things (Godin, 2008).
Invention is the creation of a new idea, but innovation is more encompassing and includes developing and implementing a new idea (Van de Ven et al., 2000). It is the durable and effective implantation of an invention in a social milieu (Gaglio, 2011). An innovation is an invention that spread; it is a process rather than a status (Gaglio, 2011).
Both imitation and invention were opposites and in the eighteen century, originality (invention) contrasted with copying (imitation) (Godin, 2008).

Several other criteria have been raised to define innovation as different from invention. According to Gaglio (2011), what distinguishes innovation from the rest is the moment of adoption. An innovation exists because it diffuses (Gaglio, 2011). Another criterion evoked is the selling of the innovation on a market, the "production" of the innovation; the third one is commercial success. According to ANT, the innovation becomes one when there are no more claims susceptible to undo the network and constituted and to call into question the stabilized split of competences between the object and its environment (Callon, 1994). Lastly, Alter and Gaglio (2011) add another criterion, that is, the usage of the innovation.

2.1.3 Definition of innovation

Innovation is defined as the adoption of an idea or behaviour that is perceived as new to the adopting organization (Zaltman et al., 1973). The perception of newness serves to differentiate innovation from change (Slappendel, 1996), as while all innovations imply change, not all changes involve innovations. Innovation is often the recomposition of existing elements (Gaglio, 2011). Innovation is further defined as the "production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome" (Crossan & Apaydin, 2010).

Innovation is also a successful meeting, synergistic, between an entity and a social ensemble. It is a chemical reaction (Gaglio, 2011). Callon (1999) defines innovation as:

> *"An emergent phenomenon based on gradually putting into place interactions that link agents, knowledge and goods that were previously unconnected, and that are slowly put in a relationship of interdependence (...). What marks innovation is the alchemy of combining heterogeneous ingredients: it is a process that crosses institutions, forging complex and unusual relations, the market, law, science, and technology".*

Three main characteristics emerge from the history of innovation as a category. First, innovation is defined as a novelty, according to the adopting organization. However, it does not have to be "entirely new". Second, the moment of adoption is since the 20th century inherently linked to the diffusion of an innovation. Callon and Gaglio speak of alchemy between the innovation and its social surroundings. Finally, innovation is more

a process than an outcome, and is closely linked with social change, in its original political sense. One last question remains on the definition of an innovation. Although the literature speaks of adoption and diffusion, there is no clear statement as to whether an innovation has to be practised to be one. Is an innovation one if no usage exists? This is an important question in relation to EMA innovations, which are often scarcely diffused and used – and where the literature has been mostly conceptual and normative in nature because of the lack of possibility to observe a very scarce practice.

2.2 Management innovation

> *"Technical innovations attract attention, economic innovations less so. Yet they are no less essential than these." (Frérot, 2013)*

There are many categorizations of innovations, between technological, social, political, administrative or management innovations. The focus of this dissertation is on management innovations.

An early definition of management innovations is that: "an administrative innovation pertains to the policies of recruitment, allocation of resources, and the structuring of tasks, authority and reward. (…) Administrative innovations will be related to the social structure of the organization" (Daft, 1978). Administrative innovations are indirectly related to the organization's primary work activity and affect mainly its management systems (Damanpour & Evan, 1984). More recently, a management innovation has been defined as a "marked departure from traditional management principles, processes, and practices or a departure from customary organizational forms that significantly alters the way the work of management is performed" (Hamel, 2006). Finally, management innovations are:

> *"New approaches to devise strategy and structure of tasks and units, modify the organization's management processes and administrative systems, motivate and reward organizational members, and enable organizational adaptation and change." (Damanpour & Aravind, 2011)*

Management innovation has, according to Hamel (2006), more than any other kind of innovations, allowed companies to cross new performance thresholds. Today, management innovation represents one of the most important and sustainable sources of competitive advantage for firms (Feigenbaum & Feigenbaum, 2005; Hamel, 2006) because it is context specific (Birkinshaw et al., 2008), and because they are ambiguous

and hard to replicate (Volberda et al., 2013). Gruber and Niles (1972) argued already that "the quality of management may be more important to success than performance in the R&D of new products and processes". The role of management innovations in developing strategies for growth, facilitating organizational change and renewal, and enabling continuous performance is described as "crucial" (Damanpour & Aravind, 2011). The benefit of management innovation enactment has been extended to include organizational change, facilitating the organization's renewal, adaptation, and effectiveness (Damanpour & Aravind, 2011). Clearly, firms benefit from investing in their capacity for management innovation alongside their capacity for product and process innovation (Mol & Birkinshaw, 2009).

Examples of this type of innovation include total quality management (TQM), just-in-time production, quality circle, cost accounting, 360-degree feedback, and divisional (M-form) structure according to Damanpour and Aravind (2011). Hamel (2006) designed a list of the twelve most noteworthy management innovations from 1900 to 2000, a list that includes cost accounting and variance analysis, and return on investment (RIO) analysis and capital budgeting. Zawawi and Hoque (2010) give the examples of activity-based costing (ABC), activity-based management (ABM), time-driven ABC, target costing, and balanced scorecards (BSC) for management accounting innovations (MAI). Management innovations denote themselves from other innovations as being key for companies' success and effectiveness in today's society.

2.3 Management accounting innovation (MAI)

MAIs refer to "newer" or modern forms of management accounting and control systems (Zawawi & Hoque, 2010). Research in MAI allows to understand which one are "true" or "false" innovations, and why they succeed (Bouquin & Nikitin, 2003). Environmental uncertainties, recent global issues such climate change, scarcity of natural resources can affect MAIs (Zawawi & Hoque, 2010). Interaction between those issues and MAIs needs further investigation (Zawawi & Hoque, 2010).

EMA is relatively new as a field of research and practice, in which the first uses only date back to the early 1990s; thus EMA can still be characterised as a field of innovation (Rikhardsson et al., 2005). According to Rikhardsson et al. (2005), the future of EMA

depends on the rate of adoption of EMA. They however note, that already, EMA is no longer a local western phenomenon as it is spreading across several Asian countries. Literature on EMA as innovation, with experiences of companies adopting, helping to diffuse or practising EMA are scarce (Rikhardsson et al., 2005), and there is a need to understand in greater depth the different steps of the innovation process for EMA technologies.

2.4 Conclusion

Innovation has been defined by Callon (1999) as "an alchemy of combining heterogeneous ingredients: it is a process that crosses institutions, forging complex and unusual relations, the market, law, science, and technology". Within the realm of innovations, management innovations denote themselves as increasingly becoming key to the success and effectiveness of organizations.

3 Theoretical traditions related to studying management accounting innovations

I will now turn to the different theoretical traditions that have illuminated the study of management accounting innovations. MAIs have also been studied by looking at the different antecedents to the adoption of innovations, and how they in turn impact organization performance and efficiency. Secondly, the main tradition that has been developed to study innovation is the diffusion theory. As mentioned in the historical analysis of innovation as a category, diffusion became part of the innovative process in the early 20th century. I will look at both diffusion, and fad and fashion perspectives on MAIs and how they have contributed to our understanding of diffusion and adoption. Finally, I will attend to three theoretical traditions grounded into alternative management accounting research (Baxter & Chua, 2003) to study MAIs: actor-network theory (ANT), institutional theory and practice theory. This will introduce the theoretical approach of this dissertation, namely the institutional and practice theories.

3.1 MAIs antecedents and consequences using contingency theory

The primary purpose of studies using contingency theory is to demonstrate the existence of empirically distinguishable dimensions of innovation and identify their associated determinants. Moreover, they often try to understand the impact of management innovation on outcomes such as firm performance or increased productivity. Contingency theory based studies of management innovations have been developed through the work of Damanpour and Aravind (1991; 2011) and Birkinshaw and Mol (2006; 2009; 2012). Antecedents to management innovations include managerial antecedents (transformational leadership, CEO novelty, managerial tenure), intra-organizational antecedents (educated workforce, internal change agents), inter-organizational antecedents (external change agents, early adopters, external networks), and interaction with technological innovations (Volberda et al., 2013). Contextual factors also mediate the outcome of management innovation, such as organizational size, environmental circumstances and performance decline (Volberda et al., 2013).

Volberda et al. (2013) emphasize the ongoing debates related to management innovation in contingency theory that is the relationship with technological innovations,

and the performance effects of management innovations.

3.1.1 Contingency studies in management accounting innovations

One of the first studies of a management accounting innovation using contingency theory is the study of activity management approaches diffusion by Gosselin (1997). His study tries to understand the paradox between the wide interest for ABC and its rather limited diffusion. He looks at the factors influencing the managers in deciding to adopt and implement, or not, activity management approaches. An important finding of his study is the association of competitive strategy profiles with the propensity to innovate in the managerial accounting area. Innovators such as prospectors appear to be more inclined to adopt activity management (AM) approaches than defenders. On the other side, the study shows that mechanical organizations are more likely to be successful at implementation of AM approaches. As Gosselin put it at the time, this was the first piece of a research program to better understand the spread of MAIs in today's organizations. Since then, studies on the determinants of MAIs and change found various organizational, technical, and economic factors that influence the diffusion and adoption of these practices (Zawawi & Hoque, 2010). The prevailing factors found in prior studies are global competition and changes in technology, performance gap, organizational structure, top management support, and the influence of government (Zawawi & Hoque, 2010).

3.1.2 Critiques of contingency based studies for management accounting innovations

Chenhall (2003) mentions that one of the criticisms is that contingency-based research has relied on traditional, functionalist theories and has not applied more interpretive and critical views. For example management control systems are not assumed to lead, necessarily, to enhanced effectiveness, rather they are used for political and power purposes by groups within the organization or within society at large, and are not associated with the welfare of the organization (Chenhall, 2003). Criticisms of contingency-based research are well known and I will not elaborate further on those.

More particularly related to innovation research, Volberda et al. (2013) question the very operationalization of the concept "management innovation", as being too specific.

Management innovations have short life span, are firm specific, context dependent and do not generate uniform outcomes. It is hard to distinguish between different management innovations and many are interdependent. Moreover, accounting innovations become an effect of environment and technology, a largely passive adaptation to external factors (Justesen & Mouritsen, 2011).

3.2 The diffusion of innovations

Diffusion is the process in which an innovation is communicated through certain channels overtime among the members of a social system (Rogers, 2003). Diffusion is a kind of social change, defined as the process by which alteration occurs in the structure and function of a social system (Rogers, 2003). The four elements of a diffusion process are the innovation, the communication channels, time and the social system (Rogers, 2003).

To explain the diffusion of innovations, Rogers (2003) classifies five attributes of an innovation that influence potential adopters:

- The relative advantage of the innovation
- Its compatibility, with the potential adopter's current way of doing things and with social norms
- The complexity of the innovation
- Trialability, the ease with which the innovation can be tested by a potential adopter
- Observability, the ease with which the innovation can be evaluated after trial

Additionally, Rogers (2003) defines external conditions that influence the diffusion of innovations:

- Whether the decision is made collectively, by individuals, or by a central authority
- The communication channels used to acquire information about an innovation, whether mass media or interpersonal
- The nature of the social system in which the potential adopters are embedded, its norms, and the degree of interconnectedness
- The extent of change agents' (advertisers, development agencies etc.) promotion efforts.

Time is an important dimension of the diffusion process, and Rogers (2003) observes

five adopter categories: innovators, early adopters, early majority, late majority and laggards. The rate of adoption is the relative speed with which an innovation is adopted.

3.2.1 Diffusion studies in management accounting innovations

The major point of interest in diffusion theory is how and why (or why not) some agents adopt ideas or phenomena (Bjørnenak, 1997). Most diffusion studies use contagion models that describe an increasing rate of adoption that eventually tapers off (Abrahamson, 1991).

Bjørnenak (1997) studied the diffusion of ABC in Norway. He qualified the diffusion of "expansion diffusion when the innovation is adopted by more and more agents (firms), so that the total number of adopters is growing over time" (Bjørnenak, 1997). The study was conducted via questionnaire, and attempted to understand whether diffusion had taken a hierarchical or contagious form of diffusion. He concluded that looking only at the demand side only gave a partial view of the diffusion process, and that the supply side (ABC experts) should be explored further to better understand the conditions and results of the diffusion of a management accounting innovation.

Alcouffe et al. (2003) analyzed eleven factors of influence in the diffusion process of ABC, GP method[4] and budgetary control. They conclude that interpersonal relations play the most important role in the diffusion process, while state organizations and professional organizations played a very minor role. They also acknowledge the role of the overall economic and managerial context as having a "positive impact" on diffusion, albeit not a sufficient explanatory factor of diffusion processes.

Lapsley and Wright (2004) went on to look at the diffusion of management accounting innovations in the public sector. Their study drove a number of interesting insights, notably that the supply side had an enormous incident in the adoption of MAIs in the public sector in the name of governmental recommendations. They were also able to identify gaps that diffusion theory does not allow to analyse thoroughly. One of the drawbacks of diffusion theory is the lack of political variables embodied in the framework. Indeed, they found that many decisions in the public sector are politically motivated and diffusion theory does not particularly attention this institutional factor.

Nassar et al. (2011) studied the diffusion of ABC in Jordan. Using semi-structured

[4] Méthode Georges Perrin

interviews, their research allowed an insight into the diffusion of MAI in a developing country. They acknowledge that diffusion followed the S curve of the diffusion process, and that the rational choice, fashion and fad perspectives were explanatory factors of diffusion. However, more interestingly they also looked at non-implementation of ABC and found that the main reasons for non-implementation were "a lack of local consultants; the high cost of ABC implementation; the high cost of consultants; a lack of journals, conferences, and seminars about ABC in Jordan; and a lack of accounting bodies". This study emphasizes that institutional factors, and the general social and economic context, play key roles in the diffusion of innovations.

Birnberg and Shields (2009) analysed the impact in the United States of Anthony Hopwood's idea that "research on management accounting practice should be informed by organizational and social theories and use field research methods to investigate management accounting in its natural contexts". They argue that developing and diffusing radical innovations can depend on minimizing 'gaps' that diminish the willingness of individuals to adopt them. The gaps they identify are the engagement gap (isolation adopters versus non-adopters), the help gap (proficiency in using the innovation), the openness gap (it is not safe to discuss an innovation), a results gap (people are concerned with the expected results), and a time gap (time needed to learn how to use the innovation) (Birnberg & Shields, 2009). Indeed, they show that despite using four communication channels to diffuse his innovation, his radical innovation still faced organizational and social forces that created gaps, which considerably limited the diffusion of the innovation in the United States (Birnberg & Shields, 2009).

Also this very partial literature review of diffusion research on management accounting innovations is far from complete, it has reviewed research on MAIs in different arenas: developed and developing countries, private and public sector, as well as in the research arena. From the research on diffusion of MAIs, it can be acknowledge that although they give a interesting quantitative picture of innovations, they fail to account for the broader institutional environment that accompany the diffusion of an innovation. One recent attempt to overturn this critic is the paper by Ezzamel et al. (2013) on the introduction of Resource Accounting and Budgeting (RAB) in the UK, where Rogers' diffusion model is used and complemented with a broader perspective on the institutional environment surrounding this accounting innovation. Moreover, Birnberg and Shields (2009) provide an interesting insight on the influence of adopters and their characteristics through the

'gaps', while diffusion studies usually emphasize the characteristics of the innovation as explanatory factors of diffusion. I now turn to general critics that have been addressed in regards to diffusion theory.

3.2.2 Critiques of diffusion

One critique of Rogers' theory is that it implies that the "old" process or technology being replaced does not change and the "new" is better than the old (Hall, 2005), when in fact the old can slow the diffusion of innovation who experience a "last gap" improvement. Another critic of the theory developed by Rogers is that it ignores the "social feedback effects", or externalities (Hall, 2005) as it grounds its approach in the decision making of the microeconomic unit (the adopting organization). Finally, the fundamental characteristics of an innovation are not enough to explain its diffusion, and the possibility to adapt the innovation to local conditions plays a role in the adoption, or at least in the speed of diffusion of the innovation (Hall, 2005).

ANT criticized the model of diffusion because of the separation that it makes between the conception and diffusion phases of innovation (Alcouffe et al., 2003). Actor Network Theory (ANT) considers that the social and the technical cannot be separated, and that the diffusion of innovations depends largely on the context in which it was shaped and created (Alcouffe et al., 2003). Sahlin-Andersson (1996) identifies the weakness of traditional notions of diffusion in ignoring the role of actants: "the impression is that new organization models spread almost automatically; organizations are regarded as passive entities, which simply react and adapt to the latest trends. If we acknowledge that organizations consist of thinking and acting persons, and that each change in organizational practice or organizational form requires that people act, we will find that the mechanical explanations leave unanswered most of the questions about why organizations adopt new trends."

3.3 Fad and fashion perspective on MAIs

The fad and fashion perspective builds on diffusion studies and the model developed by Rogers (2003). However, it takes on some of the critics to develop several other explanations to diffusion patterns for innovation. Notably, Abrahamson (1991) criticized the assumption that organizations independently and rationally adopt technically efficient innovations. Indeed, this assumption does not allow explaining the diffusion of

technically inefficient innovations or the rejection of efficient ones (Abrahamson, 1991). Most adoptions are assumed to occur because of the benefits and efficiencies gained through implementation and linked to the intrinsic characteristics of the innovation (Lapsley & Wright, 2004). Abrahamson's perspective (1991) also assumes that organizations are "uncertain about both their goals and the efficiency of innovations and are influenced by other organizations in their population in adopting managerial innovations". Consequently, Abrahamson (1991) adds three other perspectives to this efficient-choice selection.

According to the forced-selection perspective, a number of organizations control sufficient power to dictate which administrative technologies will diffuse across organizations (Abrahamson, 1991). In the forced selection perspective, the motive of the adopter may not play a part in implementation (Lapsley & Wright, 2004). The fashion perspective is based on the assumption that in an uncertain context, organizations in a group will want to imitate administrative models promoted by "fashion-setting organizations", or "opinion leaders", such as consulting firms or mass media, involved in the creation and dissemination of innovations (Abrahamson, 1991). In this perspective, potential adopters retain the choice over whether to implement the innovation or not.

The fad perspective is similar to the fashion perspective, however it assumes that the diffusion of innovations occurs when organizations within a group imitate other organizations within that group (Abrahamson, 1991). This perspective describes organisations adopting a technique in order to appear legitimate and retain a competitive advantage, rather than for reasons that are more rational (Lapsley & Wright, 2004).

3.3.1 Fad and fashion studies in MAIs

Malmi (1999) studied the diffusion of ABC in Finland using Abrahamson's theoretical model. Based on survey, interviews and archives, he proposes that the four perspectives developed by Abrahamson explain different steps of the diffusion. For example, efficient choice explains the earliest adoption and the very late adoption, when the fashion perspective is adapted to explain the taken-on stage. A more fad perspective based on mimetic behaviour explains late majority adoption. He also concludes that the driving force behind accounting change may reside outside the group of adopting organizations. Additionally, Malmi (1999) makes the parallel between the fad and fashion perspectives

closely and institutional isomorphism, both rooted in uncertainty.

Ax and Bjørnenak (2005) analyzed the role of supply side in the diffusion of the balance scorecard (BSC) in Sweden, using the fashion setting process of Abrahamson (1996) to describe the essential "bundling" of innovations with other tools as an important tool for reinforcing the diffusion process.

3.3.2 Critics of fad and fashion perspective

Malmi (1999) points to two items that Abrahamson's perspective ignores. First, the framework is silent about addressing the characteristics of the adopting population. Second, the framework ignores the potential endogenous processes that can induce change and innovation. The fad and fashion perspective also ignores the several layers of diffusion that can impend the "full" diffusion of innovations, such as described in Mellett et al. (2009).

3.4 Conception and diffusion of MAIs using Actor Network Theory (ANT)

ANT both explains the creation and the diffusion of management accounting innovations. ANT specifically challenges rationalistic and functionalist approaches on innovations. ANT regards the development of any innovation more like a complex process with multiple, cumulative and conjunctive progressions of convergent, parallel and divergent activities (Alcouffe et al., 2008).

It is during the constitution of socio-technical networks, that is during the conception, development and diffusion of new artefacts, that negotiations and adjustments between non-human and human actants take place, before the innovation is "black-boxed" (Callon, 2006). ANT explores innovation conception through a process called translation. Translation is defined as "displacement, drift, invention, mediation, the creation of a link that did not exist before" (Latour, 1999), and is closely linked to the concept of actor-network.

The idea that innovations are not "ready-made packages" to be implemented but loosely coupled set of ideas and technologies that are constantly shaped and reshaped when they "travel" from one setting to the next (Justesen & Mouritsen, 2011) redefines the conception of linear diffusion of innovation and uniformity of adoption. Adoption in ANT is being conceived as a constantly new retranslation into a new local. Management accounting innovations are modified, strengthened and undermined in the process of

dissemination (Preston et al., 1992). Accounting phenomena appear to be identical and black boxed, but actually become different things when they are translated in practice; thus when they travel they are translated rather than diffused (Justesen & Mouritsen, 2011).

According to ANT, accounting phenomena are never merely diffused, adopted or implemented; they are adapted and translated and, at the same time, they are enrolled in an actor-network that reconfigures other actors' interests (Justesen & Mouritsen, 2011). Additionally accounting technologies and calculative devices are granted a new and prominent role because they are seen as actors in the process of formulating and constructing MAIs (Justesen & Mouritsen, 2011).

3.4.1 ANT and management accounting innovations

Preston et al. (1992) is one of the first studies of an MAI, here the budget, using ANT. Unlike the subsequent studies in this paragraph which happen outside the organization and follow the MAI in a wider context (France, the world, Europe…), Preston et al. (1992) focus on the fabrication of a budget from the inside of an organization. It is an illustration of the problems of fabrication and the difficulty of making budgeting systems appear as unexceptional facts of organizational life (Preston et al., 1992). As the project was labelled a failure, they note the particular role played by the "sceptics" and the inherent social nature of the fabrication of a budget, noting that "the fate of a scientific fact or a technology rests in the actions of others" (Preston et al., 1992).

Jones and Dugdale (2002) follow the management accounting theory ABC along the network of actors, intermediaries, events and inscriptions. They note the specific role of management consultants as being pivotal, as well as the role the non-human actor computer software in black-boxing the MAI. One of the key findings remains the shift of key site for production of management knowledge, from universities to the market place itself, and the customers of new ideas. Moreover, the ambiguous simplicity of ABC enabled the various members of the network to each translate ABC to their own interests, contributing to wider diffusion of the tool. Hence, authorship and agency are distributed (Justesen & Mouritsen, 2011).

Alcouffe et al. (2008) looks at the two different MAIs and their story in the French context, one successful, the other not. They conclude that for a managerial innovation to "successfully" diffuse, it seems necessary to have a diversity of interessement modalities that combine and overlap. Moreover, enrolment and the construction of the relevant network around the innovation seem to be key for its "successful" development. They also note the importance of trial of strengths in the process, stating that the only method that did not diffuse, GP, was supported by a single champion.

Cooper et al. (2012) explore the birth of and translation of the balanced scorecard (BSC). They focus on the strategies developed by the different set of actors, and more particularly by the innovators to stay obligatory passage points. They reflect on strategies of the fact builders to try and maintain control over the innovation (see also Becker et al., 2013). They however acknowledge that as BSC travelled across space and time, its success did not stop it from being transformed and translated locally. However, they do not elaborate further on this tension between the spread of an idea that diverse interests can feel connected to, and the willingness of creators to maintain control over it.

Becker et al. (2013) follows the construction of the beyond budgeting innovation and how it came to be involved into an identity dilemma. They claim that a dilemma can appear between concerns that lie with the dissemination of an innovation and efforts to protect a particular understanding or identity of an innovation. Their paper also defines two conditions that make such a dilemma likely to emerge; one is a positioning of the innovation in clear opposition to another practice, and the fact that small translations of the innovation have already happened, in an association with this other practice. Unfortunately, they do not elaborate on the consequences for the innovation and the possibilities for that identity dilemma to be resolved.

3.4.2 Critiques of ANT based studies for management accounting innovations

Chua explicitly rejects Latour's view that inanimate objects have agency (Chua, 1995) and thereby translates ANT in a way that makes it resemble social constructivism. (Justesen & Mouritsen, 2011). Chua (1995) also acknowledge that in ANT studies, there

is a need to look beyond the organization into the larger society, to consider some influences that economic, political or cultural institutions may have on fact-building networks.

3.5 Mechanisms of institutionalization of MAIs

Di Maggio and Powell (1983) proposed three mechanisms of institutionalization: coercive, normative, and mimetic. Scott (2008b) extended them with his three pillars concept: the three mechanisms are regulative processes, normative processes and cognitive processes. Coercive pressure is often associated with the state, and refers to sanctions, threats and the use of force by a powerful actor to obtain compliance. Normative pressures is linked to cultural expectations. When companies mimic other companies, it is usually because the behaviour or form of those companies is seen to bring effectiveness. As new institutional rules emerge, existing companies incorporate those rules; they become "isomorphic" with their institutional context. "Organizations conform to them-become isomorphic to their institutional context- in order to signal their social fitness and gain legitimacy in the eyes of critical constituencies" (Greenwood et al., 2008). Isomorphism has for consequences that organizations incorporate elements that are legitimate, but not always good in terms of efficiency. However, it is also said that "dependence on externally fixed institutions reduces turbulence and maintains stability", and thus promotes success and survival rates (Meyer & Rowan, 1977).

Studying innovations through institutional theory is however not limited to studying diffusion, as we will see in chapter 3, with the recent development of institutional entrepreneurship, institutional work, and a wider interest in institutional change, more particularly in the institutionalization processes.

3.5.1 Institutional theory and management accounting innovations

Gehrke and Zarlowski (2003) analyze the diffusion of shareholder value in France. The result of the study is the observation of a decoupling between external communication and internal practices. They note that giving the strong ambiguity associated with the definition of shareholder value and the technical uncertainties of the concept, organizations tend to use that flexibility to their advantage. They also emphasize the

role of external legitimacy in adoption of innovations, potentially leading to economic gains linked to the symbolic capital acquired by being perceived as "legitimate".

Carmona and Guttiérez (2003) explore the impact of MAIs on research communities in Spain and England. They conclude that imitation (isomorphism) is indeed likely to happen when goal ambiguity is prevalent (Sevon, 1996), and is also driven by the desire to avoid uncertainty.

3.5.2 Critiques of institutional theory in studies of innovations

New institutionalism does not seem to be able to explain the earliest adoptions of accounting innovations (Tolbert & Zucker, 1983).

ANT criticizes the concept of isomorphism. According to ANT, the implementation of an accounting system is not a homogenization process, because systems are translated differently depending on the specific setting in which they become enrolled and mobilized (Justesen & Mouritsen, 2011).

Institutional phenomenon has often been found to conduct to an increasing homogeneity of organizations, "facilitating a popular misconception of the theory as having only stability and inertia as its central defining characteristics" (Hoffman, 1999). Ball and Craig (2010) state that "efforts to obtain a fuller understanding of change and how change intersects with social and environmental accounting, will be advanced if we examine degrees of change and the pace of change, rather than fixate on immediate success or failure".

3.6 The practice of innovations: emerging practice theory research

Practice theory has recently developed in the study of innovations (Pantzar, 2010). New practice creation is the enquiry into how practices become what they are (Bjorkeng et al., 2009). New practices are "as a consequence of spontaneous human actions rather than of human designs" (Chia & Holt, 2006). New practice emergence can be said to be "experimental" in nature (Andon et al., 2007). For example, Olsen (2009) describes how a practical knowledge of how "microfluidics technology can be used for biological experiments is being developed in the course of everyday practice". Those that engage in routine work practices in their jobs (Gherardi, 2012) produce knowledge and innovation on a daily basis. Ciborra (2000) insists on the importance of everyday

practices in the emergence of innovations "in the making".

As it is at the micro level that the managerial reality enfolds every day, a theory of innovation needs to connect the action (praxis) with the ostentive part of practice by understanding the role of agents (practitioners) (Crossan & Apaydin, 2010).

Practice theory can illuminate both the implementation phase of an innovation through its practice in the organization, but is also relevant to understand how a new practice is constituted in an organizational field, through practice, as illustrated by the study of Nordic walking (Pantzar, 2010). Therefore, there is a need to further explore MAIs based on practice theory (Pantzar, 2010).

Its main critics are that practice theory ignores wider institutional arrangements that can constitute the fertile ground of management accounting innovations. Although it is very close to ANT, it recognise the primacy of practices in the constitution of innovations, and does not recognise the agency of non-human actors, having a role in the constitution of MAIs.

3.7 Conclusion on the different theoretical approach to studying management accounting innovations

I have now completed the review of the different theoretical approaches to studying management accounting innovations. The table below summarizes the different approaches and their critics.

Theory	Innovation process step	Main characteristics	Main critics
Contingency theory (Gosselin 1997)	Adoption	Try to find antecedents to adoption of MAI Focus on the adopter	MAI as an effect of environment and technology, a largely passive adaptation to external factors
Diffusion theory (Bjørnenak 1997; Alcouffe et al. 2003; Lapsley & Wright, 2004; Birnberg & Shields, 2009; Nassar et al. 2011)	Diffusion	Focus on the adopter and the characteristics of the innovation	Organizations are regarded as passive entities Separation of conception/diffusion phase Ignore the effect of power relations
Fad and fashion theory (Malmi, 1999; Ax & Bjørnenak, 2005)	Diffusion	Tries to understand why efficient innovations are sometimes not adopted, and inefficient ones are Shifts focus on the supply side	Silent about addressing the characteristics of the adopting population Fails to address potential endogenous processes of change
ANT (Preston et al. 1992; Jones & Dugdale, 2002; Alcouffe et al. 2008; Cooper et al. 2012; Becker et al. 2013)	Creation, diffusion	Creation and diffusion happen through translation processes between actants and non-human actants	The agency of non human actants
Institutional theory (Gherke & Zarlowski, 2003; Carmona & Guttiérez, 2003)	Diffusion More recently: creation and disappearance	Focuses on isomorphic mechanisms Reintegrated agency and purposive action	Does not explain well early adoptions, process of isomorphism to homogenization
Practice theory (Pantzar 2010; Bjorkeng et al., 2009)	Creation, diffusion and practice (implementation)	Innovation can be created through emergent practice, and is re-enacted (diffused) through everyday practices. Practice theory allows to see innovations at the time they become "routines"	Ignores wider institutional arrangements, does not recognize the agency of non human actants

Table 0.1.1: MAIs studies and theoretical approaches

It has been emphasized that the different theoretical approaches are often complementary. Diffusion theory (Rogers, 2003) and the fad and fashion perspective are often already used in conjunction (e.g. Mellett et al. 2009). Zawawi and Hoque (2010) suggest that the principles of innovation diffusion theory that emphasize the effectiveness of innovation could be complemented by institutional theory that presumes social legitimization.

Positivist research in management accounting often chooses to ignore power struggles; when management accounting technologies cannot be separated from the formation and exercise of power in organizations and society, as it is very likely to influence the diffusion of new practices (Baxter & Chua, 2003; Alcouffe et al., 2008). Therefore in this dissertation, contingency and diffusion theoretical frameworks have to been chosen to study MAIs.

This research will also associate two theories to contribute to MAIs study from the creation phase to the practice phase. In chapter three, I will develop further how institutional theory and practice theory can together contribute to our understanding of management accounting innovations, and the reasons this combination was thought best adapted to contribute to the study of management accounting innovations.

4 The process of innovation

This dissertation takes a process approach to innovation, in opposition to looking at innovations as outcomes. The stages of innovation are broadly grouped into generation and adoption. Other partitions of the innovation process exist, such as the description by Daft (1978) of "four essential steps, starting with the conception of an idea, which is proposed, then a decision is made to adopt, and finally the innovation is implemented", the periods of design and development, adoption, implementation and diffusion (Slappendel, 1996), the awareness, appraisal, diffusion, adoption and implementation (Fiol, 1996) and the six steps of origination, development, commercialization, diffusion, adoption and implementation(Damanpour & Aravind, 2011). It can be noted that such representation of the innovation process rarely mentions the possible death, or disappearance of an innovation. However, the perspective of disappearance underlines the fragility of innovations and the possibility that it does not "anchor" itself in usage.

	Daft (1978)	Fiol (1996)	Slappendel (1996)	Damanpour and Aravind (2011)
Generation	Conception		Design	Origination
			Development	Development
Adoption	Proposition	Awareness /Appraisal		Commercialization
		Diffusion	Diffusion	Diffusion
	Adoption	Adoption	Adoption	Adoption
	Implementation	Implementation	Implementation	Implementation

Table 0.1.2: The different phases of innovation process

I will focus on the three stages that are developed in the three articles of this dissertation: origination, adoption and implementation[5].

First I will explore the phase of origination and development of management accounting innovations. Then I will the concept of adoption, and finally the stage of implementation- that is practice of the innovation.

[5] The diffusion phase is not part of this dissertation. The diffusion phase is not without importance, as without diffusion, innovation would have little social or economic impact. Diffusion is the "means by which innovations become useful by being spread throughout a population" (Hall, 2005). It is an important part of the innovation process where learning, imitation, and feedback effects arise and enhance or change the original innovation (Hall, 2005). In this research, diffusion is acknowledged through the study of the adoption phase (article 2) and in article 1 to acknowledge the consequence of elite's work in defining LCA in France and the consequences on the scarce diffusion of the tool. Studying diffusion requires access to a wider organizational field, whereas, I choose to access innovation through the focus on actors and work (article 1) and the organization and its practices (article 2 and 3).

4.1 Origination and development of management accounting innovations

The first paper of this dissertation contributes to the literature on the emergence of MAIs. Studies of the diffusion of existing management accounting innovations are common, but there is very little literature on the origins of management innovation and the generative processes through which it first takes shape (Birkinshaw & Mol, 2006). Most management innovations take several years to implement and in some cases it is impossible to say with any precision when the innovation eventually took place (Birkinshaw & Mol, 2006). Hopwood (1987) addressed the difficulty of observing emergent accountings:

> *"It rarely is possible to witness the birth pains of a newly emergent accounting. Normally we have to content ourselves with observing the process of accounting elaboration, as one organisational account is extended and refined as it becomes transformed into another" (Hopwood, 1987)*

Burchell et al. (1980) called for further historical studies of the development of accounting to answer the following questions: Just how has accounting come to function as we now know it? What social issues and agents have been involved with its emergence and development? How has it become intertwined with other aspects of social life? And what consequences might it be seen as having had?

The emergence of novel ideas is preceded by a long period of gestation (Van de Ven et al., 2000), and when they emerge, they often shock the system and set planning in motion. The process of development of an innovation is not straightforward, but instead is characterized by a proliferation of paths as well as many setbacks (Garud et al., 2013). Birkinshaw and Mol (2006) and Birkinshaw et al. (2008) identified phases for the generation of management innovations:

- Dissatisfaction with status quo,
- Inspiration, usually from the outside, facilitating factors and precipitating circumstances that lead to development of new MAI
- Invention, triggered by a combination of dissatisfaction and inspiration, initial act of experimentation
- Validation, from both inside and outside, establishing the value, theorizing, labelling

Innovation is not straightforward. It challenges established positions, monopoly rents,

the prerogatives and interests (Gaglio, 2011). Innovation processes are largely riddled with oppositions, contradictory debates and generate confrontations (Gaglio, 2011). Indeed, novel ideas are "hopeful monstrosities" (Basalla, 1988) that carry a sting of illegitimacy, that passes trial of strengths, gates or evaluation criteria, and only few new ideas succeed (Garud et al., 2013).

Management accounting innovations "creations" have been studied through broadly two main streams of research. First there have been accounts of accounting innovations through genealogies of tools (Loft, 1986; Carmona et al., 1997; Hoskin & Macve, 1988). Second, more recent MAIS such as ABC, BSC and beyond budgeting have been analyzed through the lens of ANT (Jones & Dugdale, 2002; Alcouffe et al., 2008; Cooper et al., 2012; Becker et al., 2013).

4.1.1 Emphasizing the social nature of accounting

The stories of the creation of MAIs, in particular genealogies, have emphasized the social nature of accounting and its very contextual nature in their emergence processes. The focus of genealogies on the constituting of innovations, particularly on the conditions, events, traces of power and expert discourses that have shaped their existence (Edgley, 2013). They are unofficial histories seeking to explore the many "small" ways in which techniques of knowledge emerged and spread (Loft, 1986). Accountancy is examined as an historically and geographically localized result of the composition of various lines of force (Miller & Napier, 1993).

For example, Miller (1991) emphasizes the relays and linkages that are made between a particular accounting technique and more specific features of the U.K. context such as issues of taxation and "free depreciation", and much broader macroeconomic debates concerning levels of investment and growth rates in the U.K. in the 1960s. The more programmatic aspects of accounting innovations, such as idealized schemas for representing, analysing and seeking to rectify bigger "problems" associated with broader aspects of economic and social life, need to be explored (Miller, 1991).

Looking at the social nature of accounting allows to understand how accounting works to shape its own environment, making things visible and rendering others invisible (Napier, 2006), allowing new spaces to be calculable (Carmona et al., 1997). Moreover, contextual studies grounded in the social arena can help decipher how accounting

practices and ideas are mobilized to achieve social change, and its constitutive role of for example, policy-makers' view of society (Napier, 2006).

4.1.2 Agents of accounting change

Burchell et al (1980) raised the question of what agents had been involved in the emergence and development of accountings. Studies of the conception of innovations have emphasized the role of several different agents in the inception of management accounting innovations. Innovations in management accounting have been viewed as principally the preserve of practitioners, as arising from attempts to address the problems actually faced by managers of enterprises (Miller, 1991). External change agents however are given in managerial innovations a much more significant role. These individuals were a mix of academics, consultants, management gurus and ex-employees. They often provide the initial inspiration for a management innovation, and they frequently help to shape and legitimize the innovation as it takes hold (Birkinshaw & Mol, 2006). For example, discounted cash flow procedures were supported by academics (Miller, 1991). Management accounting innovations are not only fabricated internally within firms, but are constructed out of the interrelations between a diverse array of agents including academics, accountants, engineers, consultants and government agencies (Miller et al., 1991). Jones and Dugdale (2002) note the specific role of management consultants as being pivotal, as well as the role the non-human actor computer software in black-boxing the MAI. The role of consultants was also central in the birth of budgetary control in France (Berland, 1997). In the environmental management accounting literature, the role of government and governmental agencies has been emphasized through the description of several programmes such as in Japan (Kokubu et al., 2003), Bangladesh (Mia, 2005), Korea (Lee et al., 2005), but also in the US (US EPA environmental accounting program 1992-2002). Another category of actors in management accounting innovations have been defined as social reformers "actors in society who, upon encountering economic or social phenomena they deem regrettable or maybe even highly dangerous, simultaneously produce a critique of society, a diagnosis of the risks it is running, and proposals for reforms, regardless of whether these reforms are considered realistic or utopian" (Chiapello & Berland, 2009). A characteristic of social reformers is that they are not necessarily in the position of power and tend to position themselves as forces for opposition (Chiapello & Berland, 2009).

Their ideas are transported to the very heart of the system against which it was produced, usually to overcome a difficult crisis (Chiapello & Berland, 2009).

Other focus on accounting constellations (Burchell et al., 1985) or networks "the network of social relations and inter organizational relations through which particular types of financial statements and other accounting practices emerge" (Miller, 1991). All point of views, actions and discourses are considered equal, any actor is in the network (Justesen & Mouritsen, 2011). In ANT, authorship and agency is distributed (Justesen & Mouritsen, 2011). A network is a web of mediators, existing through attachments and actors (Latour, 2005), a binding together of humans and non-humans that form seamless webs (Jones & Dugdale, 2002). The network and the enrolment process are key to the success of an innovation: "the machine will work when all the relevant people are convinced" (Latour, 1987).

Although accounting genealogies and stories of MAIs development have emphasized different kind of actors involved in the making of innovations, in particular practitioners, consultants and governments, the construction of historical agency needs to be further explored, as not anyone can articulate ideas about accounting that will be heard or believed (Oakes & Miranti, 1996). Indeed, actors are also institutionally constructed and institutional contexts determine what sorts of actors become relevant to the construction of innovations (Hwang & Colyvas, 2011). Moreover, contrary to the perspective where all actors, non-human actants are considered of equal importance in a totality of a network that supports the innovation, this research understands that actors in the innovation process have relative importance depending on the institutional context that determines their relevance. The first paper of this dissertation will introduce an agent of change, the elite, that has until now been considered as an agent of stability.

4.1.3 Channels and actions for accounting emergence

Several actions are necessary for an innovation to occupy its role and to be understood. Innovations needs to problematized, not only technically but referring to some ideals, such as "the defence of nation" (Alcouffe et al., 2008).

Theorizing is "the development and specification of abstract categories, and the elaboration of chains of cause and effect" (Greenwood et al., 2002). Innovation depends in important part on the formation of new ways of thinking about the processes in question, therefore new vocabularies for understanding the roles of accountancy and new rhetorical forms for representing the significances of particular calculative routines have to be created, in a process of "labelling" (Miller & O'Leary, 1990).

The innovation needs to be communicated, preferably through various channels. For example, four types of channel enabled the promoters of budgetary control to develop their ideas: journals, congresses, books and professional associations (Chiapello & Berland, 2009).

Key actions in ANT based research on innovations are linked to the construction of networks: enrolment of allies, controlling allies, making new alliances (Jones & Dugdale, 2002). To enrol allies, several interessement modalities have to be mobilized such as commercial, political, editorial, intellectual or career enhancing (Alcouffe et al., 2008).

4.1.4 Conclusion

The first paper of this dissertation makes the following contribution to the study of accounting in emergence. First, it introduces a new agent for change that had been considered as of now as a mere agent of stability, the elite. Second, while having grounded the study of LCA in the social and economic French context of the 90s, this first article makes a contribution by targeting the important constitutive role accounting plays in return on the environmental policy of France and Europe, having shaped the view of policy makers on environmental topics. The first article also disagrees with the view that within a constitutive network of support in the creation of a new accounting, all actors and actants have the same important in determining the future of the tool. Although elite cannot be defined as a sole "institutional entrepreneur" either, the network of support around the construction of LCA as an EMA tool was clearly conducted by a small group of elite engineers from the Ecobilan team. Fourthly, the first article brings a "work" perspective to the story of accountings in emergence, as the purposive actions aimed at creating institutions. Until now, to the exception of Cooper et al. (2012), where they review work of experimentation, theorization, labelling, and the making of abstract categories, the different work needed to the making of innovations was relatively neglected. However, genealogies of calculation must look at "the

strategies advanced for their (techniques) adoption" (Miller & Napier, 1993). Finally, this article is the first, to our knowledge, to tackle EMA as the object of research in a genealogy of MAIs.

4.2 Adoption

The second article of this dissertation addresses the moment of adoption through the empirical study of the process of non-adoption. The perception that organizations are passive receptors of legitimate ideas is now long overdue, and the adoption phase of the innovation cycle has retained more attention as the crucial link between the organizational field, and the inside of organizations.

The adoption process covers how an organization becomes aware of new ideas, acquires and adapts them (Damanpour & Aravind, 2011). For the user organization, the adoption of innovation and organizational change are closely linked; the primary distinction between innovation and change is the 'extent of newness' of the change to the adopting organization (Slappendel, 1996).

Adoption itself is composed of different steps. The models often take implementation into account, which in our case is separated in the next section. In this section we review the process of adoption, from awareness to the decision to adopt.

Beal and Bohlen (1955)	Hage and Aiken (1970)	Zaltman et al. (1973)	Klein and Sorra's (1996)
Awareness		Knowledge awareness	Awareness
Interest	Evaluation	Attitude formation	Selection
Evaluation	Initiation	(adoption) decision	Adoption (decision)
Trial	Implementation	Initial implementation	Implementation
Adoption	Routinization	Continued-sustained implementation	Routinization

Table 0.1.3: Adoption phases

4.2.1 Determining adoption

Research has made significant advances in identifying behavioural determinants of innovation adoption at the organization and macro-social level (Westphal et al., 1996). Adoption of innovation is facilitated through managerial levels that enable innovations.

Those "innovation capabilities" can be found in the mission/goals, structures and systems, resource allocation, organization learning and culture (Crossan & Apaydin, 2010). Leaders can create a learning environment that provides support for experimentation, they can be tolerant of failed ideas and adopt risk-taking norms. They can support learning and development of employees and foster acceptance of diversity (Crossan & Apaydin, 2010).

However, researchers have typically treated innovation as a discrete phenomenon, neglecting to examine variation in the form of adoption itself (Westphal et al., 1996).

4.2.2 Variation in adoption: bundling, enaction, appropriation

Adoption has been seen as being enhanced by the process of bundling: "way in which the supply side can popularise an innovation in a specific location is by matching the design characteristics and rhetorical elements of the innovation to the preferences and knowledge of the potential adopters" (Ax & Bjørnenak, 2005). Bundling implies that elements of different innovations are re-combined into "new" packages in the process of adapting these to a particular context (Modell, 2009a).

Adoption can also happen as "enaction", where there is no adoption but direct implementation, such in the case of the SAP package where there was nothing to implement (Quattrone & Hopper, 2001), and where SAP's identity was constructed through praxis. Enaction is the coproduction of knowledge and action. This comes close to the conception of emerging practices as they are being explored in article three.

Appropriation supposes that you gain familiarity with the innovation (Gaglio, 2011). Appropriation gives meaning and efficacy, guarantees the future of innovation. It underpins there is a learning process and confers legitimacy to the innovation (Gaglio, 2011). Appropriation of an innovation is in the realm of "doing", in the creation of new practices, but also relies on the adoption of the ideas that underpin that innovation (Gaglio, 2011).

4.2.3 Conclusion on adoption

The second article of the dissertation focuses on the moment of adoption in a particular way. Indeed, it has for empirical site the decision of non-adoption of widely accepted and legitimate management accounting innovation. This empirical focus, as well as the

decision to make an internally generated tool, allows understanding notions of "appropriation", "internalization" (Dambrin et al., 2007), and the development of the "bundling" concept forwarded by Modell (2009a). The article also sheds light on the widely described phenomena of decoupling, where an innovation is adopted and not implemented (see chapter 2).

4.3 Implementation and practice

The third article of this dissertation seeks to address the implementation phase of the innovation process. Innovation implementation within an organization can be defined as the process of gaining targeted employees' appropriate and committed use of an innovation (Klein & Sorra, 1996). Implementation is an uncertain exercise and may prove complex and problematic (Rogers, 2003). Indeed accounting innovations are often not successfully implemented or diffused throughout the organization (Abernethy & Bouwens, 2005). Other actors in and around the scene of the adoption of the innovation may seek to alter, modify or reinvent the innovation (Rogers, 2003). Wolfe (1994) decomposed the implementation process into four phases after adoption: implementation, confirmation, routinization and infusion.

The moment of implementation is where the tensions between organization and innovation are put forward, between the uncertainties that are carried by innovations, and the rationalization of the current organizational model (Alter, 1993). Often, new management accounting techniques are adopted while older systems are being maintained, suggesting that there is a transitional stage in the implementation of management accounting innovations (Zawawi & Hoque, 2010). Moreover, management accounting innovations can have consequences not only is the new visibilities and calculability it is giving the organization, but can push the organization to reorganize itself. Hoque and Alam (1999) observed that the management accounting system in the case organization changed to become more decentralized and project-oriented to fit with Total Quality Management (TQM). Implementation also connects with issues of organization knowledge. Fiol (1996) invites us to think of organizations as sponges, with more or less capacity to absorb new knowledge. "Depending on their absorptive capacity and on their ability to reconfigure what they have absorbed, organizations also have more or less potential to generate outcomes" (Fiol, 1996). In their development of "absorptive capacity" Cohen and Levinthal (1990) emphasize prior experience with

related knowledge as a key determinant. Others have also focused on the importance of an internal "champion" to carry the innovation forward (Daft, 1978; Brown et al., 2004; Emsley et al., 2006).

The very complex, uncertain and problematic exercise of implementing innovations involves tensions between actors, spaces realignment as new practices, roles and systems appear and redefine existing ones. Many studies in the accounting literature have carried out studies of accounting changes and failures, emphasizing how the fate of an innovation rests in the action of others (Preston et al., 1992) and concluding that bundling of innovations need to be reconceptualised to incorporate managerial and organisational learning processes (Modell, 2009a).

4.3.1 Conclusion on the implementation phase

What the third article of this dissertation seeks to add to our understanding of implementations is a practice perspective to the emergence of accounting innovations. Indeed, appropriation of an innovation is in the realm of "doing", in the creation of new practices (Gaglio, 2011). Pantzar and Shove (2010) see innovations in practice to come into existence through the connections between foundational elements such as material, image and skills. Practices evolve in circuit of reproduction where links are made between elements. By focusing on how practices surrounding the innovation "carbon accounting" are being formed, the research conducted allowed to see how new connections were formed, new spaces were created for the new practices (Sharma et al., 2010), how accounting interacted with existing practices and co-emerged with new strategizing practices. Through this practice-based approach, the article demonstrates how practices are not only created in the periphery but in connection with the centre. The connections for new practices to be created are happening through time (co-emergence of two practices that mutually reinforce each other) and space (local-centre).

5 Conclusion of chapter one

The process of innovation is defined as starting from an idea (invention) to the practice of the innovation (Garud et al., 2013). Through the three papers of the dissertation, I will explore the complexities of innovation processes which are co-evolutionary, as they simultaneously implicate multiple levels of analyses; relational, as they involve a diverse

set of social actors and material elements; inter-temporal, as temporal events and sequences are experienced in multiple ways and cultural, as they unfold within contextualized settings (Garud et al., 2013). This implies that one has to take a multi-level, longitudinal perspective, and follow events implicating actors, artifacts, and institutions over time (Garud et al., 2013). Therefore, the three articles follow innovations from idea to practice, following events, actors, accounting innovations, and the institutional environment surrounding those innovations (both LCA and carbon accounting environments).

Summary of chapter one

Innovation is defined by Callon (1999) as "an alchemy of combining heterogeneous ingredients: it is a process that crosses institutions, forging complex and unusual relations, the market, law, science and technology". Management accounting innovation refers to "newer" or modern forms of management accounting and control systems (Zawawi & Hoque, 2010).

I have addressed the theoretical lenses from which innovations have been analyzed in the past decades. Contingency theory demonstrates the existence of empirically distinguishable dimensions of innovation that are linked to potential improved firm performance. Volberda et al. (2013) question the very operationalization of management innovations and emphasize that different management innovations are often interdependent. Moreover, contingency theory based studies often portray accounting has a largely passive adaptation of external factors. Diffusion theory (Rogers, 2003) analyses how and why some agents adopt a new idea, but ignores the role of actants and the context in which the innovation was shaped and created. The fad and fashion perspective (Abrahamson, 1991) takes on from diffusion theory and adds three perspectives to the efficient-choice one: forced selection, fashion and fad. This theoretical perspective ignores the influence of the characteristic of the adopting population, the different levels of diffusion of innovation and the potential for endogenous processes of change.

ANT has on the contrary, developed a view of innovations as being a complex process with multiple, cumulative and conjunctive progressions of convergent, parallel and divergent activities (Alcouffe et al., 2008). However, ANT considers that non-human

actants have agency and often do not ground the studies of innovations in the larger economic, political and cultural institutions (Chua, 1995). Moreover, all actants of the network have the same contribution to the overall making of the innovation, which does not let room for the relative importance of certain actors over others in the innovation creation and diffusion process.

Institutional theory has been mainly used to describe diffusion through isomorphic mechanisms, but has reintegrated agency and purposive action to analyse the creation, maintenance and disappearance of institution. Additionally, institutional theory has recently been combined with practice theory to explain how innovations emerge from practice. Therefore, chapter three will develop further the theoretical lenses of this dissertation, namely institutional theory and practice theory.

The role of institutional agents in management accounting innovations creation needs to be further explored, included their strategies advanced to develop MAIs. The role of historical agency and how is it constructed impacts the way the innovations is being built, contrary to ANT's theorization of the network. Furthermore, environmental management accounting have been scarcely studied from the point of view of "innovation", and their study could uncover new insights on the creation, adoption and practice of MAIs. The phenomenon of non-adoption of a particular adoption is not yet well understood, although the consequences of partial adoption, through decoupling, are now well understood. The practice of innovations, how links are made through space and time requires further study, as organizations are regularly faced with MAIs to implement.

Chapter 2: Object of Research: Environmental Management Accounting (EMA)

1 Introduction

This researches focuses on the management accounting innovation "EMA" for several reasons. First, the status of degradation of the environment around us is visible, important in magnitude (see the introduction), and many scientists state the urgency of action to remediate to it (Costanza et al., 2013). Second, as Medley (1997) stated, the way that the accounting profession will tackle the environmental question will indicate its capacity to evolve- or not, with the rest of society. Third, it is of importance and relevance to organizations, as according to an Accenture/Global Compact 2010 survey, 96% of CEOs agree that sustainability issues should be integrated in the strategy and operations of companies.

In addition, certain characteristics of EMA innovations make them interesting objects of inquiries for the study of both the process of innovations and institutional change in accounting. First EMA constitutes an interesting field of innovations since some are still in the making (water accounting for example), others are emerging practices in organizations (carbon accounting) and finally, others have a short but constituted span of life that allows for genealogies to be unfolded (LCA). The field of EMA is also interesting because it allows observing the interaction, competition, and association of different innovations in the making (LCA and Life Cycle Costing (LCC), LCA and carbon accounting, material flow cost accounting (MFCA) and LCA). Furthermore, EMA stands at the crossroad of several streams of sciences, in the name of natural sciences, ecological economics, management accounting and traditional financial accounting. This particular node of knowledge is an interesting feature of innovations, as it brings together numerous institutional actors, ideas and has an impact on the "networks" that need to be built around innovations, on the actors that will decide upon adoption and on the practice of those innovations.

Finally, EMA has several interesting features as they make new spaces calculable (Vaivio, 1999; Miller, 1998; Antheaume, 2013). Then, they extended the temporal dimension of management accounting, for example when taking into account the damages to the environment, spanning from a few years to thousands of years (Antheaume, 2013). Finally, EMA increases the number of actors and non-human actors

that are taken into account into the management accounting realm. For example, when accounting for an LCA, the river and its pollution is integrated in the realm of accounting, as are the neighbours (their health) of a polluting plant (Antheaume, 2013).

Environmental management accounting (EMA) is a complex notion that relates to a variety of concepts. On the one hand it relates to traditional management accounting, its tools and systems. On the other hand, it is also related to recent concepts such as corporate social responsibility (CSR), the environment, ecology and sustainable development (SD).

The complexity of the notion also emerges from the two paradigms underlying the green movement and that percolated through to EMA research: the light and deep green paradigms. In this section, I will define the object of research EMA, as well as two tools that are the particular focus of the three papers: life cycle assessment (LCA) and carbon accounting.

2 Environment and ecology

Many terms in relation to the object of our research have been coined, such as environmental/ecological/eco-/sustainable accounting. As we are using the term "environmental" management accounting, we believe it is important to present the term "environment" and its meaning, as well as what ecology is.

Environment is everything around us (the etymology of the word comes from "circle", "turn", "around"). It is the whole of natural and artificial elements within which human life is happening. Environment is often now perceived as something that man can structure, in a vision of human dominating nature. This is linked to a Cartesian and instrumental approach. In a political sense, it now also refers to our quality of life, to our environment as receiving high pollution levels and being seen as a non-renewable resource. ISO 14001 gives the following definition of environment: "Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation".

Ecology is a term defining the science that studies the relations and interactions or organisms with the environment. This includes the study of interrelations and networks between plant, animals, and ecosystems.

Often "ecological accounting" has been a term closer to the deep green paradigm, or a way to distinguish itself from the rest. However, environmental accounting, or

environmental management accounting still remain the terms commonly used in the literature.

3 Sustainable development

The International Union for Conservation of Nature (IUCN), the world's oldest and largest global environmental network, pointed to the direction of sustainable development (SD) in its 1950 general assembly. Later, the concept of "ecodevelopment" was evoked in the conference of Stockholm in 1972 and through the Cocyoc Declaration in 1974 (Bebbington, 2001) but was quickly abandoned because of the conflicting positions between "environmentalists" and "economists". However, the concept of sustainability was put back in the limelight after the publication of the World Conservation Strategy by IUCN in 1980, and then later through the Rio 1992 conference and the Bruntland report of 1987.

Sustainable development, which is defined in the Bruntland report (1987) as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs", is often mistaken with "good environmental management" or the search for win-win possibilities between development and the environment. However, Redclift (1987) cited by Bebbington (2001) suggests sustainable and development are two antagonist worlds, one concerned by the "limits which nature presents to human beings", and the other with "potential for human material development locked up in nature".

Gradually, though, sustainable development has evolved into a very consensual conception (see appendices 6.1 "the historical development of the concept sustainable development" and 6.2 "the integration of the concept of sustainable development in the French and European policy realm"), the least threatening to political and ideological dominant presuppositions (Lazzeri, 2008). The development dimension is assimilated with economic growth, and sustainability is a form of equilibrium between the three dimensions of the concept (economic, environmental and social). It is the "managerial" dimension of sustainable development, related to "light green" (or weak sustainability) paradigm, in opposition to the political dimension it had earlier. The managerial dimension opened up multiple practices in all areas, from strategy, to marketing, to production activities. It relies on "the promise of capitalism working at its reconciliation with the whole of society by endorsing the concerns of the latter such as environmental

responsibility and social equity within the process of economic development" (Aggeri & Godard, 2006). The World Business Council for Sustainable Development as well as the Global Compact initiative both have their philosophy based on this recent "managerial" dimension of sustainable development.

4 Corporate social responsibility

Corporate Social Responsibility (CSR) has very different roots from the concept of sustainable development. It is rooted in the development of the firm as an entity in itself, different from the owner/shareholder as a person (Leseur, 2006). The development of the firm as "good citizen" developed in the United States as early as 1950 with Bowen (1953) and developed into a "moral status" of the firm (French, 1979), different from the individual (Appendix 6.3: The evolution of the definition of CSR, partially based on Carroll 1999). From this point of view, an organization has rights and duties, which legitimates corporate action related to sustainable development topics. This corporate responsibility has been sharpened with the notion of stakeholder (Freeman, 1984), which has now been analyzed through the lens of multiple categories (e.g. internal, external), their influence and legitimacy.

5 Hybridization of the two concepts: between SD and CSR

The two concepts of sustainable development and corporate social responsibility have been hybridised with the development of sustainable development consultancies (AccountAbility, Sustainability, Forum for the Future…) in the 90s. The new universal referential is that an organization is responsible to stakeholders not limited to local communities, employees, suppliers, NGOs, international institutions but also to future generations (Aggeri & Godard, 2006). This hybridization is based on the light green paradigm and is called "business case". It is currently based on this hybridized concept that most multinationals build their SD action plans based on a win-win strategy.

The following figure from the World Business Council on Sustainable Development (WBCSD) report "Meeting changing expectations" in 1998 illustrates the hybridization of the two concepts:

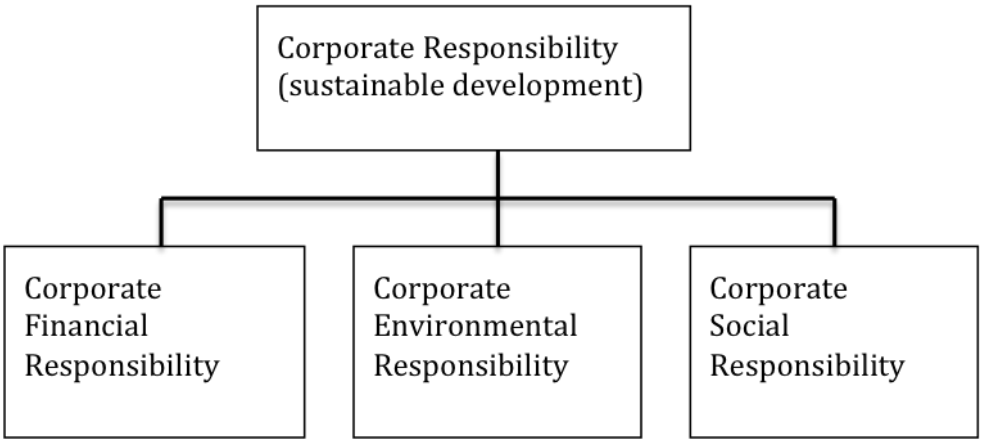


Figure 0.2.1: Illustration of corporate responsibility and sustainable development hybridization from the report "meeting changing expectations" (WBCSD, 1998)

6 Light green and deep green

In regards to studying environmental management accounting tools, it is important to recognize the distinction between light green and deep green.

It is important to understand this concept, as it is a division that is well known and used by ecologists, economists and social and environmental accounting (SEA) researchers (environmental economics, ecological economics).

It also highlights a tension in social and environmental accounting recognised since its inception between "those concerned with establishing, and monitoring, the wider accountability of the enterprise and the public organisation" and "those who seek to reinforce the legitimacy of the constitution and social role of the enterprise as we now know it" (Hopwood, 1978).

6.1 Light green

The concept of "light green" takes a lot of different names according to different authors: from weak, to light, to "private cost", to "business case", to "conservative" perspectives, they all have in common the fact that they do not question the actual neoclassical paradigm and sustainability can be achieved with economic growth and bringing economic value to business.

"Weak sustainability is associated with the idea that a community can use up its natural resources and degrade the natural environment as long as it is able to compensate for the loss with human (skills, knowledge and technology) and human-made (buildings, machinery, equipment) capital. (…)" (Schaltegger & Burritt, 2000). Weak sustainability

provides a justification for the continued use of non-renewable resources by businesses as human-made capital can be substituted.

The proponents of the "business case" approach look for a "significant financial payback" within SEA initiatives (Brown & Fraser, 2006). A statement from the WBCSD clearly shows the link between environmental protection and economic benefits they hope for: "Pursuing sustainable development makes firms more competitive, more resilient and nimble in a fast-changing world and more likely to win and retain customers. It can also help them find and keep some of the best brains on the market. In addition, it can make them more attractive to investors and insurers, while reducing their exposure to regulatory and other liabilities"[6].

SEA in this regard is also widely recognized as a way to respond to "head off campaigns from NGOs and activists" and manage "threats to organizational legitimacy" (Brown & Fraser, 2006).

The "private cost approach or conservative perspective" reflects the view that environmental aims and corporate aims can be integrated via the market mechanisms (Cullen & Whelan, 2006).

Some EMA tools and measures have been defined according to the light green paradigm. For example, environmental cost accounting and eco-efficiency measures are EMA tools based on light green thinking. Eco-efficiency was developed in the 90s (used by the Swiss company Ciba-Geigy). It is since 1992 a concept that the WBCSD defends. The goal is to minimise costs and maximise environmental benefits. Eco-efficiency expresses the efficiency with which ecological resources are used to meet human needs. It can be considered as "a ratio of an output divided by an input: the output being the value of products or services produced by a firm, a sector or the economy as a whole, and the input being the sum of environmental pressures generated by the firm, sector or economy"(OECD, 1998 cited by Schaltegger, Burritt 2000).

6.2 Deep green

The concept of "deep green" also has different naming such as "strong", "critical"… They all have in common that they do not believe that sustainable development is compatible with the neoclassical paradigm, they believe that earth supplies are limited, that each form of capital must be kept constant (principle of non substitutability of at least some

[6] http://www.wbcsd.org/newsroom/faq.aspx accessed September 20th 2013

kind of capital) and they believe in harmony with nature. Strong sustainability argues for conservation of non-renewable natural resources on the grounds of non-substitutability, irreversibility, equity and diversity (Beder, 1996). Ecological economics, based on the deep green paradigm, considers economy as a subsystem integrated into cultures and societies; themselves integrated into the biosphere (Costanza et al., 2013).
According to the critical theory approach, SEA is a tool to actually misinform, and help "camouflage" of greenwashing policies. SEA is then seen as actually being counterproductive to moving away from the "traditional business model" and legitimizing the rhetoric of businesses. In the deep green paradigm, accounting concepts that should be reviewed include the "entity assumption" (accounting considers each entity as self-contained, whereas deep green thinking believes in "everything is connected to everything else"), the "accounting period assumption" (accounting measures performance over a relatively short period, whereas accounting for the natural environment would require an ability to focus on the long term), the "objectivity assumption" (in ecological issues, a "certain amount of scientific ambiguity exists and objectivity is difficult to attain", however there is still a need to account for new contingent environmental liabilities) (Geno, 1995).

6.3 Deep green versus light green: where the research stands

The chiasm of "light green" versus "deep green" is in fact a continuously moving and evolving continuum. Where some EMA innovations are first considered "deep green" as they, for example, consider the "extended responsibility" of the producer, such as life cycle assessment (LCA); they can in time be reconsidered to light green as they become "captured" by business or because the cursor between light and deep evolves. For example, LCA, is now, for certain researchers, a "light green" tool advocating only efficiency and not absolute targets in decreasing potential impact of products or organizations. Environmental audit was first seen to have an enabling potential because of it constructs "by virtue of rendering selectively visible, relations of accountability" (Power, 1991). At the same time, Power (1991) worried that environmental auditing might at the same time be "captured" and act as a mean to reduces environmental issues to economic and risk based language, robbing the environmental audit of its potential protest-driven nature. A final example of the uneasy dichotomy of light versus green is environmental reporting. In 1997, Bebbington (1997) said that environmental reporting

had an enabling role, with a potential for two-way interaction with organizations. However today, environmental reports are often accused of having been reduced to being communication tools at the service of green washing actions from organizations that seek to hide negative aspects of their activities by actively communicating only on their positive actions through them.

The research here is based on deep green ideas that earth supplies are indeed limited and that each form of capital must be kept constant. It is also based on the belief that environmental accounting should address and challenge broader concerns and the structure in which business and accounting practices exist today (Bebbington, 1997). However, the research disagrees with the statement that the very nature of accounting will always capture, colonize, pacify environmental practices, and rob them of their radical intent (Bebbington, 1997).

In terms of research methods, the research also disagrees with statements that say "engagement with practice will inevitably turn to being 'captured by the powerful interests in which you engage'" (Bebbington, 1997). To the contrary, the research is based on engagement with organizations and believes there is a need for engaged research with the "aim of drawing from the field the rationales that the actors use to construct sustainability accounting and accountability and, directly or indirectly, enhancing practice" (Adams, Larrinaga-Gonzalez 2007). Critical engagement with economic interests can assist liberating and empowering the wider society through extending the accountability and transparency of organizations (O'Dwyer, 2003).

7 EMA: the object of research

7.1 Introduction

The concept of corporate social responsibility of a company includes the essential question of measure (Naro, 2005). EMA is therefore linked to operationalizing corporate social responsibility. Environmental management accounting is therefore an important part of the environmental management system (EMS), which is actually driven by the environmental policy of a company. ISO 14001 defines EMS as "the part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy[7]". EMA serves to plan, structure, and review the environmental policy and actions behind it.

As we have seen above, EMA is at the core of the sustainable development concept. It relates to measuring the performance of the environmental management system that is put in place to operationalize the environmental policy of a company, that itself depend on the CSR policy of a company.

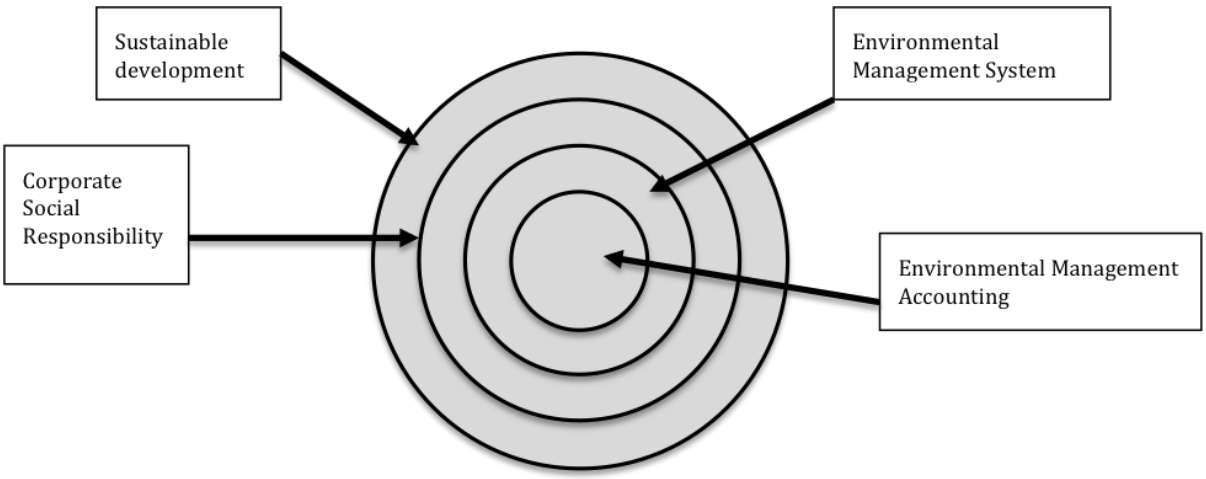


Figure 0.2.2: EMA at the core of sustainable development

7.2 The evolution of environmental management accounting

The term environmental accounting is a broad "umbrella" term used for all accounting tools related to the environment, whether management accounting or financial

[7] IS0 14001 definition of environmental policy: "Statement by the organization of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets."

accounting. It has also been used for national environmental accounting efforts. Environmental accounting was first considered in the academic accounting literature as part of the more general area of social accounting during the 70s. The term "SEA" for Social and Environmental Accounting was and is still widely used in the literature to define the broader scheme around the topic that interests us.

Snapshots of Environmental Cost Accounting (US EPA, 1998)	"Environmental accounting is a broad-based term that refers to the incorporation of environmental costs and information into a variety of accounting practices" For the US EPA, the term environmental accounting covers macroeconomic use as well as microeconomic use, and management accounting use as well as financial accounting use

Table 0.2.1: Broad definition of environmental accounting

The term environmental management accounting (EMA) is the term I will use in this dissertation to describe the object of the research. I will first define the context in which environmental management accounting as a concept emerged, the different terms coined and defined, and finally I will determine what definition of EMA I will use throughout the research.

7.2.1 Pollution-related environmental accounting (costs and liabilities), 1970-80

The first approaches for environmental impacts were based on environmental cleanup costs and past product disposal (Yakhou & Dorweiler, 2004). For example, the Environmental Accounting Project lead by the US Environmental Protection Agency (EPA) began in 1989 "in response to concerns that pollution prevention would not be adopted as the first choice of environmental management by industry until the environmental costs of non-prevention approaches and the economic benefits of pollution prevention become evident to managers".

The first issues that environmental accounting were meant to address was related to pollution, due to increasing pollution prevention and remediation regulations around the world such as the "Superfund Act" from 1980 in the United States, the 1972 Clean Water Act, and the Clean Air Act of 1980.

Pollution was first addressed through "traditional" financial accounting standards and disclosure requirements: for example the basic requirement for reporting environmental liabilities was first incorporated under the SFAS 5 (1975), "accounting for contingencies". Another example is the SEC (Securities and Exchange Commission)

regulation S-K (1982) that integrates within three sections disclosure by companies of environmental information. One is "Regulation S-K Item 101, which requires companies to disclose the material effects of compliance with federal, state and local environmental provisions on their capital expenditures, earnings, and competitive position". The second regulation is "S-K Item 103, which requires companies to disclose certain administrative or judicial legal proceedings arising from federal, state or local environmental provisions". The third item is "regulation S-K Item 303, which requires companies to discuss their liquidity, capital resources, and results of operations and is commonly known as Management's Discussion and Analysis of Financial Condition and Results of Operations"[8]. Examples of items to be disclosed under item 303 could be a pending change in environmental laws that could for example affect the company's products.

7.2.2 Pollution prevention (1980-90)

The second period evolved from pollution remediation to pollution prevention. This triggered the need for elements to evaluate pollution prevention investments, with recommendations to account for investments made on the ground of safety and the environment.

For example the IAS 16 (11) from 1995 recognised that: "Items of property, plant and equipment may be acquired for safety or environmental reasons. The acquisition of such property, plant and equipment, although not directly increasing the future economic benefits of any particular existing item of property, plant and equipment, may be necessary for an entity to obtain the future economic benefits from its other assets. Such items of property, plant and equipment qualify for recognition as assets because they enable an entity to derive future economic benefits from related assets in excess of what could be derived had those items not been acquired".

The FASB (Financial Accounting Standards Board) also issued a document saying that capitalization was possible if (FASB EITF 1990, Issue n°90-8) the costs extend the life, increase the capacity or improve the safety or efficiency of property owned by the company and if the costs mitigate or prevent environmental contamination that has yet to occur and that otherwise may result from future operations of activities" (Schaltegger et al., 1996). Finally, the Fédération des Experts-Comptables Européens (FEE)

[8] http://library.findlaw.com/2004/Aug/25/133557.html (Accessed August 11th 2010)

recommended that "costs incurred to prevent future environmental impacts should be capitalized" (Schaltegger et al., 1996).

The definition of environmental accounting is still very much linked to traditional financial accounting (liabilities, risks, asset revaluations…) but incorporates the first attempt at EMA, "cost analysis in key areas".

Accounting for the environment (Gray et al., 1993)	"Environmental accounting will cover: • Accounting for contingent liabilities/risks • Accounting for asset revaluations and capital projections • Cost analysis in key areas such as energy, waste and environmental protection • Investment review to include environmental factors • Development of new accounting and information systems • Assessing the costs and benefits of environmental improvement programmes Developing accounting techniques which express assets and liabilities and costs in ecological (non-financial) terms"

Table 0.2.2: First definition to include early EMA

Environmental cost accounting is the term used to describe the first attempts at EMA linked to pollution prevention and waste remediation.

Environmental cost accounting is described in two ways (Yakhou & Dorweiler, 2004):

- Looking for cost drivers at unit, product, batch or facility level (ABC type of work)
- Using the "cost of quality framework", looking for environmental costs in pollution prevention for example

Snapshots of Environmental Cost Accounting (US EPA, 1998)	Environmental cost accounting is how environmental costs – including those that are often hidden in general overhead accounts – are identified and allocated to the material flows or other physical aspects of a firm's operations.
Yakhou and Dorweiler (2004)	Environmental cost accounting directly places a cost on every environmental aspect, and determines the cost of all types of related action.

Table 0.2.3: Definitions of environmental cost accounting

7.2.3 Development of specific management accounting tools (1990-2000): integrating environment within management

Several different management accounting tools developed in the 90s, and although some have ramifications dating back to the 70s, they only became defined and tested through empirical examples in the 90s.

Full Cost Accounting (FCA) is used to describe an EMA tool that tries to go beyond company boundaries, pretty much in a "deep green" attempt to account for the "system view" that clearly states that the economy is part of the natural environment and thus its activities have consequences on it and vice versa. Early attempts in full cost accounting stem from the 1970s (Antheaume, 2007), but that idea of full cost accounting only took off in the 90s. There were some attempts such as the one from BSO/Origin (Huizing & Dekker, 1992), and the Ontario Hydro example led with the US EPA. The concept is being "rejuvenated" through the attempt at E P&L from Puma in 2012.

Full cost accounting is based on a concept stemming from neoclassical economy, which is the "external effect": "we speak of an external cost as soon as an external effect has some influence on economic agents in terms of benefit or cost, without any market transaction taking place between those responsible for the damage and those suffering from it" (Antheaume, 2007).

Bebbington (2001)	A system which allows current accounting and economic numbers to incorporate all potential/actual costs and benefits into the equation including environmental (and perhaps) social externalities to get the prices right
ICAEW (2004)	Full Cost Accounting involves the inclusion of external as well as internal costs and benefits. It has been developed mainly from an environmental perspective as a means of ensuring that business decisions take full account of an organisation's wider impacts.

Table 0.2.4: Definitions of full cost accounting

The US EPA launched its environmental accounting project in 1989. It participated in the launch of tools like Life Cycle Assessment (LCA) and Total Cost Assessment (TCA).

LCA is one of the first tools to be developed and spread in the 1990s. It has been linked to the development of ecolabels regulation, as well as regulations related to waste management (packing legislation). It allowed for the first time to take into account externalities.

The first attempts at LCA were reports called REPA (Resource and environmental profile analysis) that were done through the 70s in the US, with a standard methodology developed by the US EPA (Blouet & Rivoire, 1995). LCA is standardized through two ISO standards: ISO 14040 and 14044. France had actually played a leading role in

normalising it through the standard AFNOR[9] X 30-300 in March 1994, later replaced by the standard NF X30-300 that then became ISO 14040 in 1997.

There is also an existing UNEP (United Nations Environment Programme) Life Cycle Initiative that is a response to the Malmö Declaration (2000) for a life cycle economy, to encourage the development and dissemination of life cycle practices.

Christophe (1995)	"Ecobilan (LCA) allow to quantitatively include all principal factors impacting the environment on the totality of a value chain from production, consumption to post-consumption of a product. It allows gives elements that allow (in a second step) to quantify the cost of those impacts given the products and regulations in place"
Howes et al. for the European Union (1999)	LCA is an analytical approach developed for quantifying the total environmental impact of a product or process. A full LCA would include the whole life cycle of product, stretching from raw materials extraction through materials processing, component production, final assembly, distribution, use, waste management and recycling. Following the SETAC approach, a full-scale study should include a description of the product system and its mass and energy balances (inventory stage), an accounting of the environmental and resource impacts of the system (classification and characterisation) and, finally, some valuation of the different impacts (normalisation and valuation).

Table 0.2.5: Definitions of life cycle assessment

The Tellus Institute conceptualized Total Cost Assessment in 1991 on behalf of the US EPA and the New Jersey Department of Environmental Protection. The American Institute of Chemical Engineers (AIChe) later developed the complete methodology (1999). It is based on methods and programmes developed by GE (General Electric) to better select and justify waste management investment decisions that are environmentally sound and reduce long-term liabilities. The primary benefit of TCA is that it allows projects that generate longer-term savings to compete more successfully for limited capital funds. The basis for TCA, that is including external costs born by society into investment decisions, mirrors FCA in the investment decision-making area.

Total Cost Assessment Methodology (Aiche, 1999)	"TCA is defined as the identification, compilation, analysis, and use of environmental and human health cost information associated with a business decision"

Table 0.2.6: Definition of total cost assessment

[9] The French national organization for standardization (Association Française de normalisation)

Towards the year 2000, the definition of EMA evolved to include physical information additionally to monetary information and became more strategically linked with organization performance. In these definitions, the "light green" paradigm of "win-win" between business and the wider social and environmental benefits become apparent.

Ecomac Project (Bartolomeo et al., 1999)	Eco-management accounting: "Its twin parameters are a narrow definition of data – that expressed in monetary units, or of relevance to financial analysis – and the adoption of an internal management decision support perspective. (…) This will eventually require the integration of environmentally-focused financial and non-financial measurement."
United Nations Report (Savage et al., 2001)	"EMA is broadly defined to be the identification, collection, estimation, analysis, internal reporting, and use of physical flow information (i.e., materials, water, and energy flows), environmental cost information, and other monetary information for both conventional and environmental decision-making within an organization."
CIMA (Howes, 2002)	Environmental accounting: "the generation, analysis and use of monetarised environmentally-related information in order to improve corporate environmental and economic performance". "It is all about making the link between environmental and financial performance more visible, getting "environmental sustainability" embedded within an organisation's culture and operations"
Environmental Accounting Guidelines (Ministry of the Environment, Japan, 2005)	"Environmental accounting, as defined in these guidelines, aims at achieving sustainable development, maintaining a favourable relationship with the community, and pursuing effective and efficient environmental conservation activities."

Table 0.2.7: Definitions of environmental management accounting at the beginning of the years 2000

7.2.4 Integration of environmental management accounting into general guidelines

After the US EPA environmental accounting project in the 90s, Japan launched its environmental accounting project in 2000, the UN developed guidelines in 2001 and finally, the International Federation of Accountants (IFAC) issued the first environmental management accounting guidelines (2005) ever to be published by an international accounting body.

IFAC (2005)	EMA is "the management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices. While this may include reporting and auditing in some companies,

	environmental management accounting typically involves life-cycle costing, full-cost accounting, benefits assessment, and strategic planning for environmental management."

Table 0.2.8: Definition of environmental management accounting by IFAC

The most recent attempt at developing an environmental accounting tool, after FCA, LCA, TCA, and ECA is the German-Japanese method named material flow cost accounting (MFCA).

Japan had lead the way to a material flow accounting ISO standard published in 2011.

Material Flow Cost Accounting (MFCA) is an EMA tool that was first developed in Germany but was quickly picked up in Japan by a government initiative that developed guidelines and tested the concept within Japanese companies. It is the second EMA tool, after LCA, to be standardized at the ISO level.

Strobel and Redmann (2002)	Flow cost accounting performs an important function within flow management, namely that of quantifying the cost factors in the materials flow system and improving intracompany transparency, in order to lead to both economic and ecological improvements.
Guide for Material Flow Cost Accounting (Kokubu, 2007)	MFCA measures the flow and stock of "materials," which include raw materials, parts and components in the manufacturing process, in terms of both physical and monetary units. The costs are managed in the categories of material cost, system cost, and transportation and waste treatment cost.
ISO 14051 2009 working document (ISO, 2009)	MFCA is a management information system that traces all input materials flowing through production processes, and measures output in finished products and waste.

Table 0.2.9: Definitions of material flow cost accounting

7.2.5 The next steps: integrated performance and specialized accounting

In the years 2000 and beyond, specialized accounting projects developed: carbon accounting (2001, 2004, 2008, 2011), biodiversity accounting (in France with the association OREE[10]), water accounting specially in Australia.

The International Integrated Reporting Council (IIRC) is reaching out for integrated performance indicators to support the development of integrated reporting.

[10] OREE: organisation pour le respect de l'environnement dans l'entreprise

7.3 Conclusion

For the purpose of this research, we will thus define EMA broadly as:

> *"The identification, collection, estimation, analysis and reporting of physical and monetary information related to environmental issues".*

EMA tools can take the form of traditional management accounting tools (budgeting, balanced scorecard, investment review), as well as newly developed tools such as life cycle assessment, full cost accounting, total cost assessment or material flow cost accounting, as well as new indicators for integrated performance. EMA also is concerned with specialised areas such as water accounting, biodiversity accounting and carbon accounting.

The next two sections describe more in depth the two EMA innovations that are the object of research for article 1 (LCA) and article 2 and 3 (carbon accounting). These sections provide an overview of their "history", ideological basis and how the calculations within those two innovations are themselves conducted. The object of study of the creation of an EMA innovation is LCA. Life cycle assessment is an institutionalized EMA tool that has a relatively long history, allowing for a genealogy to be unfolded. On the other side, carbon accounting is the object of both the study of adoption and practice, as its actual use in organizations is relatively new. This allowed for the researcher to witness the consequences of (non-)adoption and the actual beginning of practices around this innovation.

8 Life cycle assessment

Life cycle assessment (LCA) is the most widely recognized tool for accounting for the environment and the first to be standardized at ISO level in 1997. Life cycle assessment is defined as:

> *"A quantified assessment of flows of materials and energy entering and leaving at the borders of a representative system of the life cycle of a product or service." (Grisel & Osset, 2004)*

In 2005, ADEME[11] said about LCA "In the domain of global and multicriteria evaluation of environmental impacts, LCA is the most perfect tool. Its current practice and diffusion contribute to make is a successful and recognized tool" (2005). According to ISO standards (2006), LCA is comprehensive (assesses the entire life cycle of a product and all attributes or aspects of natural environment, human health and resources), allowing revealing "the real actual, true or whole picture of environmental impact" of companies' products (Freidberg, 2013).

8.1 A short history of life cycle assessment (LCA)

A Coca-Cola study realized by Harry E. Teastley Jr in 1969, on the comparison of glass and plastic bottles, with the aims of making decision on the place of production of the bottles, the material and the number of possible refills of the bottle is considered the first life cycle assessment (Grisel & Osset, 2004). This study is considered as the first LCA as such, however, data was not made public. "One of the innovative ideas at that time was the inclusion of energy in the natural resource category" as there was no focused interest in energy as an ecological issue (Hunt & Franklin, 1996).

Later, Hunt and Franklin from the Midwest Research Institute conducted studies under the name of "REPA" (Resources and Environmental Profile Analysis) in the United States. Around 15 REPA were conducted between 1970 and 1975, and the methodology was enriched and developed with the help of the US EPA (Blouet & Rivoire, 1995). Until 1974, REPA had been private, but in 1974 the result of a US EPA led study was made public. The US EPA produced a public report "Resource and Environmental Profile Analysis of Nine Beverage Container Alternatives" in 1974 and made it available to the public through the National Technical Information Service (Hunt & Franklin, 1996). This

[11] French Environment and Energy Management Agency (Agence de l'environnement et de la maîtrise de l'énergie)

study also contained the first tentative to impact assessment. The first consultancy on REPAs was founded in 1975 as Franklin Associates. However, the US EPA lost interest in REPAs, finding it too impractical, as a "micro-managing" of private businesses (Hunt & Franklin, 1996). The term "LCA" only appeared in the US in the late 80s. A first study in Germany was also conducted

Databases of environmental information are essential to the practice of LCAs. In 1984, the Swiss EMPA of St Gallen (research institute) published a study on packaging LCAs called "BUS" (Bundesamt für Umweltschutz) publically (partly based on the work of American REPAs). This was the embryo of the first database for LCAs. The ecobalancers were "happy to have officially approved values" (Fink, 1997). Later, Buwal in 1991 published data on energy, ETH Zurich in 1994 as well (Grisel & Osset, 2004). From 1999 on, Ecoinvent became the first European web-based database for products.

After the scandals linked to the publication of an LCA by Procter and Gamble on disposable diapers in 1989, the emerging field of LCA turned over to a scientific body for harmonization of practices and standardization of methodologies. From 1990, the development of the methodology named "life cycle assessment" was conducted via the Society of Environmental Toxicology and Chemistry (SETAC) on an international level, between America and Europe. In 1990, two workshops in Vermont and Leuven aimed at bringing together the groups working on LCA related-type of work. It published the guide "a technical framework for LCA" in 1990 and the "guidelines for LCA: a code of practice" in 1993.

The international standardization of LCA into ISO standards was conducted from 1994 under the umbrella of SETAC and at a time where the products were considered the main outputs of industry causing environmental concern (Klöpffer, 2006). In 1998, IS0 14040 came out, then ISO 14041, ISO 14042 and ISO 14043.

8.2 The LCA early and current regime

Internationally, SETAC plays a big role in harmonizing and setting the pace for normalization, as well as developing methodologies, such as currently the workgroup on life cycle costing, social LCA. SETAC's membership and management are composed equally of researchers from academia, industry (including consultancy) and governmental organizations. From 1990 to 2002, the workshops were initially separated between USA and Europe. Cooperation between the United Nations

Environmental Programme (UNEP) and SETAC was officially started in 2002, and SETAC became a truly global organization to support this initiative. The basis for the cooperation was that UNEP, after the Rio and the Johannesburg conferences on sustainable development, needed to find a way to measure it. "Sustainability is not easy to measure, but if there is a solution, it will be based on methods derived from life cycle thinking, with LCA as the core element" (Klöpffer, 2006).

SPOLD (Society for the Promotion of Lifecycle Development) was an association of industries (among them Ciba, Danfoss, Dow Corning, Electricité de France, Procter & Gamble, and Unilever) initiated in 1992 and interested "in accelerating the development of LCA as an accepted management tool for the necessary restructuring of company policies towards sustainable development"[12]. It played a role in the development of databases, and notably in the elaboration of a common data format for exchange name the "SPOLD format". It also worked on the social acceptance of LCA with the "winning acceptance" project in 1995. It was dissolved in 2001 after the inception of the UNEP/SETAC partnership.

Currently, LCA is being redefined through two user groups whose focus is on preparing product category rules (PCRs) and sharing practitioner oriented stories and examples. The first group is America-based and was founded by Walmart, the university of Arkansas and Arizona State University in 2009. It is called the Sustainability Consortium (TSC). Its membership include other retailers such as Safeway, Tesco and Marks & Spencer, as well as major fast moving consumer goods (FMCG) companies such as Unilever. Governmental bodies such as DEFRA and the US EPA are also members, in addition to a few large NGOs such as CARE, WWF or the Nature Conservancy.
The other group is the former PCF (Product Carbon Footprint) World Forum that has announced its move to PEF (Product environmental footprint) World Forum in 2013. It is a German initiative started in 2007 as "The Dialogue Forum Low Carbon Society" (DFLCS), "a platform for stakeholders to share experiences and build synergies in the development of low carbon market tools that accelerate the transition to a low-carbon society". In 2009, the initiative became the PCF World Forum and organized in 2009 in Berlin the first summit entitled "International Approaches to Product Carbon

[12] http://lca-net.com/spold/whatis.html accessed September 20th 2013

Footprinting and Carbon Labelling - The Road Ahead for Business". From 2009 to beginning of 2013, it has organized twice a year a worldwide conference on Carbon footprinting for products. Behind this organization is a German think tank called Thema1 "specialized in accelerating the transition to a low-carbon society".

8.3 How does LCA work?

LCA has several purposes and can be used alternatively for internal purposes in product design or sourcing (Freidberg, 2013). In this area, LCA can help optimise and compare production sites, as well as make investment decision in technologies (Grisel & Osset, 2004). Externally, it is also used as the basis for ecolabels, for communication between professionals in the same sector or industry and in a policy of green purchasing (Grisel & Osset, 2004).

LCA is composed, according to standard ISO 14040, of four phases, which are: a phase of definition of objectives as well as definition of the scope of the analysis, the inventory phase, the impact evaluation phase and the interpretation phase. The inventory and impact evaluation phases are the most important phases of the LCA. Life cycle inventory is defined as "the collection and analysis of environmental interventions data which are associated with a product from the extraction of raw materials through production and use to final disposal, including recycling, reuse, and energy recovery"[13]. The impact assessment phase is "the estimation of indicators of the environmental pressures in terms of for example climate change, summer smog, resource depletion, acidification, human health effects, etc. associated with the environmental interventions attributable to the life-cycle of a product"[14].

Additionally to the LCA methodology, organizations usually now refer to PCRs to ensure that similarity in assessment of similar products such as tennis balls, shampoo, mineral water etc.

8.4 Current state and future of LCA

Two recent initiatives have boosted the demand in LCA expertise in Europe. First, since 2010, LCA has been used in the French experiment on environmental labelling (Affichage Environnemental) through the French standard "BP X30-323". Second, the

[13] http://ec.europa.eu/environment/ipp/lca.htm accessed September 20th 2013
[14] http://ec.europa.eu/environment/ipp/lca.htm accessed September 20th 2013

European Commission has developed its own standards for Environmental Product Footprinting and has called for a three-year experimentation starting 2013.

Methodological workgroups of the SETAC/UNEP initiatives are working on life cycle costing as well as impact assessment. Furthermore, ISO has opened working groups for standardization of the critical review process, as well as the possibility to conduct an organization LCA. Finally, the field of social LCA is a growing field of research, where databases are slowly being built up to allow practice to develop. The life cycle thinking is expanding beyond product and environmental impacts to encompass broader CSR and SD topics.

An important evolution in LCA is the growing importance taken by the Big 4 accounting firms in the field. Ecobilan, the French pioneer in LCA consulting was bought by Pricewaterhouse Coopers in 2000, and in September 2013, Bio Intelligence Services (Bios), which had became since the year 2000, the biggest LCA consultancy in Europe, has been bought by Deloitte.

Critics of LCA say that they are instruments of justification of the strategies of organizations, and no real sustainability indicators, since they show more a proof of efficiency than environmental efficacy (Richard, 2012; Freidberg, 2013). Moreover, the field of LCA is fragile, with a complicated tool, where there are still recurrent conflicts and disputes on several topics including but not limited to product allocation and the attributional versus consequential debate (Freidberg, 2013). Finally, LCA remains a costly and time-consuming technique, even today (Freidberg, 2013).

9 Carbon accounting

Over the last ten years, carbon has emerged as the key environmental indicator. I will first look at how climate change became the leading environmental issue. Then I will describe the emergence of carbon accounting, after the Kyoto Protocol signature, and via the emergence of carbon economic tools. The signification structure of the GHG Protocol Corporate Standard (GHGP) is based on the development of carbon as a major political and public issue and on the structure of the Kyoto Protocol, which for the first time developed binding targets and economic tools to achieve carbon emission reductions.

9.1 The growing importance of climate change: leading to corporate carbon accounting

Although scientists have understood the role greenhouse gases play in the climate system since the late nineteenth century, there was no understanding of the speed at which greenhouse gases could build up and become an issue until the mid 1950s (Young, 2010).

The Keeling Curve was identified through constant monitoring of carbon dioxide levels from 1957 onwards[15]. It showed the "clear upward trend" of levels of carbon dioxide in the atmosphere. It took another twenty years, before scientists started becoming concerned about the consequences of rising levels of carbon dioxide, mainly because of the difficulties to understand the complexity of the Earth's climate system:

> *"Climate change has moved to the centre stage of public concern in a remarkable way and in a very short space of time. Scientists have expressed serious concerns about global warming for a quarter of a century or more. Environmental groups have struggled for much of that period to get governments and citizens to take the issue seriously. Yet within the past few years, climate change has assumed a very large presence in discussion and debate, and not just in this or that country but across the world". (Giddens, 2008)*

Climate change has grown to become the most prominent and well-known environmental issue today. This can be seen in many opinion surveys around the world. They show that climate change "tops Americans' environmental concerns"[16], in the UK, climate change has toped the "most important environmental issues" list since 2006[17].

[15] Keeling was the first to make regular measurements of the atmospheric carbon dioxide (CO2) concentration from 1958 onwards

[16] MIT survey: Climate change tops Americans' environmental concerns, 2006

[17] Continuous Household Survey, UK, 2006-2010 (http://www.csu.nisra.gov.uk/environ/Important_Environmental_Problems.htm)

Al Gore and his "inconvenient truth" played a major role in alerting the public about climate change. He received in 2007, conjointly with the Intergovernmental Panel on Climate Change (IPCC), the Nobel Prize "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change"[18]. The Stern report (2006), with its economic calculation of the "cost" of climate change (or inaction towards tackling climate change), allowed states, the general public and corporations to put a price on global warming. The Economist (2006) said of the report "His report (…) suggests that what he calls 'market failure on the greatest scale the world has seen' should lead the planet to panic". The link between a physical threat and the economic world became established through its monetarization.

The turning point in leading to an era of "carbonomics" is the signature of the Kyoto Protocol in 1997, as an agreement "calling on the advanced industrial countries to cut their emissions of greenhouse gases by a collective average of 5 percent relative to 1990 levels by the end of the first commitment period running from 2008 through 2012" (Young, 2010). The Kyoto Protocol was the first binding agreement for states to reduce their emissions of greenhouse gases:

> *"The Kyoto Protocol, negotiated in December 1997, is a climate change treaty with a difference. Unlike the Framework Convention on Climate Change that preceded it, the Kyoto Protocol incorporates targets and timetables—that is, ceilings on the emissions of greenhouse gases and dates by which these ceilings must be met." (Barrett, 1998 cited by Carter et al., 2011)*

It created the foundation for new economic tools to help reduce greenhouse gases (GHG) emissions. The three mechanisms offered by the Kyoto Protocol for countries to meet their reduction targets were: emissions trading, clean development mechanism (CDM) and joint implementation (JI). Both the fact that countries had to meet a reduction target, and because of those new economic mechanisms, corporate carbon accounting standards soon became a necessity.

The first conferences organized in the late 70s and the 80s the UN (The United Nations Conference on Environment, Stockholm, 1972 which resulted in the establishment of UNEP; the UN World Food Conference, Rome, 1974, which recognized the central role of climate in world food production; the UN World Water Conference in Mar Del Plata,

[18] http://www.nobelprize.org/nobel_prizes/peace/laureates/2007/

Argentina, 1976[19]) and the first World Climate Conference of 1979 lead to the creation of the IPCC in 1988 conjointly by the World Meteorological Organization (WMO) and the UN Environment Programme (UNEP).The IPCC has had an enormous influence over world thinking on climate change—in so far as there is a consensus about its extent and dangers, it has played a large part in building it"(Giddens, 2008).

IPCC's role is to "provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts"[20]. It created a new practice of scientific "assessment": it is a synthesizing effort on the part of the scientific community of all available scientific findings[21]. "IPCC published in 1995 GHG inventory guidelines (The IPCC Guidelines were first accepted in 1994 and published in 1995). At the COP 3 (conference of the parties) meeting, it "reaffirmed that the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories should be used as "methodologies for estimating anthropogenic emissions by sources and removals by sinks of greenhouse gases" in calculation of legally-binding targets during the first commitment period"[22] of the Kyoto Protocol. The publication by the IPCC in 1995 of the "GHG inventory guidelines" (revised edition in 1996), and the development of carbon mitigation projects under the umbrella of the Kyoto Protocol acted as a stepping stone for the development of corporate carbon accountings.

Under the banner of the US EPA, Edward Vine and Jayant Sathaye from Berkeley worked on a three-phase process in developing usable guidelines on monitoring, evaluation, reporting, verification and certification (MERVC). In 1997, they published an overview of existing methodologies, in 1999 they published guidelines "that will support the measurement of greenhouse gas removals from project-level activities" (Vine & Sathaye, 1999) and in the third phase of the project, a procedural handbook that "describes the information and requirements for specific measurement and evaluation methods that can be employed for measuring energy savings and carbon emissions" (Vine & Sathaye, 1999). However US EPA did not pursue development of further methodologies in carbon accounting, quickly realizing the amount of work needed to develop a standard. Instead,

[19] http://www.wmo.int/pages/themes/climate/international_wcc.php#a accessed September 23rd 2013
[20] http://www.ipcc.ch/organization/organization.shtml
[21] IPCC "reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change", http://www.ipcc.ch/organization/organization.shtml
[22] http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html accessed October 24th 2011

it decided to fund the development of the standard by the GHG Protocol and adopted it for its Climate Leaders program (Green, 2010).

9.2 Multiple carbon accountings

Carbon accounting comprises:

> *"The recognition, the non-monetary and monetary evaluation and the monitoring of greenhouse gas emissions on all levels of the value chain and the recognition, evaluation and monitoring of the effects of these emissions on the carbon cycle of ecosystems." (Stechemesser & Guenther, 2012)*

In this research we are only concerned with physical evaluation of GHG emissions. There are carbon accountings at different levels. First level is the level of nations. Carbon accounting was developed after the signature of Kyoto Protocol for countries to account for their emissions. There is also carbon accounting developed at the level of cities and territories (e.g. bilan carbone des territoires, GHG Protocol City and Community GHG Accounting).

The second level of carbon accounting is the level of corporations. Three types of carbon accountings concern corporations: by site, by product and by project. Project carbon accounting is concerned with carbon-offset projects. This accounting is specific to projects conducted in general after reductions have been made inside a corporation. Those projects are in general conducted in developing countries and consist in reforestation, renewable energy projects. This accounting is out of scope for this research.

Corporations are currently faced with both regulated corporate carbon accountings and voluntary carbon accounting standards. In France, multinationals are faced with two regulations related to carbon emissions accounting. The first is related to carbon accounting for multinationals participating in the European Union Emissions Trading Scheme (EU ETS) and is directly monitored via a specific regulation "on the monitoring and reporting of greenhouse gas emissions pursuant to Directive2003/87/EC of the European Parliament and of the Council", which specifies rules on missing data, calculation factors, activity data and all the relevant details for GHG accounting. Contrary to other corporate carbon accounting, it is limited to scope 1 emissions and until 2013, to CO2 specific emissions.

The second regulation related to carbon accounting in the article 75 of Grenelle II law in France. This regulation obliges companies with more than 500 employees to report

every three years their CO2 equivalent GHG emissions emitted on the French territory. The boundaries for reporting are scope 1 and 2, and emission factors must be selected from the French managed "base carbone". This methodology of carbon accounting is explicitly based on ISO 14064, itself based on the GHG Protocol Corporate Standard.

The main voluntary carbon accounting at site level, is the GHG Protocol Corporate Standard. We will develop further its construction, since standards are shaped "by the different concepts and ideals that become attached to them" (Mennicken, 2008).
It is interesting to note that in France, an autonomous standard for carbon accounting developed from 1999, in parallel to the development of the GHG Protocol in the US. The Bilan Carbone as it is named, is the dominant carbon accounting methodology and tool used in France. We will not develop this methodology further as French multinationals mainly use GHG Protocol Corporate Standard.

9.2.1 The GHG Protocol Corporate Standard (GHGP)

The idea of a corporate standard for carbon accounting emerged from a working group composed of Monsanto, British Petroleum (BP), General Motors and the World Resources Institute (WRI) in 1998. The Safe Climate, Sound Business group stated that it would "develop a joint protocol for measuring and reporting greenhouse-gas emissions from the companies' global operations" (WRI, 1998). BP was a pioneer in terms of corporate carbon accounting. A carbon protocol was developed within the company to standardize measurement procedures, and BP developed an emissions trading system launched in September 1998. Its internal accounting served as basis for the development of the GHG Protocol. The structures of the GHGP (Giddens, 1984) will be described below.

Signification structure: financial principles, investors and carbon markets

The GHGP is based on accounting principles: "This was considered important because it is widely expected that GHG emissions will have a financial value in the near future and need to be accounted for in the same way as other financial assets or liabilities on the balance sheet" (GHG Protocol, 2001). It is was also "made" auditable: "The 'first edition' standard (…) have also been subjected to a rigorous review from KPMG to ensure they are consistent and capable of generating information that could be independently

verified". The GHGP states that it "is designed to develop a verifiable inventory" (GHG Protocol, 2004). This goes hand in hand with one of its main goals that is being readily communicable to external stakeholders.

The use of interpretive schemes of the financial community allowed a shared understanding of carbon performance by the whole finance community (investors, auditors, corporations). Since accounting is "the language of business", using accounting principles and framework allowed executives and managers to make sense of what they would do in terms of carbon accounting, and what competitors would also do (Macintosh, 1995). The GHGP embedded itself in the "cultural and cognitive schemes" of financial accounting. It has deliberately chosen to resemble closely financial accounting, to "ensure the greatest compatibility". This alignment with the financial sphere's value system has until now been a great factor of success for the GHGP, as we will see below in the development of a network of carriers and promoters. However, Andrew and Cortese (Andrew & Cortese, 2011) that "compared to financial accounting frameworks, the requirement that information be made comparable is notably absent".

Domination structure: building a network and building consensus to avoid competing standards to emerge

After the emergence of the norm in 2001, the GHGP's adoption rate grew rapidly and steadily to attain a "tipping point" (Finnemore & Sikkink, 1998), where we can see that a important number of actors had chosen the norm. Voluntary governmental initiatives, industry associations, non-governmental initiatives endorsed the GHGP as the "one and only" way to measure GHG emissions (Green, 2010). Importantly, after diffusion and adoption of a standard goes past this tipping point, "the binding nature of the norm extends to such an extent that all actors recognise norms as binding" (Sunstein, 1996). Adopters are not just "passive mediators" (Bebbington et al., 2012) but carriers of the values embodied by the GHGP to the organizations. It is important to recognize that many carriers were governmental initiatives or industry associations, thus corporations were circled by initiatives that had endorsed the GHGP. The endorsement by the Carbon Disclosure Project had for consequence that the vast majority of the reporting companies were constrained in reporting their results using the GHGP: "the short answer to who uses the GHG Protocol is almost everyone. Over 85 percent of 2487 companies who took part in a 2010 Carbon Disclosure Project survey either directly

used GHGP or did so through participation in a climate change program" (Ranganathan, 2011).

A second aspect of the domination of GHGP was the efforts made by GHG Protocol to avoid the creation of a competing scheme. A major possible competing scheme was avoided when ISO, which had first proposed to develop its own methodology for a new standard, announced in 2003 that it had decided to use GHGP as the seed document for the 14064-1 standard: "Following WBCSD/WRI's comments to ISO's TC207/WG5 N70, initial feedback received from ISO suggested that the GHG Protocol will be used as the core document for the entity standard in order to avoid duplication" (GHG Protocol, 2003).

Legitimacy structure: partnerships, multistakeholder process and becoming the basis for the ISO standard on organizational carbon accounting

The legitimacy of the GHGP is first based on the partnerships that were initially developed. The partnership with the World Business Council on Sustainable Development (WBCSD) brought from the start access to the world's leading companies that were able to road test, contribute and use the standard (Standard Setter Exploratory Interview). A second key partner was the US EPA's funding of the standardization process and adoption of the GHGP via its Climate Leaders' program. It "lent legitimacy to the efforts of WRI and WBCSD" (Green, 2010). The US EPA is the national American environmental agency, which has been involved very early in environmental accounting initiatives (e.g. the environmental accounting project started in 1989 and that lasted until 2002). Its involvement "served to reassure firms that the Protocol's rules would be taken seriously by the US government" (Green, 2010).

A second aspect of the legitimacy structure of the GHGP is that its standards are built on a multistakeholder process, which includes a steering committee, working groups, road testing phases and open consultation processes. This lends the standard a democratic touch; also silencing voices that see private standards are an unfaithful and undemocratic way of dealing with common good topics. The first draft involved 25 road testers and the revised edition 19 "structured feedback companies", and 492 contributors were involved in the standard setting process (the revised edition of 2004 provides a list of contributors).

Additionally, the wholehearted embracement of the GHGP by ISO in its standard 14064-1 was according to Green (2010) "by far the biggest success of the Protocol". The legitimacy associated with ISO among business and industry rubbed on the GHGP, and translated in a deeper adoption of the GHGP among the business community (Green, 2010).

9.2.2 Product carbon accounting

The first and main standard for product carbon accounting is the British PAS 2050. The British Standards Institute (BSI) started looking into a carbon footprint standard in June 2007, mandated by DEFRA[23] and the Carbon Trust. Debate in the UK had started in April 2007 with Tesco[24] announcing an ambitious plan to put carbon labels on all of its 70,000 products. The Carbon Trust provided their early draft of product carbon accounting to be used as the basis for PAS 2050. The Carbon Trust is an independent company founded by the British government in 2001 to help organizations move to a low carbon economy. When BSI started looking into carbon footprinting, it decided to use the Publically Available Specification (PAS) format. PAS is also called a "fast-track standard", because it takes much less time to develop than traditional standards, usually six to nine months. PAS are usually industry driven and industry sponsored. PAS are used in novel areas, where there is a very fast development and move in technical knowledge. These areas are also often areas where it is difficult to reach high level of consensus. PAS allows publishing of standards although a hundred percent consensus can't be reached, however PAS are also required to be revised every two years.

Carbon Trust and Defra came to the BSI for their reputation as being independent, having a transparent standard-setting process, and having expertise on consensus building around novel subject matters. BSI provided independent facilitation, independent project management and brought stakeholders internationally. The stakeholders were brought internationally to be able to capture all available knowledge, both theoretical and practical around product footprinting (Standard Setter Exploratory Interview). PAS 2050 was build to be used internationally for all organizations, and all products and services, and this also reflects in the time taken to develop the standard: eighteen months instead of the usual six to nine months for a PAS.

[23] Defra is the UK Department for Environment, Food and Rural Affairs
[24] Tesco is a British supermarket chain

As for the GHGP, a varied steering group oversaw the standardization process. Carbon Trust also ran a number of expert working groups throughout the process (on allocation, use phase...). When PAS 2050 had reached a maturity point, BSI ran a wide consultation, inviting over 500 organizations to give feedback on the document. More than 3000 comments were received from 25 countries. As for the GHGP, the multistakeholder process lends the standard legitimacy.

The international character and very general basis for all sectors, organizations and products or services of PAS 2050 allowed it to be the first "global" consensus based standard for carbon footprinting. It was published in October 2008.

Its legitimacy was also gained because it served as seed document for two further international standards on product carbon footprinting. The first is the GHG Protocol Product Life Cycle Accounting and Reporting Standard. Pankaj Bhatia, director of the WRI's GHG Protocol initiative, said in a newspaper interview that "his organisation was encouraged to move on this issue by none other than the Carbon Trust. They came to see us mainly because it was becoming clear to them that many US companies would have little interest in the PAS 2050 unless it was given WRI approval" (Pearce, 2008). Although this shows that PAS 2050 was the basis for the GHG Protocol new product standard, it also shows the limits of "international" or "global" private standards. However, it can be noted that there is a close cooperation between the standard setters for PAS 2050 and the GHG Protocol, reflected in them being in each other's steering committee (for PAS 2050, GHG Protocol was represented in the 2011 revision steering committee, for GHG Protocol Product Standard, DEFRA and the Carbon Trust were represented). The second standard based on PAS 2050 is ISO 14067, which is still in the making.

Contrary to the corporate site carbon accounting standard, which has a hegemonic grip on the market for carbon accounting, product accounting is still multiple. BSI did not try to avoid other standards to emerge, and there are now two competing standards for product carbon accounting available since October 2011 (ISO 14067 not being published yet). Many countries develop their own methodologies while trying labelling programmes (in France for example). Recently the European Union developed its own environmental product footprint methodology, which includes carbon. Their methodology is being road tested as of 2013.

There have also been questions on the technical background of the standard: PAS 2050

is built around "process LCA", when others favour a "hybrid LCA" built on input-output analysis and more traditional life-cycle analysis. PAS 2050 is regarded as "a half-baked method relying on an artificial boundary around products to limit the cost of data collection and therefore of producing a carbon footprint" (Pearce, 2008).

The legitimacy structure around PAS 2050 is less strong than the one developed around GHGP. In a survey conducted by BSI in 2011, 15,8% of respondents answered to the question "why did you not use PAS 2050?" that they were "waiting for ISO 14067 or the GHG Protocol Product Standard" (BSI, 2011). This demonstrates the ongoing competition between the standards for product carbon accounting.

9.3 Conclusion

It is clear that the very scope of each main standard of both site and product carbon accounting is different: one is for organization wide accounting (based on site), the other for product accounting. However, both standards also carry different values and meanings embedded in their construction and history. Below I have summarized the key characteristics of both standards.

GHG Protocol Corporate Standard	**Characteristics**	**PAS 2050 (LCA based carbon accounting)**
2001 (revised 2004)	*Year of standardization*	2008 (revised 2011)
A corporation	*Scope*	A product
Energy sources by site	*Source of emissions considered*	Energy sources by product
Scope 1, 2 and 3	*Scope*	Entire life cycle or cradle to gate
Control or equity share approach (financial consolidation)	*Boundaries*	One product only
Investors	*Main Stakeholders*	Consumers
Financial accounting	*Methodology*	LCA techniques
Relevance, completeness, consistency, accuracy, transparency	*Principles*	Relevance, completeness, consistency, accuracy, transparency
Financial analysts/financial accountants	*Cognitive orientation*	Environmental engineers
Invoices	*Source of information*	Physical flows
Audit	*Verification*	Peer Review
BP	*First companies (Initiators)*	Food and supermarket companies (Tesco)
Public reporting, participation in GHG markets	*External Output*	Environmental Claim

Table 0.2.10: Characteristics of the two standards

This table highlights two generations of carbon accounting standards. One is the first standard, published in 2001, with initiator companies linked to energy intensive industries (BP, but also General Motors and later Holcim). The pressure came impending regulation that was considered as a huge financial risk by investors. Thus, the signification framework was clearly linked to financial markets. The second generation of standard was published in 2008, with initiator companies that had until recently no incentive to develop carbon strategies, with no immediate regulation threats, that is food and distribution related companies (Tesco). The second generation of standard is linked to mounting pressure from consumers on product transparency related to environmental impacts. The framework for consumers is the life cycle of a product, since the consumer does not equate, when purchasing in a store, the product to a corporate boundary. The techniques behind life cycle assessment are build upon engineers' knowledge and processes (peer reviews) and do not appeal to financial accounting techniques.

9.4 How is carbon accounting conducted in practice

Corporate carbon accounting requires defining two types of boundaries to account for carbon emissions. The first type of boundaries is organizational boundaries. They that determine the operations owned or controlled by the reporting company. Three types of boundaries exist: equity share, financial and operational control. Depending on which one of the boundaries set is chosen, the result in scope 1 and 2 emissions will be relatively different. Different set of boundaries chosen by two companies that share for example one division, can also lead to double counting. Equity share approach reflects economic interests and in the closest to financial accounting approach. Financial control looks at the financial liability perspective, and whether a unit is consolidated or not in the books. The last approach is operational control approach, which is the most difficult to assess, since it requires to look at specific contractual arrangements to determine who has the control over operating policies of a division. However, this approach has the advantage to take full ownership of all GHG emissions that a company can directly influence or reduce.

The second type of boundaries is operational boundaries. The operational boundaries are linked directly to the sources of GHG emissions. They are separated into direct emissions (scope 1) and indirect emissions (scope 2 and 3). Those boundaries are very often referred to, for example the article 75 in the French Grenelle 2 law obliges companies to report scope 1 and 2 emissions.

Critical steps for LCA based carbon footprinting, are to determine the functional unit and the reference flow. Defining the unit of analysis is a critical step because it directly influences the subsequent steps and results of the inventory. The unit of analysis is the basis on which the inventory results are reported, and therefore a transparent unit of analysis is important to ensure inventory results are interpreted and used correctly (GHG Protocol, 2011). The reference flow is also critical since it is the basis for all data collection since it defines the magnitude of material or energy inputs and outputs.

Both corporate and product carbon accounting are linked, since each covers the same operational boundaries. In principle, the sum of product carbon accountings should account for an organization's corporate result.

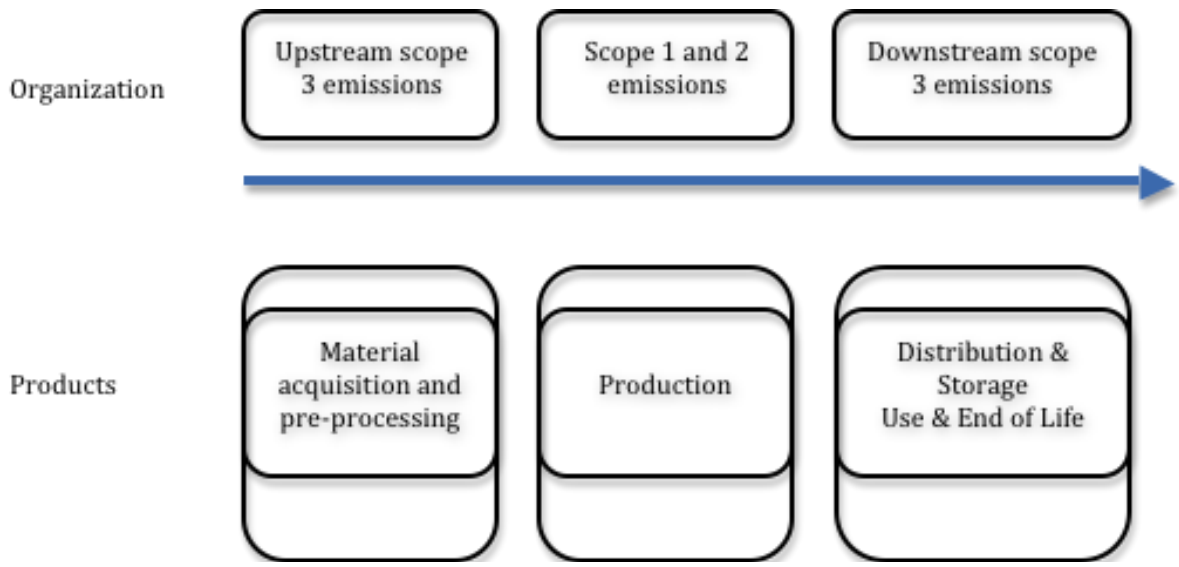


Figure 0.2.3: The link between corporate and product carbon accounting (GHG Protocol, 2011)

Carbon accounting is calculated in practice using three sets of data. One is called activity data, the other is emission factor, and the last is the global warming potential (GWP), which is often already incorporated in the emission factor: Activity x Emission Factor x GWP= result in CO2e. For example if A car consumed 100 litres of motor gasoline for a specific reporting period, the calculation would be 100 litres (gasoline) x X kgs/litre x 1 = X kgs CO2e (1 being the GWP of CO2). The difficulties linked to the practice carbon accounting are the gathering of activity data, which is often not readily available in information systems, and the uneven quality of emission factors available in databases.

9.5 The carbon disclosure project

The carbon disclosure project (CDP) is an investor led initiative started in 2000. Since 2002, it has requested FT500 multinationals to disclose their carbon strategy and report their emissions by responding to an online questionnaire, and gradually expanded their request to every nation's top multinationals. From 221 companies reporting in for their 2002 emissions, it has grown to an impressive 4100 reporters. It represents currently 722 institutional investors worth USD 87 trillion in 2013, up from 35 in the initial 2002 campaign. The CDP initiative has grown to include water reporting and most recently forest reporting in 2012. It has also developed a supply chain initiative and a cities GHG emissions disclosure project.

Historically, investor led environmentalism has been made possible because of the rise of institutional investment in the 80s and 90s. This led to a fundamental shift in the nature of corporate ownership within the Anglo-American economies. In the US, for example, institutional stock holdings rose from 16 percent in 1965 to 46 percent in 1990,while individual holdings declined from 84 percent to 54 percent over the same period (Harmes, 2011).

The CDP is criticised for making itself appear as an independent and not-for-profit entity when it is funded by organizations such as Axa, Merrill Lynch, Price Waterhouse Coopers and several foundations as well as NGOs (Andrew & Cortese, 2011). It is also criticized for encouraging disclosure ("what gets measured, gets managed") and seeing climate change only through the eye of an information asymmetry, and not as an externality to be monetized (Harmes, 2011). As the Stern review (2006) puts it:

> *"Greenhouse gases are, in economic terms, an externality: those who produce greenhouse gas emissions are bringing about climate change, thereby imposing costs on the world and on future generations, but they do not face the full consequences of their actions themselves." (Stern, 2006)*

Finally, the quality and comprehensibility of data inputs has also been questioned: "the frequent lack of disclosure of types and meaning of emissions data, and of reliability checks, means that it is very difficult to get insight into reported emissions, let alone firms' actual achievements" (Kolk et al., 2008).

However, it is still the only international, and largest repository of greenhouse gas data from multinationals, and therefore is significant and influential. Importantly, it has an influence on the type of data produced, through the evolution of its yearly questionnaire sent out to corporations. Currently, the questionnaire contains questions on climate change management (including governance, targets), climate change risks and opportunities according to the responding organization and emissions (including methodology, detailed results of emissions). The CDP reports are becoming core hubs of information on carbon performance and best practice. Investors are increasingly using their data to determine whether to invest or not in companies. Consequently, the CDP has been named in 2010 "The Most Powerful Green NGO You've Never Heard Of" by Andrew Winston[25].

[25] http://blogs.hbr.org/2010/10/the-most-powerful-green-ngo/ September 24th 2013

9.6 Conclusion of carbon accounting

The climate change accounting "regime" is dominated by two structures: first the GHG Protocol and the standards that it creates, most importantly the corporate standard (GHGP), and the Carbon Disclosure Project. Carbon accounting is evolving into two directions: first the development of scope 3 accounting, in part pushed by the requirements of the CDP questionnaire and by the rapid development in carbon footprinting for products. The second development is the growing number of companies that develop tools to be able to do product carbon footprinting in mass, closing the gap between product and corporate carbon accounting.

Summary of chapter two

EMA is broadly defined as "the identification, collection, estimation, analysis and reporting of physical and monetary information related to environmental issues".

Carbon accounting comprises "the recognition, the non-monetary and monetary evaluation and the monitoring of greenhouse gas emissions on all levels of the value chain and the recognition, evaluation and monitoring of the effects of these emissions on the carbon cycle of ecosystems" (Stechemesser & Guenther, 2012).

Life cycle assessment is defined as "a quantified assessment of flows of materials and energy entering and leaving at the borders of a representative system of the life cycle of a product or service" (Grisel & Osset, 2004).

LCA has a short but constituted span of life that allows for genealogies to be unfolded, therefore constituting a good field of research to analysis retrospectively the creation of the tool in the French context.

Carbon accounting is a good representation of EMA at the crossroad of several streams of sciences, such as natural sciences, management accounting and traditional financial accounting. This particular node of knowledge is an interesting feature of carbon accounting, as it brings together numerous institutional actors, ideas and has an impact on the "networks" that need to be built around innovations, on the actors that will decide upon adoption and on the practice of those innovations.

Chapter 3: Theoretical Framework: Institutional Theory and Practice Theory

1 Introduction

EMA innovations are studied using the lens of institutional theory and practice theory in the three papers of this dissertation. Hopwood (1977) encouraged considering "the institutional processes that can both facilitate and constrain the development of accounting". Although there is an inherent tension between institutionalization (stabilization) and innovation (newness), I believe institutional theory brings interesting theoretical insights into the process leading to stabilization and from stabilization to "destabilization" and death of institutional innovations (Hopwood, 1978). Embracing the study of institutional change, studies have explored a variety of theoretical puzzles such as the role of agency, more recently the purposive work of actors (Lawrence & Suddaby, 2006), the phenomena of decoupling (linked to adoption of innovations) and processes of deinstitutionalization (Peton, 2012; Hiatt et al., 2009).

Until recently, there were still critics as to the deficit in institutional theory of an approach to practices (Lounsbury & Crumley, 2007). However, recent works have made the connection between the wider social processes and organizational practices (Arjalies, 2010; Labatut et al., 2012). Despite this connection, practice theory has long approached practices more as a routine and a process of stability (Feldman & Pentland, 2003) than as a dynamic process. What I seek here is to introduce an explanation of how innovations emerge through a study of practices as constantly emerging (Ciborra, 2000; Andon et al., 2007; Bjorkeng et al., 2009; Gherardi, 2012).

In chapter 1 of this dissertation, I have explored the different theoretical traditions that have enabled the study of innovations, and in more particular of innovations as a process. I believe that innovations cannot be understood correctly if not situated in its institutional environment (Chiapello & Berland, 2009). No innovation exists in a vacuum, they are embedded in an institutional environment that shapes them (Garud et al., 2002). Diffusion theory fails to account for the broader institutional environment that accompany the diffusion of an innovation. The fad and fashion perspective does not account for the varied adopting population and the "secondary diffusion" perspective within adopting organizations. Both also fail to account for the social construction of innovations, and the interrelation of the "origination" phase with the phase of diffusion.

ANT is criticized for its limited analysis of social structures (Alcadipani & Hassard, 2010). It is also criticized for not taking into account the importance of particular actors (Whittle & Spicer, 2008), and for assuming all actors equal in a network- thereby suppressing the notions of power and potential resistance (Whittle & Spicer, 2008). This dissertation uses the theoretical framework of institutional theory and practice theory together to account for the totality and interdependence of the difference phases in the innovation process (origination on diffusion, adoption and practice, implementation back on to adoption and origination). Indeed, this dissertation seeks to understand the totality of the innovation process, from ideas to practice. The goal of this dissertation thus requires being able to analyze both the field where innovations are being given birth to, the link between this field and the adoptants, and the actual practice of innovations. The combination of these two theoretical frameworks allows doing that by explaining the social and institutional environment that shapes, constrains and in return is shaped back by innovations; the agency of actors and their purposive work; as well as the micro-foundations of institutional innovations in analyzing the emerging practices that constantly shape and reshape innovations in daily praxis.

2 Institutional theory foundations

Institutional theory attends to the deeper and more resilient aspects of social structure, as the ostensible subject is stability and order in social life (Scott, 2005). It has been used to explain both the persistence and the homogeneity of phenomena (Dacin et al., 2002). A key contribution of institutional studies has been the development of strong accounts of the processes through which institutions govern action (Lawrence & Suddaby, 2006). The argument of institutional theory initially was that formal organizational structure reflected not simply technological imperatives but also institutional forces (Scott, 2008a).

Di Maggio and Powell (1983) proposed three mechanisms of institutionalization: coercive, normative, and mimetic. Coercive pressure is often associated with the state, and refers to sanctions, threats and the use of force by a powerful actor to obtain compliance. Normative pressures is linked to cultural expectations. When companies mimic other companies, it is usually because the behaviour or form of those companies is seen to bring effectiveness. As new institutional rules emerge, existing companies incorporate those rules; they become "isomorphic" with their institutional context. "Organizations conform to them - become isomorphic to their institutional context - in

order to signal their social fitness and gain legitimacy in the eyes of critical constituencies" (Greenwood et al., 2008).

2.1 Critics of institutional theory and new areas of interest

"Institutional theory tells us relatively little about 'institutionalization' as an unfinished process (as opposed to an achieved state)" (DiMaggio, 1988). Institutionalism has largely ignored "how institutions are created, altered, and reproduced, in part, because their models of institutionalization as a process are underdeveloped" (Barley & Tolbert, 1997). Indeed, increasing isomorphism was taken to be the central indicator that institutional processes were at work, emphasizing a relative passive construction of meaning (Scott, 2008a; Lawrence & Suddaby, 2006). Consequently, early theory and research focused on the diffusion of existing institutional models, the middle of the institutionalization process, and obscured the beginning and the end (Scott, 2005; Hasselbladh & Kallinikos, 2000).

Early theorizing and research on institutions posited "top-down" models of social influence, from institutions onto organizations (Scott, 2005). The concept of "institutional effects" embodied the unilateral manner in which environmental forces where seen to exert an influence on compliant organizations (Scott, 2005). Neoinstitutionalism tended to bypass the central issue of the social construction of rationalization (Hasselbladh & Kallinikos, 2000). This overshadowed the fact that institutional environments are not monolithic, but often varied and conflicted (Scott, 2005) and that subjects have a capacity to make a difference (DiMaggio, 1988) and exert agency.

Contemporary institutional theory is now employed to examine systems ranging from micro interpersonal interactions to macro global frameworks (Scott, 2005). Institutionalism takes both politics and agency seriously in exploring change as much as stability. It focuses on the actors who create, maintain and undermine institutions, as much as the institutions themselves (Symon et al., 2008). Questions such as what are the sources or drivers of institutional change, how do organization response or initiate change, and finally what constitutes the process of institutional change now form the core of the new interrogations for institutional theorists (Dacin et al., 2002).

2.2 Institutional change

To overcome the situation where institutions were only seen as frameworks for action, the institutional change perspective tackles questions that cannot be explained by norm-governed behaviour (Holm, 1995). Institutional change is interested in looking into how institutions are created, when and why they come to change and disappear (Holm, 1995). Institutional change is often triggered by external events or jolts, such as technological change, legislation or market forces (Tolbert & Zucker, 1996) and is recognized as a complex process involving different types of forces and agents, facing the strong inertia of institutions (Battilana et al., 2009).

DiMaggio (1988) introduced the idea of institutional entrepreneurship, whereby agents deploy the resources at their disposal to create institutions. Institutional entrepreneurs serve as agents of legitimacy supporting the creation of institutions that they deem to be appropriate and aligned with their interests (Dacin et al., 2002). Institutional entrepreneurs acquires a central place in institutional processes since "new institutions arise when organized actors with sufficient resources (institutional entrepreneurs) see in them an opportunity to realize interests that they value highly" (DiMaggio, 1988). Fligstein (2001) developed the concept of social skill "the ability to engage others in collective action" has being pivotal to the construction and reproduction of local social orders. He already described some set of strategic forms of actions relative to social skill, such as framing, agenda setting and brokering. Fligstein explains that maintenance and reproduction of institutions are the realm of actors in dominant organizations, while institutional entrepreneurs create entirely new systems of meanings.

More recently, a new stream of research on institutional work has sought to overcome the heroic nature of institutional entrepreneurship, thereby emphasizing how interactions among a broader array of actors can produce institutional change (Lounsbury & Crumley, 2007). Contrary to ANT which emphasize the network as the principal locus for the construction of innovations, institutional work emphasize the role of actors, albeit a wide range of them which contribute in central or supportive roles to the development of innovations (Lawrence & Suddaby, 2006).

Moreover, this stream of research has sought to understand better the strategic forms of actions as purposive actions of individuals and organizations aimed at creating, maintaining and disrupting institutions (Lawrence & Suddaby, 2006), acknowledging that one enabling condition for institutional change is a higher-level mastery of certain activities involved in change implementation (Battilana et al., 2009). This followed the worked by Oliver (1991; 1992) in bringing attention to the possibility of strategic responses and strategic behaviours of organizations in response to institutional processes affecting them, thereby recognising active agency. Lawrence and Suddaby (2006) have described a set of work around a life cycle of creating, maintaining and disrupting institutions, however this categorization is increasingly put into question as steps are empirically observed to overlap, intersect and coexist (Currie et al., 2012; Kaplan, 2012).

3 Institutionalization process

3.1 Definition of institutionalization

Institutionalization is defined as:

> *"The process whereby new norms, values, and structures become incorporated within the framework of existing patterns of norms, values, and structures. This process is one that lends stability and predictability to social relationships and enables them to persist." (Kimberly, 1979)*

Institutionalized patterns structure reality and activity as they become legitimate and valuable (Drori et al., 2003). Institutionalization is a process, whereby the achievement of "taken-for-granted" status allows the new "object" to be reproduced, becoming therefore self-sustaining, having provided the cognitive schema for continued consumption (Lanzara & Patriotta, 2007; Suddaby & Greenwood, 2001). Institutionalized structures, norms or values become "habitualized action", they are internalized. Such behaviours are evoked with minimal decision-making effort by actors, and those behaviours are based on shared definitions and meanings (Schutz et al., 1962; Schutz, 1967). Finally, to be institutional, structure must generate action (Tolbert & Zucker, 1996). However Colyvas and Jonsson (2011) also suggest that law or strong beliefs might institutionalize practice, but practice can be scarcely used- therefore, generating very little action.

The analysis of institutionalization processes is of particular importance in relation to knowledge-making dynamics in organizations, for it yields understanding of the performativity, durability and persistence of organizational knowledge systems — that is, why knowledge works, why it is stable, and why it is 'sticky' (Lanzara & Patriotta, 2007). Institutionalization serves as an important causal source of stable patterns of behaviour (Berger & Luckmann, 1967; Zucker, 1977). Moreover, institutionalized patterns are likely to diffuse more easily in consequence (Zucker, 1977).

Institutionalization is not a black or white status and there are degrees of variation in the institutionalized status. If a pattern is weakly institutionalized, it is unstable and variable and direct social control or other intervening mechanisms are required to maintain and reproduce an existing order of things (Jepperson, 1991; Zucker, 1977), (Lanzara & Patriotta, 2007). Highly institutionalized items are accepted without further dispute, have achieved some degree of authoritativeness and legitimacy, and do not require intervention of further exogenous human action to become reproduced (Jepperson, 1991; Zucker, 1977; Lanzara & Patriotta, 2007).

3.2 Institutionalization processes

The institutionalization process is a reciprocal process that has multiple phases that include:

> *"The emergence of anomalous activity, the problematization of extant practices, social recognition of a novel innovation, and political processes that may involve resistance by incumbents, as well as the theorization and legitimation of a new practice." (Lounsbury & Crumley, 2007)*

Tolbert and Zucker (1996) had first shed some light on the question of identifying the processes involved in the generation and diffusion of an innovation. Later, Suddaby and Greenwood (2001) and Greenwood et al. (2002) also conceptualized the processes linked to the generation of innovations. While Suddaby and Greenwood (2001) were specifically interested in the generation of management knowledge, their conceptualization of the process helps understand the particular phase of commodification, and the potential role of management "gurus" in the legitimation phase. Their process emphasize the different roles actors can have in supporting an innovation through the process, as comodifiers, carriers, agents of legitimation, or idea entrepreneurs (Abrahamson & Fairchild, 1999).

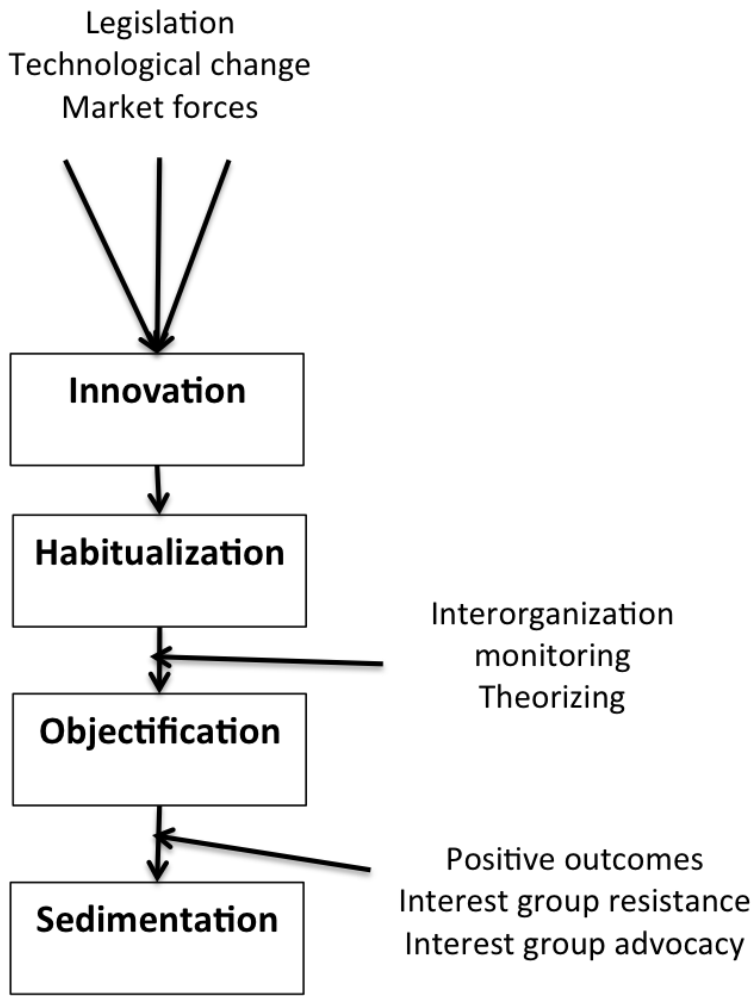


Figure 0.3.1:Institutionalization process (Tolbert & Zucker, 1996)

Precipitating Jolts	Social, technological, regulatory
Deinstitutionalization	Emergence of new players Ascendance of actors Institutional entrepreneurship
Preinstitutionalization	Independent innovation Technical viability paramount
Theorization	Specification of general organizational failing Justification of abstract possible solution
Legitimation	Moral and/or pragmatic legitimacy Popularizing the innovation
Commodification	Converting abstracted innovation into a "salable" product (codification/abstraction)
Diffusion	Increasing objectification Pragmatic legitimacy
Reinstitutionalization	Cognitive legitimacy

Figure 0.3.2: Stages of institutional change (Suddaby & Greenwood, 2001; Greenwood et al., 2002)

The two figures 0.3.1 and 0.3.2 illustrate how the institutionalization process has been conceptualized and phased. While other theoretical frameworks have a generic "creation phase", institutional theory offers a more complex view of how an innovation comes to be "diffusible". This is particularly visible in the schemas of Suddaby and Greenwood (2001) and Greenwood et al. (2002) where they define several moments such as preinstitutionalization, theorization, legitimation, commodification. I believe that this shaping of the process allows understanding better how innovations create links with existing institutions, or why certain do not.

Subsequently I will review the three phases of the institutionalization process that are illustrated in the articles of this dissertation, and how the three articles contribute to the literature on institutionalization specifically on those three phases.

3.3 From production of innovations to commodification

Little work has focused on the origins of new practices (Scott, 2001), mainly because diffusion studies in the neo-institutional approach treated practices as objects that are either adopted or not, essentially leading to the black-boxing of practice (Lounsbury & Crumley, 2007). Therefore:

> *"To investigate how patterns of interaction lead to the emergence of a new institution is, to say the least, a formidable task. An enormous amount of luck or prescience are required to recognize an emerging institution and then gather data on relevant, ongoing actions and interactions." (Barley & Tolbert, 1997)*

3.3.1 Actors in the origination process

In the perspective to better understand the institutionalization processes, I will now focus on agency in the construction of institutional innovations. Several studies have recently tried to better understand why certain actors become entrepreneurs and others don't (Battilana, 2006; Battilana et al., 2009; Mutch, 2007; Kisfalvi & Maguire, 2011).

First, there has been work on the characteristics of the field in which actors evolve, and on the situation of those actors in the field (Dorado, 2005). Furthermore, Battilana (2006) has worked on the impact of social position of actors on their propensity to become institutional entrepreneurs. Fields are also structured systems of social positions where entrepreneurs have a "subject position" – legitimate identities that allow them to have access to resources (Oakes et al., 1998). Actors of institutional change are products of their institutional fields (Hardy & Maguire, 2008); institutional

contexts determine "what sorts of actors would perform what kind of institutional work" (Hwang & Colyvas, 2011; David et al., 2013).

Actors situated at the margin of a field are more likely to develop ideas for change, since they are less connected, less aware of norms than more powerful, central but embedded actors (Hardy & Maguire, 2008). Radically new practices that may evolve into institutions are most likely to be introduced by parties from the fringes of an inter-organizational field (Leblebici et al., 1991).

For example in accounting, one category of actors at the margin of a field active in institutionalizing the budget were the social reformers, defined as "actors in society who, upon encountering economic or social phenomena they deem regrettable or maybe even highly dangerous, simultaneously produce a critique of society, a diagnosis of the risks it is running, and proposals for reforms, regardless of whether these reforms are considered realistic or utopian" (Chiapello & Berland, 2009). A characteristic of social reformers as that they were not necessarily in the position of power and tended to position themselves as forces for opposition (Chiapello & Berland, 2009).

Actors situated in the field and holding power positions such as chefs transforming the field of haute cuisine in France (Rao et al., 2003) or the accounting firms that managed to introduce a new organizational form (Greenwood & Suddaby, 2006), after having access to alternative practices, exert boundary bridging to institute change (Greenwood & Suddaby, 2006).

Scott (2008c), Ramirez (2013) and Muzio et al. (2013) have isolated professionals as institutional agents and argue that the professions in modern society have assumed leading roles in the creation and tending of institutions. Scott (2008c) event insists on calling them the "preeminent institutional agents of our time". Scott further split institutional agents into three categories: cultural-cognitive agents, normative agents, and regulative professions. The weapons of professions as institutional agents include: "devising ontological frameworks, proposing distinctions, creating typifications, and fabricating principles' and generalizations", "formulating and promulgating normative beliefs", and privileged access to regulatory powers (Scott, 2008c). Suddaby and Viale (2011) corroborate this articulation by stating that professionals are uniquely positioned within organizational fields as brokers of varieties of capital, having critical social skills that allow them to engage in institutional work.

Institutional entrepreneurship can also be collective, coordinated or not, resulting from the accumulation of countless institutional entrepreneurs' divergent actions (Battilana et al., 2009; Holm, 1995). One collective form of institutional entrepreneurship are social movements, defined as agents or infrastructures of change, with two approaches, one where movements are forces against institutions whereas the other considers movements from within fields (Schneiberg & Lounsbury, 2008). More often social movements are seen as movements of contestation, such as with the consumer groups that fought for consumer advocacy (Rao, 1998). However, movements can become institutional forces from the inside as shown by Arjalies (2010) and the work on recycling movements (Lounsbury et al., 2003).

Finally, entrepreneurs are now being studied at the individual level, trying to understand how individual characteristics may play a role into who becomes an entrepreneur of institutional change. Two of the characteristics that have been identified by prior literature are "reflexivity" (Mutch, 2007) and the "independence and comfort with marginality, a desire to perform, and a lived sense of agency and duty" (Kisfalvi & Maguire, 2011). Battilana and D'Aunno (2009) proposed that the three dimensions of agency, iteration (habit), projection (imagination), and practical evaluation (judgment), might play a role in institutional entrepreneurship. Additionally, work implies a future-oriented intentionality that aims at reshaping social situations (Lawrence et al., 2011). It also implies efforts towards a goal of change and reshaping institutions. Entrepreneurs are bound to show strategic behaviours that encompass future temporal orientation, showing their capacity to imagine alternative possibilities (Emirbayer & Mische, 1998). Kisfalvi and Maguire (2011) have also highlighted that personal motivations and characteristics drive certain individuals to initiate institutional projects.

3.3.2 Origination work

"Idea entrepreneurs" need to negotiate a shared understanding of the problematic condition or situation they defined as in need of change, attribute blames, articulate alternatives and urge others to act (Benford & Snow, 2000). This work is called "framing" and is decomposed in diagnostic framing, prognostic framing and motivational framing.

Diagnostic framing seeks to make explicit the failing of the existing organization or broader field, expose contradictory meanings in current institutionalized practices and assign blame (Suddaby & Greenwood, 2005). This can be done through story telling, and reusing symbolic stories of the field (Zilber, 2007). Prognostic framing involves the articulation of a proposition, superior to the previous arrangement (Benford & Snow, 2000). Lastly, motivational framing provides the reasons as to why to support the new arrangements (Battilana et al., 2009).

A second important type of work in origination work is mobilizing allies, cultivating alliances and cooperation (Battilana et al., 2009) through having social skills (Fligstein, 2001). One specific form of mobilizing work is advocacy, defined as "the mobilization of political and regulatory support through direct and deliberate techniques of social suasion" (Lawrence & Suddaby, 2006).

The third type of work is resources mobilization, which is considered difficult to obtain, but essential (Battilana et al., 2009).

Finally, and before theorization can occur, belief systems need to be reconfigured, and the boundaries of meaning systems need to be altered (Lawrence & Suddaby, 2006). This happens through constructing identities, constructing normative networks, changing normative associations and educating (Lawrence & Suddaby, 2006).

3.3.3 Theorization

Theorization is defined as "the self-conscious development and specification of abstract categories and the formulation of patterned relationships such as chains of cause and effect" (Strang & Meyer, 1993; Greenwood et al., 2002). Naming or labelling often represents a critical first step that provides the foundation for further theorizing (Lawrence & Suddaby, 2006).

Theorization is said to have a significant impact on the diffusion phase. First, diffusion becomes more rapid and more universal as cultural categories are informed by theorization (Strang & Meyer, 1993). Second, theorization renders diffusion less structured by social relations (Strang & Meyer, 1993). Actors that may participate in the theorization process include scientists, academics, professionals and intellectuals (Strang & Meyer, 1993).

3.3.4 Legitimation

The creation, transformation, and diffusion of innovations require legitimacy, a condition whereby other alternatives are seen as less appropriate or desirable (Dacin et al., 2002). An innovation is faced with contests with established institutions, embedding it in legitimate and familiar designs help shape the outcomes of those contests (Hargadon & Douglas, 2001). Another side of the coin of the legitimation process is that while you need to construct legitimate accounts that make sense of your institutional project –symbolic work, there might also be a need for discrediting alternatives (Holm, 1995; Suddaby & Greenwood, 2005). More importantly, a new innovation's legitimacy depends on the ability of the entrepreneur to accommodate it with existing cultural schemas (Garud & Van de Ven, 2000).

Specific actors can act as agents of legitimation, such as "gurus" who help legitimating new managerial practices by translating them into popular press, presenting the ideas in organizations or at conferences and promoting them through their own consulting work (Suddaby & Greenwood, 2001). Other techniques of legitimation include association with renown players of the field, such as when the GHG Protocol associated with carbon markets, carbon registries and ratings (Green, 2010), or what David et al. (2013) call "affiliation" to legitimate actors so that they can "borrow" legitimacy – status is contagious.

Rethorical strategies (Suddaby & Greenwood, 2005) are often mobilized in legitimation processes. For example, analogy help legitimizing the vision for change, as for example in the GRI institutionalization, where sustainability reporting was compared to financial reporting (Etzion & Ferraro, 2010). Similar to analogy in rhetorical strategies, some use mimicry work (Lawrence & Suddaby, 2006) to associate new practices to taken-for-granted ones, such as Edison who thought that by imitating the features of gas lighting, this would avoid requiring dramatic changes in the surrounding understanding and patterns of use (Hargadon & Douglas, 2001).

3.3.5 Objectification and commodification

According to Berger and Luckman (1967), objectification is an important prerequisite for institutionalization. Objectification involves the disassociation of patterns with particular actors and particular historical circumstances: the patterns acquire a

normative, "factual" quality and their relationship to the existing interests of different actors becomes obscured (Barley & Tolbert, 1997).

Rationalized packages have three dimensions, reproducibility, durability and communicability that play a role in defining the degree to which intuitive or fortuitous modes of understanding and acting become embedded in particular organizations and accepted standard practices and orientations (Hasselbladh & Kallinikos, 2000). Those dimensions also shape the capacity of accepted and standardized practices and orientations to cross the boundaries of particular contexts and diffuse in organizational populations (Hasselbladh & Kallinikos, 2000).

Qualities of rationalized packages	Forms of objectification
Reproducibility	Formal codification
Durability	Formal codification, writing
Communicability	Oral and written language

Table 0.3.1: Qualities of rationalized packages and forms of objectification according to Hasselbladh and Kallinikos (2000)

Rationalized packages and routines are carriers of institutionalization, and at the same time they shape the way actors understand themselves and their roles, how they shape actorhood and have subjectifiying effects (Hasselbladh & Kallinikos, 2000)

Actors that play a part in the process of commodification are consultants, who codify, abstract and translate management knowledge (Suddaby & Greenwood, 2001).

Definitional work is defined as the construction of rule systems that confer status or identity, define boundaries of membership or create status hierarchies within afield. It comprises formal accreditation processes, the creation of standards and the certification of actors within a field (Lawrence & Suddaby, 2006). It pertains to formal codification and enhanced reproducibility.

3.4 Adoption and diffusion

Diffusion is concerned with how new practices flow and spread. The ubiquity of a practice may suggest that it has become widely accepted, but activities that diffuse may never develop a foundation that enables them to persist (Colyvas & Jonsson, 2011). On the other hand, some practice such as golden parachutes, or backdating of stock options

had spread widely but are considered illegitimate and therefore cannot be institutionalized (Colyvas & Jonsson, 2011).

Often, the success of an innovation has been equated with its wide spread, and successful diffusion with institutionalization. Often depicted as "contagion" and emphasizing social influence, diffusion models do not take all interactions into account that take place during the process of adoption, whether they are with mediators or other actors and organizations that intervene as part of a more global social scenery in which diffusion takes place (Colyvas & Jonsson, 2011). Diffusion is often studied from an outsider perspective, looking at parameters that influence adoption, diffusion channels and different actors such as opinion leaders.

However, diffusion in the institutionalization process has been reflected to be more complex and to achieve a better understanding of the diffusion, one needs to turn to the specific phase of adoption and its characteristics (Colyvas & Jonsson, 2011). Indeed, the emphasis on diffusion has underemphasized adoption topics such access to innovation or ignorance of the innovation, as well as rejection (non-adoption) or reinvention on the innovation being adopted (Colyvas & Jonsson, 2011). In the second article of this dissertation, I therefore focus on a case of rejection of an institutionalized innovation, the GHG Protocol corporate standard, a situation rarely analyzed (Höllerer, 2013).

Finally, the studies of adoption are mostly conducted from the outside of the organizations adopting (to the exception of Carpenter & Feroz 1992), and look at determinants of adoption in the field or in the innovation characteristics (Kennedy & Fiss, 2009). In this dissertation, I will access adoption from the inside of the organization that made the decision of non-adoption.

3.4.1 Adoption

Adoption can be defined as the moment where a potential adopter makes the decision to incorporate the innovation into the organisation. Adoption as a organization decision-making process is "more important than the outcome it produces" (Feldman & March, 1981): "It is an arena for exercising social values, for displaying authority, and for exhibiting proper behaviour and attitudes with respect to a central ideological construct of modern western civilization: the concept of intelligent choice" (Feldman & March, 1981). The counterpart to adoption is non-adoption, but the literature also speaks of "active adoption", "minimal adoption", "appropriation", "internalization" and

"assimilation". The decoupling phenomena also shed some light on a specific type of adoption that could be labelled as "presentational adoption".

The literature on adoption determinants has emphasized field level and organizational level determinants. Rogers (2003) found that innovations are adopted more easily when they are compatible with the socio-cultural values and beliefs prevailing in the adopting population. Love and Cebon (2008) refine this finding saying that organizational-level meaning systems influence the adoption decision strongly only in early diffusion. Ansari et al. (2010) couple both organizational and field level determinants to explain the extant to which an innovation is adapted (not adopted) according to two dimensions fidelity and extensiveness. The criteria are technical, cultural and political, and focus on the characteristics of the practice, the field level (supra organizational), the organizational level and the members of the organization level to explain the fit and its evolution in time.

To my knowledge, one of the only researches, which analyze adoption from the organization perspective, is the study of the adoption of GAAP by the state of New York (Carpenter & Feroz, 1992). They explore four theoretical perspectives to understand an adoption decision (what preceded, motivated and affected the decision): agency theory, traditional-rational theory, political-power theory and institutional theory. They conclude that "the most compelling explanation for New York's current use of GAAP (…), as an institutionalized legitimated practice, is a convenient symbol of legitimacy needed for retaining access to the capital markets".

3.4.2 Decoupling phenomena as partial adoption

Decoupling is a phenomenon that happens when a firm is confronted with inconsistent stakeholder expectation (Meyer & Rowan, 1977) or because a firm needs to comply with externally imposed legal and regulatory requirements, and those appear in contradiction with profit-maximizing activities (MacLean & Behnam, 2010). It is defined as a response that "segregates and buffers daily work from formal structures that are taken on to satisfy external demands" (Bromley et al., 2012). Decoupling of structure and action implies a Goffmanesque "backstage/frontstage" definition of institutionalized structures (Tolbert & Zucker, 1996). Decoupling is an expression of post-adoption heterogeneity (Bromley et al., 2012), or an expression that adoption is not often a "yes

or no" answer but a more subtle rendering of adoption that can be "minimal", "active" or else. Decoupling phenomena encompass all variations from straight "adoption" to the "non-adoption".

Bromley and Powell (2012) determined two types of decoupling: symbolic adoption and symbolic implementation or means-ends decoupling. In the case of symbolic adoption, the adopted innovation serves a presentational purpose. This implies that such innovations fundamentally lack normative and cognitive legitimacy and that they are not at any time real signals of underlying intention (Tolbert & Zucker, 1996). This kind of adoption questions the institutionalization status of the innovation (Tolbert & Zucker, 1996). Means-ends decoupling depicts a process where an innovation is adopted, and practiced, but only weakly, they are not tied to core functions (Bromley et al., 2012).

The risks associated with the decoupling phenomenon are multiple. For example when ceremonial adoption occurs and employees "do not have the knowledge and the cognitive categories they need to correctly understand and interpret the practice" (Kostova & Roth, 2002), the practice becomes suspect because it is not consistence with their values and beliefs (Kostova & Roth, 2002), resulting in a dissonance that needs to be resolved (MacLean & Behnam, 2010). In the case of symbolic implementation, decoupling compliance from day-to-day activities led to non-compliance and a loss of external legitimacy (MacLean & Behnam, 2010).

Although it has been thoroughly empirically studied in accounting (Covaleski & Dirsmith, 1988; Collier, 2001; Siti-Nabiha & Scapens, 2005; Tsamenyi et al., 2006; Rautiainen, 2010; Moll & Hoque, 2011), Kostova et al. (2008) contend that MNEs will engage in less decoupling and ceremoniality than typically suggested by neo-institutionalists. Crilly et al. (2012) hints that unity can be achieved by singling out the ultimate stakeholder, hence resolving uncertainty for managers, through tighter formal controls or the use of shared values and strong leadership; therefore, decoupling is not inevitable.

3.4.3 Two-stage in adoption

As hinted in the decoupling phenomenon, adoption can be decomposed in a two stage phenomena, (initial) adoption and entrenchment. In the institutional framework it is

often assumed that new practices, once adopted, become embedded or entrenched within the organization (Zeitz et al., 1999). However, Gallivan (2001) analyzed further the adoption process into a primary adoption decision, followed by a secondary adoption where organizational assimilation processes take place.

Entrenchment is defined so that the abandonment of a practice is unlikely, even under external pressure (Zeitz et al., 1999). It is the gateway between the decision to adopt, and the routinization and infusion of practices in an organization. Similarly, Kostova and Roth (2002) speak of active adoption and internalization, versus minimal adoption, stating that two different kind of adoption processes can happen, one where the new practice/innovation is "internalized" or "entrenched", the other where it is not.

Entrenchment is different to minimal adoption because it demonstrates several qualities such as compatibility (with larger system beliefs and values), formality, depth of embeddedness in cognitive structure, coherence with the system, and is interconnected with other operations (Zeitz et al., 1999). Entrenchment is visualized through models (examples, stories…), values contained in mission and philosophy statements, formal company trainings, administrative regulations and operative reports (Zeitz et al., 1999).

3.5 Implementation of innovations

3.5.1 Implementation of innovations in institutional theory

Stories of implementation of accounting innovations using institutional theory attempt to both "examine the wider institutional influences on the change agents together with their attempts to make out during different phases of organizational evolution" (Soin et al., 2002). According to Soin et al. (2002), institutional theory supplies important extra features to the analysis of managerial innovation. First, the importance of legitimacy in explaining organizational structures and working practices, second a more sophisticated view of structure, and finally a framework that allows to analyze the particularities of each case study and its uncertain outcomes.

Burns and Scapens (2000) have introduced a framework that allows connecting the "institutional realm" and the "realm of action" through rules and routines (Giddens, 1984). They see existing rules and routines as being "encoded" with prevailing institutional principles. The institutional view on change is that "institutions always exist prior to any attempt by the actors to introduce change, and will therefore shape the processes of change" (Burns & Scapens, 2000). Actors enact rules and routines in a

reflexive monitoring and application of tacit knowledge, or conscious choice. The repeated behaviour is the process of reproduction, which finally leads to institutionalization. This view is coherent with practice theorists, which argues that when people take part in practices, they engage in macro-phenomena (Barnes, 2001), as well as with the view of institutional theory that institutions are created in the "everyday acts" (Barley & Tolbert, 1997).

Finally, Burns and Scapens (2000) interpret organizational change through three dichotomies that allow characterizing different empirical processes. Formal change occurs by conscious design, usually through the introduction of new rules and through the actions of those in power. Informal change on the other hand, occurs at a more tacit level, on a longer period, when routines adapt over time to changing operating conditions. However, both processes of changes often occur simultaneously, the risk if they do not is the apparition of tensions (Burns & Scapens, 2000). The second dichotomy is between evolutionary and revolutionary change. Revolutionary change signifies that it has potential impact on institutions, hence the importance of studying the institutional context. The last dichotomy separates regressive from progressive change. Regressive change reinforces ceremonial dominance, hindering institutional change, when progressive change replaces ceremonial dominance by instrumental behaviour.

Soin et al (2002) have mobilized the framework of Burns and Scapens (2000) to interpret the role of management accounting in a bank implementing ABC. They found evidence of both informal and formal change, revolutionary change and regressive change. They also emphasize the attention paid to role played by agency in analyzing the micro-processes of the organizational change at play. However, this framework uses practices as they are represented by routines, and is suited to explain more stability (Lukka, 2007) than implementation of new practices in emergence.

3.5.2 Bridging institutional theory and practice

Institutions are created in the "everyday acts" (Barley & Tolbert, 1997), from a practice perspective, institutions emerge from practices, and institutions are located within the set of practices people engage in (Barnes, 2001). Democracy, for instance, resides in the acts of polling, campaigning and related activities that people do as citizens of a democratic society, rather than in some emergent property of the society that is

separate from those practices (Lawrence & Suddaby, 2006). In institutional theory "practices are conceptualized as kinds of institutions connected to broader institutional beliefs such as logics" (Lounsbury & Crumley, 2007). Institutionalization and institutional change are enacted in the everyday doing of individuals who reproduce their roles, rites, and rituals at the same time that they challenge, modify, and disrupt them (Lawrence et al., 2011).

The practices that lead to institutional innovations are themselves institutionally embedded and so rely on sets of resources and skills that are specific to the field in which they occur (Lawrence & Suddaby, 2006). Understanding practice and their effect on the dynamics of organizing allows showing how the local contributes to the generation of broader effects (Nicolini, 2012). Indeed, institutions are "linkage mechanisms that bridge across three kinds of social divides - they link micro systems of social interaction to meso (and macro) levels of organization, they connect the symbolic with the material, and the agentic with the structural" (Mohr & White, 2008). Moreover, all practices imply some level of durability and carry traces of institutionalization (Nicolini, 2012).

Both practice theorists such as Vaara and Whittington (2012) and institutional theorists Lawrence and Suddaby (2006) call for linkages to be made between institutional theory and as-practice theories, to study the creation and dissemination of innovative by untested practices, and to study institutional outcomes using agents, activity and institutions through institutional work related research, linking practice and how practices gain influence on a larger scale.

3.5.3 Implementation of innovations "in practice": the emergence of new practices

Hager et al. (2012) define practice as consisting "of the relations among the everyday interactions, routines, and material arrangements (…) and forms generated from these". Practice is viewed as socially and collectively constituted (Keevers et al., 2011; Pesqueux, 2013).

Where new practices come from is an important, yet relatively unexplored question (Lounsbury & Crumley, 2007; Vaara & Whittington, 2012). Using practice theory allows retracing the steps, strategies and events that led to the emergence, stabilization, or failure of specific assemblages (Nicolini, 2012). In "as-practice" theory, practice are

social accomplishments that are inherently contingent, materially mediated and cannot be understood without reference to a specific place, time and concrete historical context (Nicolini, 2012). Often, the study of practices has explained the stabilization of practices, explaining the durability of practices as when one practice becomes a resource in the accomplishment of other practices. Once a practice becomes part of a larger configuration, it contributes to the nexus of practices of which it is part (Nicolini, 2012).

Innovation has only recently started to be a focus of practice-based studies (Pantzar, 2010). New practice creation is the enquiry into how practices become what they are (Bjorkeng et al., 2009). Indeed, "innovation is social in that it does not easily occur as a stated and pre-planned outcome but as emergent in the social relations and contexts within which they occur" (Pitsis et al., 2012). Moreover, new practices are "as a consequence of spontaneous human actions rather than of human designs" (Chia & Holt, 2006). Therefore, practice theory is adapted to study the social nature of innovations. Pantzar (2010) explains how practices become what they are by making linkages between elements, a re-combination of existing elements. Indeed, a practice is in the end a node, a knot, and a conglomerate of material and human agencies untangled (Nicolini, 2012). Pantzar (2010) suggest that the different elements of a practice (material, skill and image) need to be integrated – actively interconnected, to become a novel practice.

There is a need to further explore MAIs based on practice theory, as in the study of "making of" Nordic walking (Pantzar, 2010). Its main critics are that practice theory ignores wider institutional arrangements that can constitute the fertile ground of management accounting innovations, although I have demonstrated that both theorists from practice and institutional theories are making calls to connect the two to advance research on novel practices (Vaara & Whittington, 2012). Therefore, there are interesting insights into the practice of innovations that can be made using practice theory, using a dynamic view of practice (Shove et al., 2012).

4 Conclusion of chapter three

My intention in this dissertation is to gain a better understanding of the institutionalization processes at play in environmental management accounting

innovations from ideas to practice. The dissertation aims at answering the following research questions:

- How can environmental management accounting tools be created, by whom and with what strategies?
- What is the process of adoption and the consequences on the adopting organization? How can an accounting innovation become the centre of a conflict of legitimacies at the time of adoption?
- How do EMA tools translate into organisations' practices?

Following Hopwood (1977), who encouraged research into "the institutional processes that can both facilitate and constrain the development of accounting", I will mobilize institutional and practice theories in conjunction to answer the research questions and so as to be able to analyze the institutionalization process from the origination phase to how the institutional innovation is actually practised in the organization. I believe that innovations cannot be understood correctly if not situated in their institutional environment (Chiapello & Berland, 2009), moreover, institutional theory offers an interesting insight into the interconnectedness of the different phases of the innovation process. Finally I will mobilize practice theory studying the dynamic emergence of new practices, as institutions are created in the "everyday acts" and require more than historical or archival material to render their observation possible (Barley & Tolbert, 1997).

There is a need to further explore how institutional agents can be agents of change and stability at the same time (Currie et al., 2012). More particularly, those institutional agents define their work differently as they combine creation and maintenance work. Adoption processes, through decoupling studies, hint to the direction that internal legitimacy plays an important role for the "stickiness" of practices. Finally, innovation emergence processes have scarcely been studied "in practice" in the organizational context and more studies need to explore how innovations "become" what they are through their practice in organizations.

Summary of chapter three

I believe that innovations cannot be understood correctly if not situated in its institutional environment (Chiapello & Berland, 2009). No innovation exist in a vacuum, they are embedded in an institutional environment that shape them (Garud et al., 2002). Hopwood (1977) encouraged considering "the institutional processes that can both facilitate and constrain the development of accounting". This dissertation uses the theoretical framework of institutional theory and practice theory to account for the totality and interdependence of the difference phases in the innovation process (origination on diffusion, adoption and practice, implementation back on to adoption on origination); the social and institutional environment that shapes, constrains and in return is shaped back by innovations; the agency of actors and their purposive work; as well as the micro-foundations of institutional innovations in analyzing the emerging practices that constantly shape and reshape innovations in daily praxis.

Chapter 4: Research Design

In this chapter, I will explain the reasons for choosing a qualitative approach to research, the paradigm in which I situate my approach to qualitative research, as well as the choices in terms of data collection methods and analysis.

According to Nicolini (2012), the aim of social science is to provide a richer and more nuanced understanding of the world. "Good" science enriches the ingredients that make the multi-faceted universe in which we live, make us more articulate; "good" science is generative, increasing our capacity to make connections among phenomena (Nicolini, 2012). Research and learning requires engaging with the world, intervening in it and giving it a chance of "biting back at us" (Nicolini, 2012).

1 Assumptions about ontology and human nature

According to Morgan and Smircich (1980), organization theory would be better served if researchers were more explicit about the nature of the beliefs they bring to their subject of study. Each approach to inquiry has inherent basic values, assumptions and beliefs about the nature of reality and what constitutes valid knowledge; therefore I will specify the ones underlying this research (Evered & Reis Louis, 1981). The epistemology that underlies the research conducted in this dissertation emphasizes the importance of understanding process and change, as well as the way human beings concretize their relationship to their world (Morgan & Smircich, 1980). In the six assumptions characterizing the subjective-objective debate described by Morgan and Smircich (1980), the researcher sees reality as a social construction and humans as creating their own realities. This assumption thus rejects that there is one singular objective, observable and knowable world (Modell, 2009b).

Core ontological assumptions	Reality as a social construction
Assumptions about human nature	Man as a social constructor
Basic epistemological stance	To understand how social reality is created

Table 0.4.1: Basic assumptions for this research (Morgan & Smircich, 1980)

Consistent with these assumptions, this research is based on the interpretive paradigm (Burrell & Morgan, 1979), which is based on the view that people socially and symbolically construct their own realities (Gioia & Pitre, 1990).

2 Qualitative research and the interpretive approach

The objects of my research are environmental management accounting innovations, with a perspective of asking how and why they came about, are adopted and practiced. It has been analyzed through both the institutional lens and practice lens. It is important to define the paradigm in which this research has been conducted, because it defines my (researcher) standpoint, my relationship, as a researcher, to other, and what counts as knowledge creation in this research (Lincoln, 2010).

Qualitative research can be defined "as an intricate fabric composed of minute threads, many colours, different textures and various blends of material" (Creswell, 1998). Qualitative research can be conducted with different frameworks such as constructivism, the interpretative framework, feminism, the methodologist framework, postmodernism, positivism "with a heart" and naturalism (Creswell, 1998). I follow an approach to qualitative research as defined by Denzin and Lincoln (1994) that involves "an interpretive, naturalistic approach to its subject matter". Indeed, the aim of my research is to understand the creation and construction of EMA innovations, their adoption and practice through the lens of actors, their interactions and the meanings they attribute to those innovations:

> *"The interpretive paradigm is informed by a concern to understand the world as it is, to understand the fundamental nature of the social world at the level of subjective experience." (Burrell & Morgan, 1979)*

It sees the social world as an emergent social process, which is created by the individuals concerned (Burrell & Morgan, 1979). Interpretivists are orientated towards obtaining an understanding of the subjectively created social world 'as it is' in terms of an ongoing process (Burrell & Morgan, 1979). The interpretive approach is unique in its ability to address issues of description, interpretation, and explanation (Bluhm et al., 2011). Interpretive researchers argue that it is "through interactions embedded in ongoing organizational processes that highly situated and local meanings are attributed to management accounting technologies by those social actors connected to them" (Baxter & Chua, 2006). Accounting, from the interpretive perspective, is being conceived of "as one form of symbol that is used in the social construction of a fluid, subjective reality" (Covaleski & Dirsmith, 1990).

Qualitative research reflects on decisions, individuals, organizations, processes, programmes, institutions or events. It is used when you want to understand a real-life phenomenon in depth, with important contextual conditions, and when boundaries between this phenomenon and context are not clearly evident (Yin, 2009). It is directed at describing, translating, analysing, and inferring the meanings of events or phenomena occurring in the social world (Covaleski & Dirsmith, 1990). There are several characteristics of interpretive qualitative research. First it occurs in the natural setting of an organization or field, second, data originates from the participant's perceptions of his or her experiences, and third, qualitative research is reflexive in its design, gathering of data and analysis (Bluhm et al., 2011). The setting and research questions influence the procedures for uncovering data and the instruments used (Bluhm et al., 2011). Moreover, qualitative research is characterized by a long and intense contact between the researcher and the fieldwork (Miles & Huberman, 2003). The role of the researcher in qualitative research is to acquire a holistic comprehension of the study, and to try and capture the perceptions of local and insider actors through a process of intense attention to the field (Miles & Huberman, 2003).

The strengths of qualitative research are:

- Its ability to deal with a full variety of evidence, from documents, artifacts to interviews and direct observation (Yin, 2009). The methods of data collection and analysis are not standardized (Bluhm et al., 2011)
- Its faculty to uncover deeper processes in individuals, teams, and organizations, and understanding how those processes unfold over time (Bluhm et al., 2011)
- Its faculty of gaining an understanding both of what individuals experience and how they interpret their experiences, the meanings attached to actions and events in the language of its principal actors (Bluhm et al., 2011; Covaleski & Dirsmith, 1990)

However, qualitative research also has weaknesses, which will be addressed in the validity and limitations paragraphs below:

- It tends to be time intensive (Covaleski & Dirsmith, 1990) and it tends to be problematic as to multiple interpretations when more than one researcher is involved (Covaleski & Dirsmith, 1990)
- It is accused of lacking rigor and not being easily replicable, allowing equivocal evidence or biased views influencing the direction of findings (Yin, 2009). While

not going to the extreme "validity checklist" (Ahrens & Chapman, 2006), I will refer to a general validity framework relative to qualitative studies to discuss the rigor of the methods used in this dissertation (see sections "research validity" and "limits of participant observation")

- Some see the researcher bias as a potential issue for the validity of results of qualitative research, while others see the "inside-out" perspective as the main feature of qualitative research, that brings to the contrary, the richness out of qualitative research (Evered & Reis Louis, 1981) and is considered by others as a source of credibility and quality of the data (Becker & Geer, 1957). Ahrens and Chapman (2006) go as far as to say that checklists to avoid researcher bias and targeted at defining good qualitative field research are "at best indirectly helpful and potentially counterproductive".

2.1 The choice of qualitative research

2.1.1 Interpretive paradigm

Interpretive studies are "fat with the juice of human endeavour, human decision making, zaftig with human contradiction, human emotion, human frailty" (Lincoln, 2010). Interpretive research pleads for research that is "thick- replete with multiple levels of understanding, assembled from many 'ingredients', and patched together to from new patterns, new images, new languages" (Lincoln, 2010).

Qualitative data sets correspond to the need for a representation of the "complexity" of the field in which the research takes place (Richards, 2005). They are "records of observation or interaction that are complex and contexted" (Richards, 2005). Fieldwork involves "learning from people" and "realizing his vision of his world" (Spradley, 1980). Fieldwork is concerned with the "meaning of actions and events to the people we seek to understand" (Spradley, 1980).

2.1.2 The nature of research questions

Interpretive theories answer "why" and "how" questions, and often come with stories that help understand what the theory means to people (Lincoln, 2010). The explanatory nature of the investigation and the theoretical lenses used both require the use of a qualitative approach to research. Yin (2009) states that explanatory questions are more likely to lead to the use of qualitative research methods. Qualitative research is flexible;

as research questions do not clearly indicate what data you need to answer them (Richards, 2005).

2.1.3 The object of research

Innovation processes may not necessarily follow a linear sequence from invention to implementation, and will implicate multiple levels simultaneously. In addition, innovation processes are subject to cultural influences, it is important to extend the study of innovations beyond the boundaries of the enterprise (Miller & O'Leary, 1990). The particulars of how specific innovation processes unfold will depend on the cultural setting, therefore requiring rich case studies (Garud et al., 2013). Minimally, "one has to take a multi-level, longitudinal perspective, and follow events implicating actors, artifacts, and institutions over time" to be able to study innovations (Garud et al., 2013).

2.1.4 The theoretical lenses used to illuminate the research questions

Studying institutional contexts and processes requires qualitative field studies (Covaleski & Dirsmith, 1990), and making institutional work visible requires rich, detailed case studies (Lawrence et al., 2009); additionally, in practice-based research, the researcher must put himself in the place of the weaver of organization texture, to uncover the activity "inside" the process (Brown & Duguid, 2001; Gherardi, 2012).

3 Methodological framework

The methodological framework of this dissertation uses a qualitative approach and is based on two different fields, one conducted outside organizations, in the field of life cycle assessment, and the other within an organization. The two fields allowed to cover the life cycle of an EMA innovation, from the creation, to the adoption (non-adoption) and finally to the implementation phase. This framework allows gaining a better understanding of the institutionalization processes at play in environmental management accounting innovations from ideas to practice, by answering the following research questions:

- How can environmental management accounting tools be created, by whom and with what strategies?
- What is the process of adoption and the consequences on the adopting organization? How can an accounting innovation become the centre of a conflict of legitimacies at the time of adoption?
- How do EMA tools translate into organisations' practices?

Article	Research Question	Principal research method	Complementary research methods
Genealogy (Article 1)	How can environmental management accounting tools be created, by whom and with what strategies?	Interviews	Secondary data (books, archives, press)
Case study (Article 2)	What is the process of adoption and the consequences on the adopting organization? How can an accounting innovation become the centre of a conflict of legitimacies at the time of adoption?	Participant observation/ single case study	Interviews, secondary data
Case study (Article 3)	How do EMA tools translate into organisations' practices?	Participant observation/ single case study	Interviews, secondary data

Table 0.4.2: Methodological Framework

4 Genealogy (article one)

4.1 The purpose of genealogies

I believe studying the genealogy of accounting tools brings about the how and why tools that we commonly use today were incepted and diffused. "Such an unofficial history (genealogies) seeks to explore the many 'small' ways in which this technique of knowledge emerged and spread" (Loft, 1986). At the same time, "the historical perspective allows society to assess the future of accounting and its artefacts and manifestations" (Carnegie & Napier, 2012). Genealogies explore the identification and explication of the factors causing the accounting, whilst being attentive to the changes in meaning that accompanies their emergence (Miller & Napier, 1993). Different calculations are deployed according to different objectives or ideals, and present practices are an outcome of disparate events and processes (Miller & Napier, 1993) that need to be further explored and analysed.

Genealogies help respond to the call by Burchell et al. (1980):

> *"There is, we think, a real need for more historical studies of the development of accounting. Just how has accounting come to function as we now know it? What social issues and agents have been involved with its emergence and development? How has it become intertwined with other aspects of social life? And what consequences might it be seen as having had?"*

Genealogies often take a "longitudinal approach", therefore I will study the institutionalization processes of life cycle assessment in France over a period of twenty years (Tolbert & Zucker, 1996). This allows seeing different contextual phases and different processes of institutionalization up to now. We will also be able to analyse power relations and networks at play and "locate the processes historically" as stated by Ball and Craig (2010).

Longitudinal approaches study a phenomenon across time (Thiétart, 2007). The time is an important feature of the analysis of the process of innovations, since they happen over long period of time (Garud et al., 2013). Longitudinal approaches require to collect data from the different periods considered (here 1990 to 2012), and to gain insights from interviewees that were active over the different periods.

4.2 Exploratory phase of genealogy

The genealogy was conducted in two phases. This initial research allowed a better understanding of the institutional context for environmental topics in France, and to identify successfully institutionalized EMA tools as potential case studies, since "there has been a tendency for technical histories of accounting to be written in isolation of their social, economic and institutional contexts" (Hopwood, 1985).

I conducted an exploratory study during five months, where the different possible institutionalization forces for EMA tools in France were explored. I was able to identify two EMA tools as having been particularly successfully institutionalized in France. One of the tools was much younger than the other allowing one to observe only a short period of about 10 years, therefore the écobilan, allowing one to observe institutional work throughout a period of a little over 20 years, was chosen to illustrate the institutional work of actors in the creation and institutionalization process of an EMA tool in France.

Interviews were conducted with French researchers, members of the parliament involved in law making related to sustainability reporting, a former environmental director of a French company, who had an important role in the making of ISO 14001, as well as a manager from ADEME[26] (French environmental agency). ADEME is a public agency, under the supervision of both the ministry of ecology and the ministry of higher education and research. It is involved in the implementation of public policies in the areas of environment, energy and sustainable development. I also met with the accountants' association sustainability group, read the debates related to the making of NER[27] law in 2001, attended a workshop on the Grenelle, as well as a consultancy conference on carbon accounting. To complete the exploratory research, I interviewed international experts on EMA involved in the US EPA (Environmental Protection Agency) project in the 90s and in the making of the EMA report at the United Nations, to get an understanding of how EMA had developed outside of France. In total thirteen interviews were conducted totalling about 10 hours of interview data.

[26] ADEME : Agence de l'environnement et de la maîtrise de l'énergie

[27] New economic regulations (NER) law: loi sur les Nouvelles Régulations Economiques (loi NRE). The article 225-102 was the first regulation in France to oblige listed companies to communicate on the social and environmental consequences of their economic activities

4.3 Data sources for article one

Favoured sources of empirical elements for histories of accounting are archives, contemporary documents, contemporary press, annual reports and secondary literature (Napier, 2006). Few "histories" use interviews (Caramanis, 2002), however recent accounts of management accounting tools rely more and more on them because they are "particularly informative about the way in which (the tool) is discussed, interpreted and promoted by the innovation community" (Becker et al., 2013).

4.4 Interviews

The localist sees "the interview process as an opportunity to explore the meaning of the research topic for the respondent and a site to be examined for the construction of a situated account" (Qu & Dumay, 2011). A localist argues that "social phenomena do not exist independently of people's understandings of them, and that those understandings play a crucial generative role" (Hammersley, 2007). Interviews are narratives that produce "situated accounts" of the phenomenon under study (Qu & Dumay, 2011). Interviews are "the productive site of reportable knowledge itself" (Holstein & Gubrium, 1997). Semi-structured interviews are used in an attempt "to understand the complex behaviour of members of society without imposing any a priori categorization that may limit the field of inquiry" (Fontana & Frey, 1994).

4.4.1 Interviewees

Because of the tentative focus on institutional work of actors, identification of major actors was key to elaborate the genealogy. Actors were not selected on the basis of their belonging to the French elite, but on the basis of their role in the institutionalization process of écobilan. However, for the period from 1990 to 2000, as well as for people connected to the former consultancy Ecobilan, a vast majority of interviewed actors are from the French elite, as defined in the next section. Names of contacts within the consultancy Ecobilan were first obtained via the book from the two journalists Blouet and Rivoire "l'Ecobilan" written in 1995. Names were further collected through collection of press articles related to life cycle assessment in France. Two key contacts were made through personal network. Further interviews were made through snow balling, asking interviewees to provide names of key actors in the life cycle assessment history that could provide further highlights. Contacts were not always easy to make due

to the fact that many people involved in the écobilan's creation and institutionalization process have either left the field, retired or simply did not want to reflect on that period. Some contacts required over a year before acceding the possibility of an interview. Interviews allowed access to the making of life cycle assessment through different angles and time periods. First I was able to conduct interviews with consultancies, but also receivers (users in the industry), governmental agencies, as well as one non-governmental organization (NGO) actor. I was also able to access people that were active in the beginning of the period (1990-95), sometimes actors that were active from the beginning of the 90s until now, and actors that were more active recently.

	Number of interviews	Minutes
Academia	2	40
Consultancies	9	528
NGO	1	25
French industry	4	228
Government/governmental agencies	4	186
Total	20	1006 minutes

Table 0.4.4: Interviews for the second phase

4.4.2 Interview questions and conduction of interviews

The localist perspective (social construction of situated accounts) to semi-structured interviews (Alvesson, 2003; Qu & Dumay, 2011). The semi-structured interview "involves prepared questioning guided by identified themes in a consistent and systematic manner interposed with probes designed to elicit more elaborate responses" (Qu & Dumay, 2011). Interviews were conducted so as to understand central themes around the development of the life cycle assessment tool, while seeking to obtain open accounts of the specific experiences in the subject's interaction with the tool (Qu & Dumay, 2011). The interviewer tried to remain open to new and unforeseen phenomenon, and did not impose frameworks or categories upon the interviewees (Qu & Dumay, 2011).

Questions were tailored to each respondent, as their particular role in the development of life cycle assessment was different. However, topics included the development of the methodology, the strategy of the consulting firms, strategy of clients, limits of the tool, standardization of the tool in the French and international context, the evolution of the market of LCA in France, the role of the government and governmental agency into the

development of LCA, and the most recent period with the impact of Grenelle on the latest developments (appendix 6.17 and 6.18).

Advantages of semi-structured interviews include that they enable interviewees to provide responses in their own terms and in the way that they think and use language (Qu & Dumay, 2011). It is particularly valuable since the researcher was aiming at understanding how the interviewees perceived the social world (field of life cycle assessment) under study (Qu & Dumay, 2011).

The researcher presented herself as a doctoral student from HEC Paris doing research on the creation of the tool life cycle assessment. Presentation is very important as it has a great influence in the success or failure or the study (Fontana & Frey, 1994). Gaining trust of the interviewees is important, albeit difficult when you interview a person for the first and last time. Interviewing people from the elite consisted occasionally in responding myself to precise questions about whom I was and the aim of the study before being accepted as an unacceptable and trustable interviewer. To establish rapport, the interview started with questions on the career of the interviewee and how they came to connect with LCA. Interviews were conducted by the author face-to-face whenever possible or by phone if geographical distance required it. Interviews were all recorded, and notes were taken during the interview process.

4.5 Secondary data

Secondary data was collected from the media (archival search on Lexis Nexis with the words écobilan, analyse de cycle de vie, bio intelligence service, and the names of prominent actors of the field), manuals, and the journal from the elite school Les Mines "Responsabilité & Environnement". Accessing secondary data such as manuals enabled me to see how LCA was objectified and packaged (Cooper et al., 2012). Secondary data help understand how life cycle assessment was conceptualised and provide information on the role of different actors and institutions in the "innovation community" (Becker et al., 2013). Although archives for the principle consultancy were not available[28], I was however able to access to the archives of the French environmental agency for the period 1990 to 2012 on life cycle assessment.

[28] This is due to two reasons: the consultancy still operates, and was bought two times since 1995

Additionally, I attended a one-day workshop from the association AFITE[29] in November 2011, called "Reinvestir l'analyse de cycle de vie" (reinvest life cycle assessment). AFITE is an association "whose members consider that the dynamic and balanced protection of the environment (...) must be drawn from adequate technical and regulatory measures, supported by a neutral, technical and scientific approach attentive to the expectations of society" (AFITE, 2013).

Type of source	
Interviews of second phase	16,7 hours (20)
Interview exploratory first phase	10 hours (13)
AFITE training recording	2 hours
Books	878 pages (4 books)
Press articles (Lexis Nexis)	1192 pages (557 articles)
Press articles (other)	97 pages (25 articles)
Other sources (archive, congress presentations etc.)	551 pages (22 documents)
Standards	3 standards (the French one from 1994, and the international ISO standards)

Table 0.4.5: Overview of sources

4.6 Analysis of data for article one

4.6.1 Meeting the data

The interviews transcribed were first read a first time as "skim reading". Then, they were re-read and notes were taken. First ideas emerged from the reading and annoting of data manually (Winter 2011/2012). For example, first ideas about "work" emerged such as framing, standardizing and the importance of the network. The second tool (Bilan Carbone) was taken out of the study in the spring of 2012, and the analysis of work was refined towards summer 2012 for the tool "life cycle assessment".

4.6.2 Coding software

Coding was done using software called Dedoose, that is an "Nvivo-type" of software. Dedoose[30], formerly called EthnoNotes, is a qualitative data analysis online software,

[29] Association française des ingénieurs et techniciens de l'environnement.

[30] Dedoose is also very pragmatically compatible with Mac computers, inexpensive compared to other programs that have a very high entry-fee, and does not fail as it is internet based, plus it saves data automatically and never looses the work you have done. Reliability of the software is a very important feature since coding is time consuming Miles & Huberman (2003), and needs to be repeated sometimes several times, or at least amended during the course of research.

designed by experienced social science researchers using psychological and anthropological research methods. It has been in existence for the last 13 years. It is a "code and retrieve" program (Weitzman, 2000), that specializes in allowing to apply category tags to passages of texts and later retrieve and display the text according to the codes. It links data together, connecting data segments with each other, forming categories and clusters (Weitzman, 2000). Dedoose has several features, coding, storing, search-and-retrieve and well as linking data together (Weitzman, 2000). Codes can be dynamically added, and modified anytime (Lieber et al., 2003), remaining flexible and open to modifications (Miles & Huberman, 2003). Several levels of coding can be made. Coding schemes is a central feature of the data model of the software Dedoose (Lieber et al., 2003). Code-and-retrieve programmes do not allow however for interpretation, which remains part of the work of the researcher after coding. However, code-and-retrieve programmes are systematic, and allow an exhaustive and detailed coding of the data while keeping the flexibility to update the codes and the hierarchy at anytime.

4.6.3 Coding the data

I analysed both interview transcripts and all secondary data described above with the qualitative data analysis software Dedoose (description of the tool was made in section 4.4.2) that allows line-by-line coding of data, and 512 excerpts were coded. The unit of analysis for small paragraphs of one to three or four sentences each.

The analysis conducted was thematic at first. Secondly codes were inferred by theory on institutional work, also complemented by additional codes that emerged from the analysis of the material. An additional coding linked to time periods was added to facilitate restitution. General codes were deductive and came from both theory (creative institutional work, maintenance work) and general emergent themes came from the interviews and were inductive (the company Ecobilan, the tool, elite relations). Some codes were renamed and recombined after several rounds of analysis, such as "theorizing and defining work", which is renamed "locking work" or elements of the strategy of the firm Ecobilan, which are renamed "gatekeeping work" (see appendix 6.14).

4.6.4 Interpreting the data

According to Miles and Huberman (2003), there are four different groups of tactics to interpret the data. The first one consists in "looking at what is going on". In this first phase, the researcher looked for patterns around themes and proceeded in grouping data around codes that were hierarchically arranged, which for the genealogy, consisted in looking for different type of actions that were key to the process of the making-of and development of the EMA innovation. The second and third phase of interpretation consists in improving the understanding of the data set by contrasting the work in different periods (for example theorizing and demonizing). The last phase described by Miles and Huberman (2003) is to gain a global coherent and comprehensive interpretation of the data set, constructing a logical chain of indices and gaining a global theoretical coherence. For article one, it meant connecting creation and maintenance work, as well as making relationships between the different actors of the elite. According to Miles and Huberman (2003), the relationships built within the set of data must have meaning and must be complete. The data gathered for article one are longitudinal over twenty years, as to have a comprehensive understanding of the creation phase of an EMA tool. The interpretation was made coherent by the connections made between the different point of views of interviews (consultants, government, clients, others), and the connections between interview data and secondary data – press and books related to the different periods of the creation of the tool.

4.7 Limits of research methods, validity and ethics

4.7.1 Limits of research methods used

Limits of longitudinal approaches are that studies are mainly retrospective (Thiétart, 2007) and appeal to secondary data (archives) and when interviews are conducted, interview data might suffer from the bias of past reconstruction.

Interviews are person dependent and context sensitive, and although this can be considered as a limiting factor of the interview gathered data, it can be also overturned as a major asset of this method, as the interviewer is the primary asset to gain access to the knowledge he requires for his research (Kvale & Brinkmann, 2008). Interviewer craftsmanship is the best way to soften the limit of interview as unreliable method of data gathering (Kvale & Brinkmann, 2008). Interview data is subjective, however this

contributes to the multi-perspectival construction of knowledge (Kvale & Brinkmann, 2008).

4.7.2 Validity

The collection of secondary data allowed for "triangulation" of data, to show that independent measures go in the same direction, or at least do not contradict our results (Miles & Huberman, 2003). This was important, as the limits of interviews are that interviewees may reconstruct the past and try to give the best view of themselves (Alvesson, 2003), or they might be tempted to say what the interviewer wants to hear. The article as read by an insider of LCA history in France who had not participated in the research to provide feedback on the rendering of LCA history.

4.7.3 Ethical considerations

The object of inquiry in interviews is human beings, and therefore extreme care must be taken to avoid any harm to the participants of the study (Fontana & Frey, 1994). The interviewee must be carefully informed about the research. This informed consent was realized by sending an email that explained the research, the identity of the interviewer, and that the interview would be recorded and the data rendered anonymous (right to privacy). Once the interview was started, the researcher stated again that the interview would be recorded. Four interviewees asked to re-read extracts from their interview, and made modifications for clarification purposes, but also for one, to take out company names involved. One interviewee asked me to specifically destroy any interview data once the research was published.

5 Case study (article two and three)

The case study is preferred in examining contemporary events over which the investigator has little or no control, and to answer "how" and "why" questions (Yin, 2009). Moreover, the case study allows interpreting the social system being studied (Scapens, 1990). A case study is "an exploration of a bounded system over time through detailed, in depth data collection involving multiple sources of information rich in context" (Creswell, 1998).

In the social and environmental accounting literature, it has also been argued, that there is a need for more engaged approaches with organizations that practice sustainability

accounting, with the "aim of drawing from the field the rationales that the actors use to construct sustainability accounting and accountability and, directly or indirectly, enhancing practice" (Adams & Larrinaga-Gonzalez, 2007). Therefore we believe case studies with strong participant observation approach responds to the call for more engaged approaches with organizations.

5.1 The choice of a unique case study

When studying a social situation, it is suggested to select one single social situation to allow for a better understanding of the complexity embedded in it (Spradley, 1980). The careful study of a single case leads researchers to see new theoretical relationships and question old ones (Gibb Dyer & Wilkins, 1991). The aim of single case study is to reveal the "deep structure of social behaviour"(Gibb Dyer & Wilkins, 1991). Theory that is born out of deep insights will be more "accurate" since the researcher will take into account the "intricacies and qualifications of a particular context" (Gibb Dyer & Wilkins, 1991). Moreover, Yin (2009) suggests that there are five rationales for choosing single case studies. First, the "critical case" in testing a well formulated theory, second the "extreme or unique case", third the "representative or typical case", fourth the "revelatory case" and fifth the "longitudinal case". Miles and Huberman (2003) also classify case studies upon their representation of a "critical case", "extreme case", "typical case", "intense case".

My research questions respond to "how" questions and are explanatory in nature. My object of inquiry (EMA) is relatively new when it comes to being studied at corporate level. Therefore, I believe that the case study company here will be a revelatory case, where the researcher has "an opportunity to observe and analyze a phenomenon inaccessible to social science inquiry" (Yin, 2009). Indeed, practices of EMA from the inside of a company, and the study of the adoption of an innovation from the inside of a company are phenomena that have been rarely studied from within (Burritt et al., 2011; Zawawi & Hoque, 2010). Moreover, I believe the case study dataset represents an "intense case" in the sense of Miles and Huberman (2003) as it is a rich case that expresses the phenomena with intensity, without being of extreme character. Using a single case study to be as close as possible to the phenomenon under investigation is important to reveal the mechanisms at play in innovation studies (Gibb Dyer & Wilkins,

1991; Garud et al., 2013). The richness of single case studies is paramount to contributing to practice-theory and institutional theory as well.

5.2 Access to the field

To study the phenomena of adoption and practice of environmental management accounting, I searched for a company that would have the intention of, or started the process of using EMA tools and methods. Gaining access to a situation where observation of corporate practices is possible requires finding out, which companies have already experienced with these novel practices. It also will require permission from the company to conduct observation, interviews and collect secondary data for research.

In the spring of 2010, I participated in a consultancy workshop on carbon strategy and carbon accounting, and was able to identify several French companies that had the particularity of having had a first encounter with carbon accounting. I sent out a research proposal to several of those companies and started interviews to gain access to a field. Separately, I also sent a research proposal to a case company in the food sector, which I had heard, had started collaboration on a carbon accounting tool with an external partner.

A first meeting with the environmental director of the company followed this "cold contact" in March 2010, and opened the door of a potential collaboration for research on their burgeoning carbon accounting.

In April 2010, after discussion with the nature manager and the nature CFO, there was an agreement that the collaboration would take place in the form of a doctoral project[31] over a period of three years, in which the time of the researcher would be split between participant observation periods and periods out of the field.

5.3 Data sources

Several sources of evidence exist in case studies. Yin (2009) defines six data sources, which are documentation, archival records, interviews, direct observations, participant observation and physical artifacts.

In my case study, the main mode of data collection is participant observation. The other sources of evidences used are interviews, documentation from the company and about

[31] The doctoral project took the form of a CIFRE contract, which is a research contract between the state (through ANRT), the laboratory of the doctoral researcher (HEC Paris) and the case company.

the company and access and use of physical artifacts, namely accounting tools related to carbon accounting.

5.3.1 Participant observation as the main mean of data collection

The researcher can only obtain adequate knowledge of cultural practices by engaging in those practices (Hastrup, 1997). Fieldwork requires "close engagement, rather than objective, distanced capture" (Ahrens & Chapman, 2006). Fieldwork should thus be conducted as "living another life" (Hastrup, 1997). The researcher should try to become an insider, to gain access to the discourse and action among members of the field (Jonsson & Lukka, 2007). Therefore, my main mode of data collection in my research is participant observation.

Participant observation has seven basic features:

- "A special interest in human meaning and interaction as viewed from the perspective of people who are insiders or members of particular situations and settings;
- Location in the here and now of everyday life situations and settings as the foundation of inquiry and method;
- A form of theory and theorizing stressing interpretation and understanding of human existence;
- A logic and process of inquiry that is open-ended, flexible, opportunistic, and requires constant redefinition of what is problematic, based on facts gathered in concrete settings of human existence;
- An in-depth, qualitative, case study approach and design;
- The performance of a participant role or roles that involves establishing and maintaining relationships with natives in the field; and
- The use of direct observation along with other methods of gathering information" (Jorgensen, 1989).

It is adapted for studying processes, relationships among people and events, the organization of people and events, continuities over time, and patterns, as well as the immediate socio-cultural contexts in which human existence unfolds (Jorgensen, 1989). More particularly is it relevant when little is known about the phenomenon (here environmental management accounting practices) and when the phenomenon is hidden from public view (within the realm of a private organization) (Jorgensen, 1989).

Participant observation can be differentiated from action research or interventionist research (David, 2008) by several distinctive features. Participant observation and interventionist research share the principal objective to gain a deep understanding of the functioning of a social situation. However, interventionist research has distinctive characteristics, which are that the research aims at defining trajectories of possible evolutions, choosing one alternative and helping realizing it as well as evaluating the result (David, 2008). Moreover, the production of knowledge is done in interaction with the field (David, 2008). Interventionist research makes deliberate use of active participant observation as a key research asset, however seeking to act on the situation in concert with the host organization (Jonsson & Lukka, 2007). The distinguishing aspect of interventionist research is the very intention to achieve some desired result in the field (Jonsson & Lukka, 2007). In this research, the participant observer did not seek to define trajectories for the case organization, nor to help choosing any or realizing it. The researcher had no intention to achieve some desired result that would act back on the company. The role as a "carbon accountant" had no influence on the strategic decision making of the company where the research took place, and therefore, the research cannot qualify as interventionist.

The different kinds of participation

Spradley (1980) defines different kinds of participation modes, from non-participation to complete participation. Non-participation involves no participation at all and is exemplified by Spradley with ethnography in front of television shows. Passive participation relates to an observer that occupies a "bystander" or "spectator" role in the social situation observed. Other modes, from moderate to complete participation, included some kind of interaction with what people in the social situation do.

In this research, I was a in a "complete participation" mode as a "carbon accountant" at headquarter level of the organization. In several occasions, I used a "moderate participation" mode to access meetings and workshops in which I was a "watcher" and not a participant as such.

The participant observer

The participant observer accesses a social situation with two purposes: to engage in activities appropriate to the situation (work as a "carbon accountant") and to observe

the activities, people, and physical aspects of the situation (Spradley, 1980). He seeks to become explicitly aware of things usually blocked out to avoid overload (Spradley, 1980) and must approach social life with a wide-angle lens, taking in a much broader spectrum of information (Spradley, 1980). Consequently the participant observer experiences are both as an insider and an outsider simultaneously. He must learn to increase introspectiveness and use himself as a "research instrument" (Spradley, 1980). Finally, a participant observer records both observations and subjective feelings.

Key characteristics of "complete participant observation"

The methodology of participant observation requires that the researcher become directly involved as a participant in peoples' daily lives (Jorgensen, 1989). It allows gaining access to the interior, subjective aspects of human existence. Through participation, the researcher is able to observe and experience the meanings and interactions of people from the role of an insider (Jorgensen, 1989). The character of field relations heavily influences the researcher's ability to collect accurate and truthful information (Jorgensen, 1989). Therefore the performance of an insider role, the ability to gain at least a comfortable degree of rapport with the people and situations and setting of the research influence the quality of data gained through participation observation (Jorgensen, 1989).

Another characteristic of participant observation is that the researcher becomes himself the instrument of research, with the particular role of recording with eyes and ears wide opened, what is going on around him (Arborio et al., 2010).

The researcher must adopt the emic perspective, which is key to interpretive case studies. It is inevitably needed in order to be able to communicate in equal terms with the people in the field and participate in the organization processes (Jonsson & Lukka, 2007). However, the researcher must also be able to cross back to the realm of academic "pure reason" and adopt the etic perspective (Jonsson & Lukka, 2007).

Participant observation at the case study company

Participant observation was conducted from November 2010 to January 2011, and from November 2011 to July 2012. In total, I spent twelve months as a "carbon accountant"

with the nature team of the organization, in the headquarters. In total, 149 formal meetings were attended (See appendices 6.10 and 6.11).

This position allowed gaining insights to the top-level ongoing development of the nature and carbon strategy. This included participation in workshops related to the development of future strategies, meetings related to the monitoring of divisions' nature strategy and meetings related to relationships with key opinion leaders. Moreover, as an insider, I was able to access and participate in bi-weekly team meetings, have access to formal and informal lunches, have access to the team's exchange folders and website.

I was more particularly involved in the day-to-day tasks related to carbon accounting, as well as the strategy of development of carbon accounting tools and methodologies. In the first part of the fieldwork from November 2010 to January 2011, I was involved in both the launch and design of the accounting based on the GHG Protocol corporate standard, and the response to the Carbon Disclosure Project questionnaire for year 2010. The work on the GHG Protocol included meetings with a consultancy that had recommended the implementation of the second accounting method in parallel to the one developed internally. In the second period from November 2011 to July 2012, I continued to be involved in the implementation of the GHG Protocol standard, seconding another carbon accountant of the nature team. However, I was more deeply involved in four other projects, three of them related to carbon accounting. The first project consisted in testing the concept of "convergence" between the carbon accounting developed by the company, and the carbon accounting standard from the GHG Protocol. This allowed me to gain deep understanding of the construction and the characteristics of their carbon accounting, as well as the design of the external standard. The second project consisted in auditing the developing ERP system for carbon accounting, and managing the redesign of the tool in consistency with the existing methodology used in the excel-based accounting tool. During this project, I gained access to the designer of the excel accounting tool, and a very rich and detailed understanding of the excel tool. This project also allowed me to gain access to the way the excel tool was used, transformed and sometimes diverted from their initial goals by carbon masters. I was able to discuss thoroughly the accounting processes, practices and strategic uses of the tool with several carbon masters in France, Belgium, USA, and work closely with carbon masters of Canada, Italy, Spain and Germany. In continuation of the second project, I participated in the making of the business intelligence module that was to sit on top of

the ERP system for carbon accounting. This shaped a deeper understanding on the strategic use of carbon accounting data for carbon management.

Finally, I joined the inception of a project related to integrated reporting. The case company became a pilot of IIRC in September 2011. The participation in this project allowed me to gain a rich contextual understanding of the whole company strategy and the embeddedness of the nature strategy within the business strategy.

I kept a diary of daily activities and feelings throughout the participation observation period, although I found it difficult to take records of subjective feelings at the time of observation, especially when sitting in between two members of the organization. However, the "journal de bord" amounted to 135 pages and was completed by two notebooks of handwritten notes.

Being a participant observer allows first hand access to untraditional, nonetheless important information such as "organizational gossip" (Soin et al., 2002), which takes place at lunchtime, at the coffee breaks or in chance meetings in the corridors. A lot of the research in a participant observation context happens with "unofficial non-formalized techniques of inquiry" (Baldamus, 1972). For example, gathering frustration about the implementation of the second carbon accounting tool and its "secondary" status in the minds of people in the company was possible around a coffee in the morning. Other tensions were captured while being a taxi with the two heads of the department I was participant observer in.

Different people in the organization perceived the researcher differently. My position as a researcher was not hidden from people inside the organization, and all members of the nature team at headquarters had in mind my position as an "academic". However, daily, people considered me as a member of the team on carbon accounting. This closeness, although is part of the limits of participant observation, is also one of the access to richer data, where people have enough trust to discuss organizational matters with you, to let you in strategic meetings and access to people throughout the organization, from directors to carbon masters for the research. In particular, the trust and mutual respect that was installed between my main contact inside the company and myself was literally a "key" to accessing people in the organization, but also some strategic meetings, reports and tools.

Limits of participation observation

A participant observer tries to insulate from the daily realities of fieldwork, but it is unrealistic to think that you can be unaffected (Jorgensen, 1989). This is especially the case in lengthy participations, which are also intense when you perform a membership role. The perception of a participant observer is influenced by the closeness to the team the participant belongs to while doing the research. Several tactics exist to anticipate the consequences of this mode of data collection, such as talking through daily experiences with professional colleagues or close friends (Jorgensen, 1989). The researcher needs to avoid going native (Collier, 2001) as over rapport can lead to negative consequences for the research, such as limited access to data or limited access to another category of potential stakeholders of the research (Hammersley & Atkinson, 2007).

Moreover, the participation mode renders indispensable the reflexive analysis of the researcher's participation. The researcher does not completely control the situation and the role he plays in the organization. Unpredictable events, the character of people, misunderstandings can affect the situation in which the researcher is. This has inevitably consequences on the quality of information gathered during the observation (Arborio et al., 2010).

One of the main tactics I used during the participant observation was the "outsider" period negotiated with the case study company. Indeed the research was conducted in two separated full time periods, with in between an extensive period outside of the field. This period allowed for reflexion on the data collected and first encounters with theoretical frameworks. A second tactic was used to avoid being affected by the field, which was to discuss the field several times per week with other researchers, and to reflect upon the experience with another researcher who had previously conducted a similar mode of data collection.

5.3.2 Interviews

Interviews can be complementary methods of data gathering to participant observation (Jorgensen, 1989). There are particularly adapted for interpretive qualitative designs of research (Kaufmann & Singly, 2007). Interviews allow highlighting processes and "how" questions, and they reveal the logic of an action, and its operating principles (Blanchet et al., 2007).

The principal characteristic of an interview is that it constitutes a "speech event" (Blanchet et al., 2007), aimed at producing discourse. It is also defined as an activity of research, conducted at the initiative of the researcher, to the difference of a normal conversation between two people.

Interviews can be exploratory or semi-directive, but the conduct of the interview is variable, as a social relationship, and the interaction between the interviewer and the interviewee will shape the progress of the interview (Blanchet et al., 2007).

Exploratory interviews and contextual interviews

In my research strategy, I also focused on building knowledge of the contemporary organization-societal context, by conducting interviews with organizational members and external constituents, as I acknowledge social construction of reality is a long-term and gradual process (Covaleski & Dirsmith, 1990). Fourteen exploratory interviews were conducted. Exploratory interviews are meant to explore hypothesis when they are not yet well defined. They also allow for reception of the unexpected (Blanchet et al., 2007).

For the case study, exploratory interviews (See appendix 6.8) were conducted with the nature team members, with former environmental directors and external people related to carbon accounting standards.

Interviews at the case company

Thirty-seven interviews were conducted at the case company (See appendix 6.9). The population targeted for the interviews was threefold: carbon masters, country business unit managers and headquarter level management.

Although I accessed carbon accounting practices and carbon strategy through interaction with carbon masters in diverse projects related to the accounting methodologies, I felt that I needed to complemented this knowledge with semi-structured interviews that would allow to access for the diversity of interaction with the topic of carbon around the world and to understand the development of practice over time. Indeed, each Country Business Unit (CBU) is largely independent and adapted its carbon accounting to their local context. Being able to interview managers and carbon masters from different regions and countries allowed to gain a rich understanding of carbon accounting in the case study company, in addition to the daily interactions with

carbon masters on the projects that I conducted during the participant observation period.

Interviewees	Duration	Number of interviews
Headquarter	232 minutes	4
Headquarter Dairy division	185 minutes	4
Headquarter Water division	259 minutes	5
Dairy carbon master	415 minutes	8
Water carbon master	162 minutes	4
Water country business unit general manager	94 minutes	3
Dairy managers (CBU)	133 minutes	4
Water managers (CBU)	173 minutes	4
Consultancy	120 minutes	1

Table 0.4.3: Population for interviews

Access for country business unit carbon masters and managers was gained through the interface of both environmental managers, by sending an email explaining the research, my position and the aim of the interviews. They were conducted from February to July 2012. Access to interviews at headquarter level was made through the nature CFO and the nature manager (for the COO and the CFO).

One interviewee requested the questions ahead of the interview, and gave written responses in complement to the interview. All interviews were tape-recorded, however with varying quality due to the fact that many interviews were administrated by phone in countries with difficult connection (Indonesia, Mexico).

A set of questions was predefined on the topics of accounting and strategy (See appendices 6.19, 6.20 and 6.21), however, depending on how the interview was carried out, and if "unexpected" responses or topics arose, more questions were asked. This happen for example, when I interviewed one carbon master and found out that he had had a particular role in the inception of the accounting tool and methodology in 2006 and 2007. The interviews were started by asking general questions on the interviewee (who they were, their job and history in the company), allowing for a relationship to build between the interviewee and the interviewer.

All interviews were transcribed to allow for analysis and coding taking place. Moreover, notes were taken thoroughly for all interviews, complementing the transcription in some cases where the recording was not easy.

Limits of interviews

Interviews are a situation of exchange, and no simply an objective and passive recording of facts (Kaufmann & Singly, 2007). There are influence games that are taking place during the interviews. Moreover, different influences can be exerted by the place where the interview is taking place (whether the interviewee feels at ease or not), the time of the interview. Contamination can occur on the discourse of the interviewee, for example if the interview takes place after a difficult meeting, at a time when the interviewee could be stressed or relatively "absent" from the interview (Blanchet et al., 2007).

5.3.3 Secondary data

To gain knowledge of the history of the case organization, and to acknowledge the long-term construction of social reality, I finally collected archival material concerning the organization (appendices 6.12 and 6.13) and its external constituents (Covaleski & Dirsmith, 1990).

My role as a participant observer allowed me to collect a wealth of secondary data internal to the company. This secondary data was composed of:

- Powerpoints of meetings (On strategy, accounting developments, team meetings)
- Minutes of meetings
- Emails exchanges
- Presentations and data from country business units carbon reduction strategies and actions
- Methodologies
- Documents from consultancies
- Accounting tools
- Detailed documentation on excel of accounting activities, "auditing" activities related to carbon accounting

Moreover, I collected more general internal information related to the nature strategy in the form of responses to external ratings (DJSI, CDP, Vigéo) and externally available information such as investor relation presentation and press articles from 2001 to 2013 on the group's sustainability strategy.

5.4 Analysis (meetings and interviews)

5.4.1 Meeting the data

The interviews and meeting transcribed were first read a first time as "skim reading". Than, they were re-read and notes were taken. Finally, I made comparisons between similar situations found in different interviews and meeting transcripts. First ideas emerged from the reading and annoting of data manually. For example, the idea of credibility, preciseness and external legitimacy emerged from the first readings, as well as the notes made on the strategic role of the carbon master as "evangelizer" and "orchestra conductor". In a second step, I went back to reading literature on the topic of both legitimacy and the link between accounting and strategy, as well a practice emergence.

5.4.2 Coding the data

Coding is the process of analysis that allows organizing the phenomena under study and facilitates interpretation (Miles & Huberman, 2003). Coding can be inductive, when the codes are generated from the data or deductive, from a pre-established theme list. This research is abductive, therefore the coding was first inductive from the data gathered (emergent codes), and then theoretically informed, as well as further refined.

I coded the data for each of the two papers between July 2012 and May 2013. First codes were generated and linked to original data using the software Dedoose (Description of the software in section 4.6.2). New categories were generated in an ongoing process. Lastly, after all material was coded, I conducted a second review and coded "on" from initial codes, as well as merged certain categories together for further clarification of the analysis (Richards, 2005). I used both topic coding such as "green capex" and analytical coding such as "negative statements" or "misunderstanding between LCA and GHG protocol". Codes were hierarchical as can been seen in appendices 6.15 and 6.16.

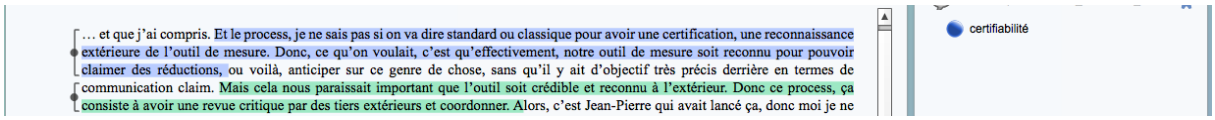


Figure 0.4.1: Visualization of one excerpt coded

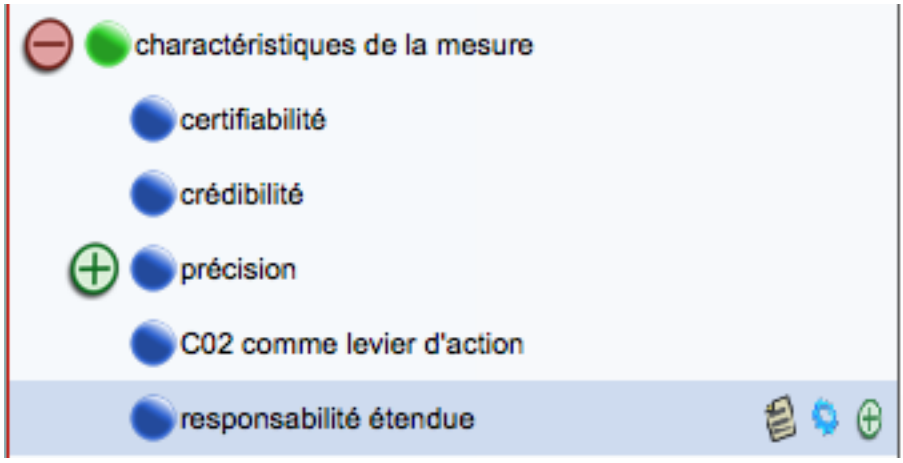


Figure 0.4.2: Excerpt of coding hierarchy for article two

5.4.3 Interpreting the data

According to Miles and Huberman (2003), there are four different groups of tactics to interpret the data. The first one consists in "looking at what is going on". In this first phase, the researcher looked for patterns around themes and proceeded in grouping data around codes that were hierarchically arranged. The second and third phase of interpretation consists in improving her understanding of the data set by contrasting for example the statements on the outsider tool and the ideals behind the construction of the insider tool, or making connections between strategizing events (on productivity) and accounting events (translation of productivity in CO2, simulation of future productivity projects), connections between local actions (acting with suppliers to get more accurate emission factors) and headquarter work (trying to get more accurate emission factors from industrial lobbies such as the one on plastic for Europe). The last phase described by Miles and Huberman (2003) is to gain a global coherent and comprehensive interpretation of the data set, constructing a logical chain of indices and gaining a global theoretical coherence. For article two, the coherence of indices was gained through going back and force between the data and theory around legitimacy, internal and external. According to Miles and Huberman (2003), the relationships built within the set of data must have meaning and must be complete. For article three, the data set represents the complete implementation from the "idea" of carbon accounting to the transition to a more global environmental accounting, which is the next step that the company proposes at the end of the case study. Therefore, the dataset is complete when it comes to study implementation of a new practice. Moreover, the completeness

of the interpretation is achieved by building relationships and connections between the tool and the accountant, strategy and accounting, the headquarters and local teams, as well as between the surroundings and the accounting (productivity, other teams, suppliers…).

5.5 Research validity

Qualitative researchers interpret data based on the totality of their own experiences, training, social position, etc., and there is a general acceptance of the non-objectivity of these methods (Bluhm et al., 2011). Moreover, participant observation is said to have strong internal validity, in the sense that researchers have time to "learn the language" of participants, and because it is conducted in natural settings, it reflects the reality of informant life experiences (Schensul et al., 1999).

Long-term participant observation provides a more complete data set about specific situations and events than any other method (Becker & Geer, 1957). It provides not only more, but different kinds of data, as well as repeated observations, therefore making the data set less dependent on inference, wrong associations and premature theories (Becker & Geer, 1957).

However, threats to internal validity exist. First of all, scenes (organizations) are not stable over time, people move, and change jobs, leave the scene during the duration of the study (Schensul et al., 1999). For example, between the first and the second period of participant observation, I lost access to part of my field. I had wanted to become a participant observer not only at headquarters but also in one country business unit geographically close by where I would have been able to observe during a few months the carbon master work "in action". However, the carbon master of that unit left the company when I contacted her to start conducting observation.

Secondly, researcher can be exposed to the "observer effects", where participants tend to act differently when they are observed, and could be tempted to give false or misleading information in the researcher's presence (Schensul et al., 1999). To reduce this effect, the degree of trust and comfort that informants feel will influence the "normal flow" of behaviour during observation. In my case, my integration as a "carbon accountant" at headquarter, with an active role in carbon accounting, allowed me to get into a trusting relationship with people not only in the nature team, but also with carbon masters I interacted with weekly for accounting projects.

Thirdly, some components of the population or setting can be omitted from the study (Schensul et al., 1999). This is called the "selection or regression" effect. This could affect internal validity by distorting research results in favour of the group that is represented. The case company is composed of four divisions, two of which represent the major component in terms of number of employees, and contribution to turnover. Those two divisions are the most represented in my study, although I have included a third division by attending a one-day workshop in one of their business units. I also interacted repeatedly with the carbon master of that unit during the course of the 12 months. Tentative to access carbon masters and managers in the two remaining divisions were made several times for specific interviews, but to no avail. Only a very short interview (not represented here) was conducted with a division marketing manager in 2012, which last only 15 minutes due to lack of information related to carbon in that division from the informant.

External validity can be threatened by the creation of a researcher-informant relationship that would seriously affect the setting or results (Schensul et al., 1999). The research was conducted under a CIFRE contract that presupposes a working relationship between the researcher and the company. This entails that the researcher develops close and trusting relationships with the informants within the company. Several tactics were used, so that the relationship developed during the CIFRE contract would not impair the results of researcher. The first one was to leave the field for a long period of several months in a row, which allowed for first analysis of data, "stepping back", drawing first conclusions and preparing for the second phase of participant observation. The second was to leave the field definitively one year before presupposed defence of the research. I left my participant observation status on July 27th 2012, which has allowed for the analysis and final "stepping back" to occur in the last year. I also kept detailed record of the informants and the observation events (meetings, workshops). Finally, I conducted numerous conversations related to the field with colleagues throughout the period, to allow keeping a distance between the position of participant observer and the researcher.

Respondent validation is "the single most important way of ruling out the possibility of misinterpreting the meaning of what participants say and do and the perspective they have on what is going on, as well as an important way of identifying the researcher's biases and misunderstandings" (Maxwell, 2008). The research was presented to the

company during a two-hour meeting in July 2012 where the main findings for the two papers were presented. People from the nature team, carbon masters and from worldwide business units were present and interacted with the researcher on the research and the interpretations that had been ensued from it.

5.6 Research ethics

In research, the responsibility of the researcher is to care for the physical, social and psychological welfare of those participating in the studies, and honour their dignity and privacy (Principles of professional responsibility, 1971, cited by Spradley 1980). Spradley (1980) goes further to say that the researcher has "a positive responsibility to safeguard their rights, their interests, and even their sensitivities".

As participant observation represents a powerful tool for invading other people's way of life, and as it can be used to affirm their rights, interests and sensitivities, but also violate them (Spradley, 1980), it is important to take the necessary steps to safeguard the informants' position.

In the case study company, several steps were taken to safeguard informants' rights and interests. First the interviewees were guaranteed that the quotes taken from the interviews would be rendered anonymous. For this to take place, "our country", "the country", replaced the name of countries presented in the interviews. Moreover, the interviewees were only identified by their function (carbon master).

The complete version of the two papers related to the case company were sent on numerous occasions for proof-reading to the nature CFO of the company, and delicate points were discussed openly, such as the use of specific numbers or quotes.

Finally, the thesis was presented in July 2012 to a group of people from the nature team, people from worldwide divisions and one carbon master from a country business unit, to safeguard the sensitivities of the informants from the participant observation on the research conducted.

6 Conclusion of chapter four

I have presented in this chapter the research design. The epistemological position that underlies the research conducted in this dissertation is linked to the researcher's view that reality is a social construction and that humans create their own realities. This assumption thus rejects that there is one singular objective, observable and knowable

world. Therefore, this dissertation is interpretive as the researcher believes that studies should be "fat with the juice of human endeavour, human decision making, zaftig with human contradiction, human emotion, human frailty" (Lincoln, 2010). This dissertation is based on two qualitative case studies, one on life cycle assessment spanning twenty years, and the other in a French multinational spanning five years. It uses three main data gathering methods: participant observation, interviews and secondary data.

The methods used are appropriate to analyze a new and relatively unexplored phenomenon, environmental management accounting, since qualitative research is suitable for exploration. Moreover, rich, detailed case studies allow giving a full account of innovation processes that are multi-level, longitudinal, implicating numerous actors and artifacts, as well as institutions over time, in their cultural setting (Garud et al., 2013).

Summary of chapter four

"Good" science enriches the ingredients that make the multi-faceted universe in which we live, make us more articulate; "good" science is generative, increasing our capacity to make connections among phenomena (Nicolini, 2012). In the six assumptions characterizing the subjective-objective debate described by Morgan and Smircich (1980), the researcher sees reality a social construction and humans as creating their own realities. This assumption thus rejects that there is one singular objective, observable and knowable world (Modell, 2009b). Consistent with these assumptions, this research is based on the interpretive paradigm (Burrell & Morgan, 1979), which is based on the view that people socially and symbolically construct their own realities (Gioia & Pitre, 1990). This research uses a qualitative approach, which is directed at describing, translating, analysing, and inferring the meanings of events or phenomena occurring in the social world (Covaleski & Dirsmith, 1990).

The nature of research questions (how), the object of research (innovations) and the theoretical lenses (institutional and practice) all point to using contextualized, multi-level and longitudinal field studies to research EMA as innovations. The main data collection methods used were participant observation (article 2 and 3) and interviews (article 1). Coding and analysis were made in an abductive manner using a code and retrieve software. Validity was ensured through using complementary methods

(interviews, observation, secondary data) and validation of interpretation by members of the organization (article 2 and 3) and one "insider" of the LCA history (article 1).

Table 0.4.5: Synthesis of the empirical approach

Elements of research	**Modalities**	
Nature of data	Qualitative data	
Paradigm	Interpretive	
Research approach	Abductive	
Research design	Single case study	Genealogy
Data collection methods	Participant observation Interviews Secondary data	Exploratory interviews Second phase interviews Secondary data
Data analysis	Transcription of interviews and some meetings Coding of interviews and some recorded meetings with a software (Dedoose)	Transcription of interviews Coding of both secondary data and interviews with a software (Dedoose)
Validity of research	Triangulation of interview data with participant observation notes and secondary data Feedback meeting organized at the case study company in July 2012 Proof-reading of papers by the manager of the case company (CIFRE) Discussion of the paper with colleagues	Triangulation of interview data with secondary data (press, archives and books) Proof reading of the paper by a person close to the tool but external to the research Discussion of the paper with colleagues
Ethics of research	Anonymization of all interviewees (non-headquarters) Informed consent of recording	Anonymization of all interviewees and data Informed consent of recording Proof reading of quotes by four interviewees at their request Proof reading of the paper to test for anonymization
Choice of case study	Implementation of an environmental management accounting tool "Hybrid" company with a strong history in CSR	Possibility of doing a genealogy over 20 years Tool created in the French context
Exploratory interviews	14	13
Interviews	37 (1773 minutes)	20 (1006 minutes)
Participant observation	12 months full time	Seminar AFITE
Meetings	149 attended	--
Secondary data	Emails, powerpoints, access to the accounting tools	Books, press, archives

Chapter 5: Case Study Company Presentation

1 Introduction

To study the phases of adoption and implementation of an EMA innovation in the institutionalization process, a single case study in a multinational company has been conducted. Global MNEs represent today an immense part of the global economy:

> *"The largest in 2009, WalMart Stores, had revenues exceeding the respective GDPs of 174 countries including Sweden, Saudi Arabia and Venezuela and employed over 2 million people, more than the entire population of Qatar. If it were a country, it would be the 22nd largest in the world. Shell has bigger revenues than the combined GDPs of Pakistan and Bangladesh, the sixth and seventh most populous nations in the world, together home to 350 million people. Sinopec, China's leading energy and chemical company, is bigger than Singapore. The insurer AXA is bigger than Nigeria. Even with the troubles of the automotive industry, Ford is bigger than New Zealand" (Keys & Malnight, 2010)*

and are accused of being responsible of much of environmental damage, together with their accounting (Gray & Bebbington, 1998).

To the contrary, others say that:

> *"Business is the only mechanism on the planet today powerful enough to produce the changes necessary to reverse global environmental and social degradation" (Hawken, 1993).*

MNEs therefore pledge to not be only accused of, but also pledge to be motor in the remediation to environmental damage (Gunningham, 2009). Consequently I wish to concentrate on one MNE to seek to understand its involvement in the environmental debate around sustainability (Gray & Bebbington, 1998) and to contribute to the understanding of this paradox.

The case study company is a medium size multinational in the food sector that is leader in its segments but does not represent a mastodon of the food industry worldwide. This company is a typical example of hybridity, a transitional form of organization that is an example of blending, where "the possibility of new alternative accounts of management accounting practice (…) are no longer bounded by organizations and society, but accommodate their fusion and permeability" (Baxter & Chua, 2003). It represents a transitional organization form that is an example of private organization "grappling with their increasing community and environmental responsibilities" (Baxter & Chua, 2003).

7 The dual economic and social project

Following the 1968 events, the president of the company addressed a letter to the managers stating the starting point of a human and social politic for the company. This letter forged the cornerstone of the future "dual project", pointing to the inseparable human and economic objectives of the company (Labasse, 2007). The president explained that to forge this dual project, he acted with his guts, with his heart, and that he was always interested in social issues, as being an integral part of a company's life (Former president of the company, 1999).

In 1972 in Marseille, the CEO made an address to the employers' convention. This address was the external formalization of the dual project following the internal letter of 1968 and is widely considered as the beginning of the CSR strategy of the company. The CEO mentioned key social subjects such as social justice "this growth is not bringing social justice", social performance indicators "we must set to ourselves human and social targets", and the need for social reporting ''at company level, I think we should create a panel of experts of the highest level who would be responsible for signing an annual social report for all staff". It became the "bible" of human and social relations in the company (Labasse, 2007).

In 1974, the dual project materialized into five recommendations on preliminary objectives:

- Improve procedures in the event of unemployment problem
- Addressing inequalities of status and salaries
- Improve the working life at the same time as economic efficiency
- Manage human resources in order to match the needs of the group with the aspirations of people
- Develop consultation with staff and their representatives

In 1978, the dual project was reasserted:

> *"The development of the dual project of economic efficiency and personal fulfilment of employees thus remains the general framework of policy guidance of the group" (Labasse, 2007)*

and the recommendations were refined and became the five human and social policy axes:

- Attune staff levels to needs, reduce job insecurity and minimize the negative consequences of layoffs
- Develop wage and compensation policies that provide incentives consistent with the situation and environment of the business unit
- Develop the potential and contribution of executives, supervisors and all staff members in accordance with their aspirations and the needs of the business
- Simultaneously improve working conditions and business efficiency with the support of employees
- Extend and improve communications with employees and their representatives

The dual project was clearly not against growth and the president said in a Le Monde article in 1975 (Labasse, 2007):

> *"Economic growth, a factor of reduction of poverty and under-development, is a vital necessity, an ardent duty, a topic that needs to continue to make the young generation dream without a guilty conscience", but "growth need not be accompanied by disturbances such as inflation, poor working conditions and pollution"*

In a report to French Prime Minister Jacque Chirac in 1987, the CEO of the company reiterated:

> *"You cannot make a success of technological change, or for that matter, of any economic undertaking, if you are not successful with people".*

In the annual report of 1997 the pre-eminence of social objectives were reinforced: "commitment to responsibilities extending beyond financial results is a core value for (the company). Responsibilities to employees top the list". In 2000, the "Year 2000 dual project" document reiterated the importance of employee participation: "Experience shows that lasting progress hinges on the integration of employee participation and expression in the continuing operation of workshops and offices and on the rapidity of results"[32], the commitment to profit-sharing, constructive dialog with employee representatives and training as an investment.

The dual project is regularly reinforced, such as in 2012 at the fortieth anniversary of the Marseille address. Two recent milestones in the social strategy are the creation of a minimum health insurance for all employees worldwide and the signature of nine agreements in 2012 with the International Union of Food.

[32] Company document on dual commitment

Other major social landmarks in the history of the company are stated in table 0.5.1. The CSR management program will be developed in section 3.

1968	Letter to employees about the human and social politic of the company
1972	President's Marseille declaration
1974	Formalisation of the economic and social dual project through five recommendations
1978	The recommendations become the five political axes of the dual project of the company
1986	Year 2000 dual project (Le double projet de l'an 2000)
1998	Publication of the first social 173responsibility and environmental annual report
2001	Company Way/ update 2007
2003	Membership into Global Compact, membership reaffirmed in 2009
2007	Creation of the Social Responsibility Committee of the Board of Directors
2011	Minimum health insurance for all employees
2012	Signature of nine agreements with the International Union of Food

Table 0.5.1: Social strategy history of the company

2 Burgeoning environmental policies

The environmental aspect of sustainable development was already present in the October 25th 1972 Marseille speech: "corporate responsibility does not end at the factory gate (…). The energy and raw material we consume change the face of our planet. Public opinion is there to remind us of our responsibility" (…) "the energy resources of Earth are limited". However, the social side of corporate social responsibility was prioritized in the dual project (Section one).

Nonetheless, the president conducted two emblematic projects around the responsibility of industrials related to the environment. The first was led through an association starting 1971, the other through a second network of industrials in 1992, both linked to the responsibility of producers related to waste.

The Association "Progrès et Environnement" was created in January 1971. The association had for goal to study all clean methodologies to ensure environmental protection against the growing mass of waste. Article two of the association specified that the aim be to "group industrials interested in packaging to the aim of, in a joint effort, find solutions to the problems caused by its elimination and the reemployment of its ingredients". The association led the operation "Vacances Propres" (Green/Clean Holidays) starting in July 1971. Eighteen sites were concerned by this initiative in 1971,

and 1300 today (Labasse, 2007). Following this initiative, Dominique Reiniche, at the time president of Coca-Cola Europe, named the president of the company "a pioneer of sustainable development".

The president of the company was commissioned to write a report named "waste and the environment" for the French Environmental Ministry in 1991, offering a financial contribution of industrials to finance the collection and sorting of waste. It led to the July 13th 1992 law on waste disposal and recovery of materials (Labasse, 2007). In 1992, the company was at the origin of the organization "eco-emballages" in France, which operates selective waste sorting in collaboration with local authorities. This organization is a response to the principle "extended producer responsibility" initiated by OECD in 1992.

Other major environmental landmarks in the history of the company are stated in the table below. The key environmental performance indicators are developed in section 4.

1971	Initiated Vacances Propres (Green/Clean holidays) to fight against litter and educate consumers on the topic
1990s	Company recognizes protection of resources as a "strategic priority"
1991	Creation of the corporate Environment Department, with around 20 correspondents around the world to ensure follow up of corporate recommendations
1992	Creation of the 1st network for collection and recycling of packaging, Eco-Packaging
1995	Launch of the "Green plants Programme", environmental standards for production (Usines Sobres)
1996	Adoption of an Environmental Charter
1999	First ISO 14001 site certifications (16 sites). In 2009, 51% of all sites were certified
1999	Integrated of the approach of FARRE (Forum de l'Agriculture Raisonnée Respectueuse de l'Environnement / French Forum for Environmentally Friendly Integrated Farming), and contribution to the establishment of environmental standards and their deployment
2000	Set targets for limiting water and energy consumption and reducing water and packaging
2002	Co-creation of the SAI platform (Sustainable Agriculture Initiative)
2002	Creation of the Company Fund for Water
2005	Global policy on the protection of underground water resources
2006	Deployment of the GREEN project (Global Risk Evaluation for Environment)
2009	Main French water catchment system site recognized a Ramsar site

Table 0.5.2: Environmental strategy history

3 Managing sustainable development

In 2001, "Company Way" was launched with the goal to help the diffusion of the "company model" and the best practices. The rational was to help what used to diffuse naturally and that was now more difficult to infuse, with the global dimension of the group[33]. It is based on the dual economic and social project of the group and includes all CSR topics. It was created at a time when social ratings and environmental reporting started to emerge, with the Dow Jones Sustainability Index and the beginning of the Global Reporting Initiative. The second goal of the CSR management program was to support global reporting on CSR topics, with a web-based tool. The third goal is to mobilize employees around the continuous improvement of the three performances: economic, environmental and social (Sautereau-Moquet, 2008).

The Company Way evaluation process concerns the company's main responsibilities at different stages of operational activity, from the purchase of raw materials to the recycling of finished product packaging. Each Country Business Unit (CBU) does an annual self-assessment of sustainable development performance graded against 16 fundamental principles. They report on their established management practices that have been formalized and documented and on their measurement of their performance (indicators proving concrete results). Each CBU obtains a score out of 1000, which determines a number of stars, reflecting the level of progress of their sustainable development performance. The results are integrated in the bonus determination process for General Managers and members of their respective Executive Committees for all CBU if the final score is strictly less than three stars.

The results are audited both by internal auditors and by external auditors. 89% of the company (based on turnover) is covered by the Company Way evaluation system.

[33] Sustainability Report, 2000

Prerequisites	No Child Labour
	No Forced Labour
Human Rights	Equal opportunities & diversity
	Safety at work
	Health at work
Human Relations	Social Dialogue
	Working hours
	Wage Policy
	Development & Training
Environment	Management of environmental footprint
	Control of Environmental risks
	Raw materials management
	Reduction in packaging
Consumers	Quality management
	Standards on nutrition & Health
Governance	Policy for conducting business
	Corporate social responsibility applied to suppliers
	Relationship with local communities

Table 0.5.3: The 16 Company Way fundamentals

4 Key environmental performance indicators: 2000-2010

The case study company as long stated "the environmental impact of the (…) group's business is by nature limited"[34] and that "the food industry has less environmental impact than many others"[35]. However in 2000, it acknowledged, "the (…) group has a specific role to play in regards to nature protection". Objectives were set to limit water and energy consumption and reduce waste and packaging. The objectives were achieved earlier than planned and a new strategy was defined starting 2008 (See section 6).

	Objectives 2000/10	**Performance 2009**
Water (l/kg product)	-30%	-35%
Total energy (kWh/t)	-20%	-45%
Packaging (Pack ratio) (2008)	-10%	-5%
Waste Recovery (%)	80%	86%

Table 0.5.4: Results of the 2000 environmental targets[36]

5 Integrated CSR strategy 2008-2012

The move beyond social, to a more integrated "societal" approach of CSR happened with the new mission statement in 2006: "Although the progression from social to societal

[34] Annual Report 2001, page 22
[35] Sustainability Report 2002, page 9
[36] Sustainability Report 2009, page 96

developed gradually, 2006 marked a milestone with the advent of the [company] mission"[37]. A new strategy based on four core strategic priorities (Health, For All, Nature, and People) was announced in 2008, closely aligned with the company's 2006 mission: "bring health through food to as many people as possible".

The president defined the four priorities as follow: "'Health' that is to say, the company's contribution to public health through nutrition, 'For All', that is to say, the creation of products and economic models accessible to population groups with low purchasing power, 'Nature' to drastically reduce the environmental impact of our activities throughout the lifecycle of our products, 'People' by giving all of our employees the opportunity to develop, to anticipate the changes and to give meaning to their work". He added in the 2009 Sustainability Report, that each of these core priorities must act like a "transformer", a way to rethink the company's methods and invent "new business and social responses".

To coordinate this strategy and the new directions created in 2009, which included the creation of a "nature" department in place of the former environment department.

Three funds were created additionally. The Nature fund in 2008, later renamed "livelihoods", deals with carbon credit projects, mainly linked to agriculture and forestry, and connected to social actions. This fund is now outside of the realm of the company and has incorporated other business partners. The communities fund, started in 2006 with the social business in Bangladesh, has for aim to finance the creation of more social businesses. The ecosystem fund contributes to support local actors who contribute to the activities of the company, such as small producers of milk or fruits, or distributors around the plants. The ecosystem fund has 100 million Euros to build projects and 40 are currently active in the socioeconomic surroundings of the company's plants.

2006	Creation of the Company Communities fund
2008	Creation of the Company Nature Fund with the International Union for the Conservation of Nature (Livelihoods)
2009	Creation of the Company Ecosystem fund

Table 0.5.5: Integrated CSR strategy programmes

[37] Sustainability Report 2009, page 10

6 The environmental strategy after 2008

The environmental topic became a strategic priority after 2008: "Our perennial alignment with nature, radically reinforced since 2008"[38], acknowledging that the environmental component of the company's dual social and economic project had been dormant. The company acknowledged that after 10 years:

> *"We had environmental objectives and they were regularly reached, they were maintained a little on an ongoing basis, they were not at the heart of our priorities, they were there and we followed them regularly, but they were not at the heart of our priorities." (Interview 14)*

While a need for change in the way the environment was dealt with was acknowledged, the new strategy was not easily redefined:

> *"And I thought that beyond the commitments that the group had by the year 2010 and that were important, of reduction, of consumption, of a number of resources, I was looking for a way to articulate more strongly still our business approach and its relation to natural resources." (Interview 9)*

Looking at other "hybridized" companies was one source of inspiration. Consumers started to show an environmental awareness that the company could not ignore. The company was also orientating its strategy towards providing healthy food, and realized it could not talk about health, without talking about nature:

> *"In 2007 we needed to integrate the environment not say like an adjustment variable, a compliance variable, but as an activity that could be really beneficial for both driving performance internally and then also adding value to products, adding 'nature" value to products." (Interview 1)*

A new department was created in 2008 named the nature general management. Its role was to oversee "the environmental management strategy and programmes related to various partnerships and activities pertaining to the (…) fund for nature". The department reported to two sponsors who were members of the Executive Committee, one from the business side (the general manager of a worldwide division) and functionally to the group Chief Financial Officer[39]. In addition environment directors were deployed in each of the businesses and a nature finance team was created.

[38] Sustainability Report 2009, page 96
[39] Sustainability Report 2009, page 75

The nature manager defined in early 2010[40] her department's mission as being "the bridge between environmental experts and operations", a way to "translate" ideas into action.

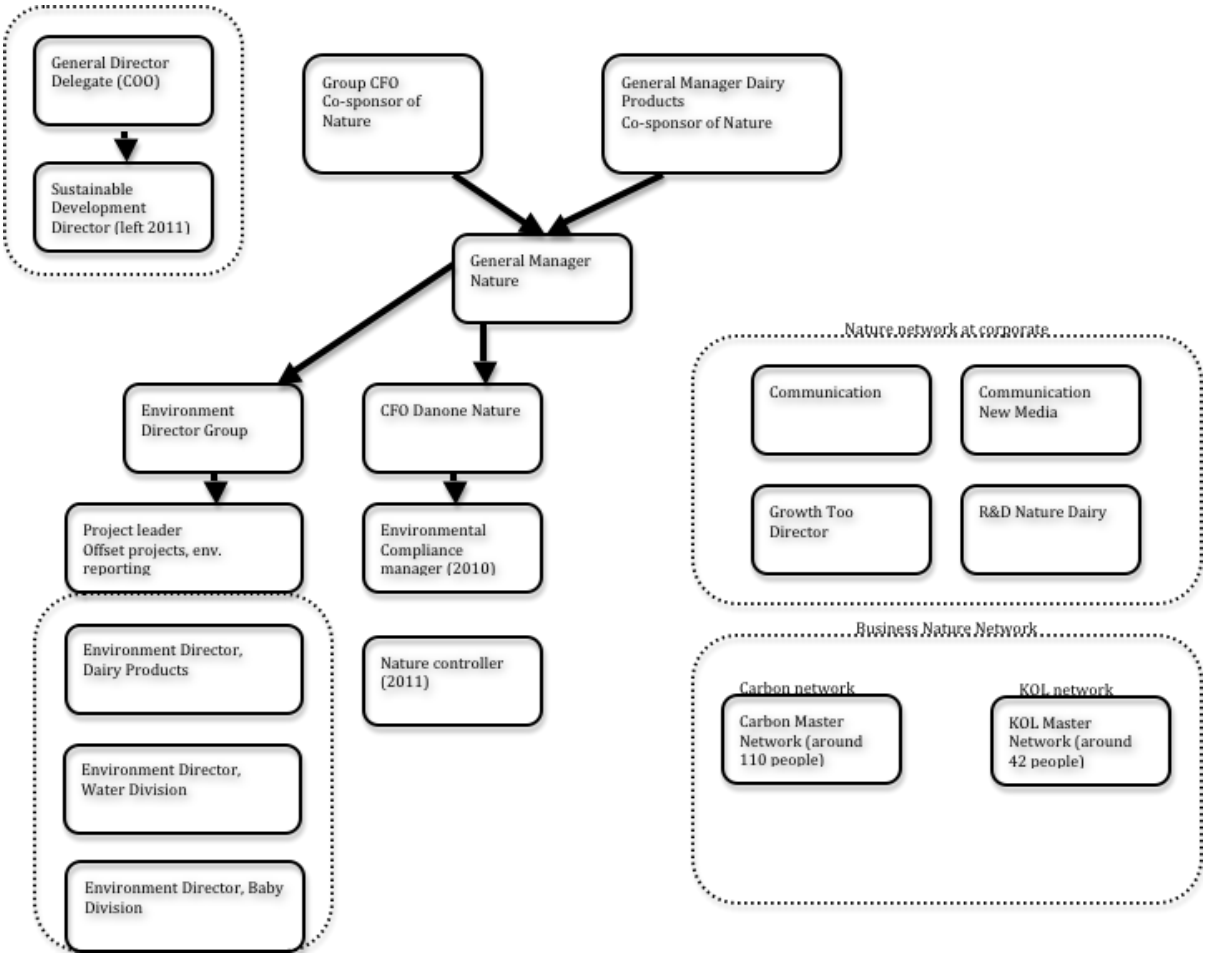


Figure 0.5.1 Nature team at corporate headquarters

In 2008, the new nature team announced its five new priorities for environmental action: "reducing the carbon footprint, protecting water resources, stepping up packaging research to transform waste into a resource, promoting sustainable agriculture, and supporting biodiversity".

7 Carbon accounting

Within the five priorities defined by the nature manager, I will focus on the reduction of the carbon footprint. Carbon accounting as an EMA innovation is the focus of article 2 and 3 of this dissertation, in the adoption and implementation phases.

[40] Zeroing in on Carbon

7.1 Carbon accounting methodologies

7.1.1 The company's carbon accounting methodology

The company's carbon accounting methodology is primarily based on the LCA methodology (ISO 14044) and on PAS 2050 (2008). According to the "carbon accounting methodology guide" from 2010, a successful carbon accounting system should have the following characteristics:

- Comprehensive (scope 1, 2 and 3)
- Periodic: enables updates at regular intervals and comparison across reporting periods
- Auditable: trace transactions and enables independent reviews for compliance
- Flexible: incorporates data from multiple approaches to life cycle assessment
- Standard-based: accommodates existing generally accepted standards and emerging standards
- Scalable: accommodates growing volume and complexity of business operations
- Efficient: delivers data in the timeframe required for decision making

The goals of the approach according to the internal "carbon accounting methodology guide" are:

- To be able to compare main products of their portfolio based on carbon footprint
- To help identify action plans allowing the reduction of carbon footprint
- To product with an eco-design approach
- To communicate on product carbon footprints when possible

The carbon masters fill in data for at least ten product footprints, sometimes more depending on the representativeness of the products in terms of turnover in their country. Individual footprints of products are defined in internal guidelines as: "the total emission of greenhouse gases (GHG) linked to a product, across its life cycle, from the production of raw materials to its end of life". The carbon master fills in the following tables: product data (including ingredients, and packaging information) logistics data (where the distribution scenario for each country is modelled), manufacturing data, for dairy products fruit data, composite packaging data and warehouses data. Emission factors by country are defined at corporate level and given in the tool to the carbon masters, except when they are calculated based on country assumptions such as for chilled storage in stores or at home, and fruit emission factors.

The company then calculates the business footprint for each country but allocates the responsibility on a consumption basis and not on a production basis. For example, a product unit of a yogurt made in Belgium and sold in France has a footprint partially calculated in Belgium, and the rest of the footprint is complemented with carbon accounting data by the French carbon master for logistics, consumption and end of life based on the French market. The total carbon product footprint is then allocated to the French business unit as it has ordered the manufactured product (in Belgium) and as the product has been sold to the final customer in France. Footprints are calculated for the CBU based on different product category sales. Finally, the total group footprint is the addition of all CBU footprints. The result is both in millions tons of CO2 equivalent and in the efficiency target of grams of CO2 equivalent per kilogram of product sold (the accounting is based on turnover and not on production). In total more than 800 individual product footprints are used to come up with the total of the group's yearly results.

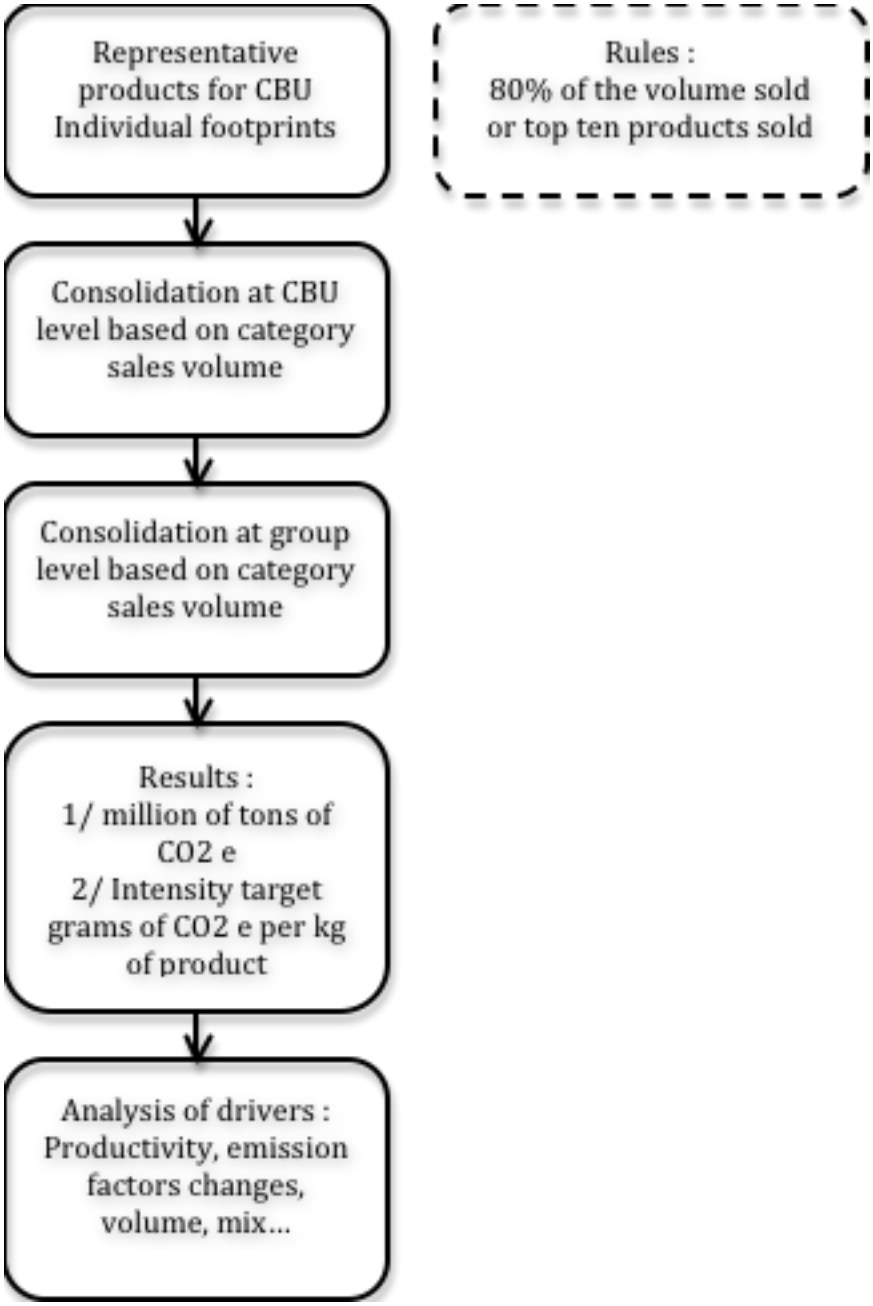


Figure 0.5.2: Company carbon accounting

7.1.2 The GHG Protocol Corporate Standard

Since 2012, the company also measures company-wide carbon emissions using the GHG Protocol Corporate Standard (2004) on all its sites (not limited to manufacturing sites). It was tested on four country business units in 2011, and extended to all business units in 2012. It is a comprehensive calculation of scope 1 and 2 carbon emissions of the company, once a year.

The results are used to respond to the carbon disclosure project questionnaire once a year, and to the French obligation to report GHG emissions on scope 1 and 2 since the end of 2012.

7.1.3 The convergence project

Based on the need to bring together different stakeholder views of carbon performance, The company decided in 2010 to launch the "convergence" project. The project's aim was to examine whether different accounting approaches could be linked with each other in a way that the resulting information corresponds with each other. These accounting approaches are, on the one hand, the company's internal accounting approach and on the other hand, the GHG Protocol Corporate Standard that is used to respond to investors' and external rating agencies' needs. The goal of the convergence project is to develop a comprehensive corporate carbon accounting approach, which arrives at consistent figures, no matter whether carbon is accounted with their own internal responsibility oriented performance accounting system or the externally driven accounting and reporting system complying with international standards is applied.

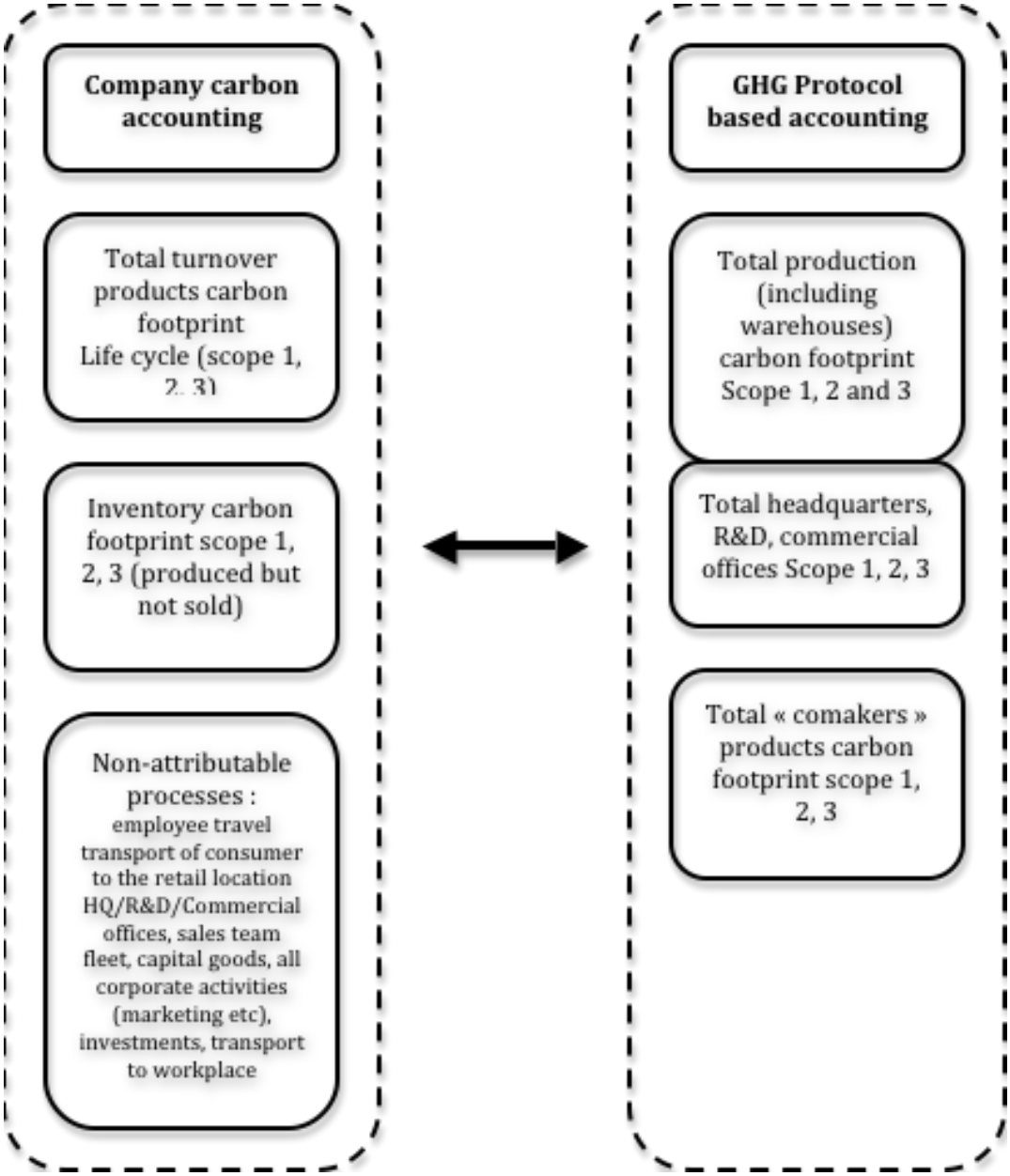


Figure 0.5.3: Convergence of methodologies

7.2 Carbon accounting tools

7.2.1 Excel based tool

The tool used since 2007 to collect data for individual product footprints is an excel tool which is used by "carbon masters" (the employees responsible for the data collection, see section 8.3) in each country business unit to calculate carbon footprints once a year. The tool provides tables with emission factors and calculation formulas so that the carbon masters only need to fill in activity data for the specific year and some that are

intermediate data for emission factors (ingredients, kilometres, energy consumption, etc.). The excel tool is composed of four different parts[41]:

- An interface where the user enters primary data describing the product and the main characteristics of its life cycle
- A database on GHG emissions factors (ingredients other than dairy ingredients and fruit preparation, packaging materials) as well as average destination of waste in a given country, allowing to calculate, based on the data entered by the user, the total carbon footprint of a given product. This global database is country specific, as far as country bases are existing, otherwise factors are common
- A calculation engine, based on excel formula allowing to calculate the results, based on the primary data entered by the user, the GHG coefficients and some formula used to model the life cycle steps included in the system
- An interface displaying the carbon footprint results of a product. Carbon footprints are presented with 2 units: per kg of product (e.g. g CO2e / kg of yoghurt) and per product unit (e.g. g CO2e per cup or per bottle)

Following the methodology of two-step consolidation, the first excel tool calculates individual product footprints, the second extrapolates to the volume of sales of the CBU, and the third tool consolidates at the company level.

The individual footprint excel tool exists in three different versions for the four divisions but have each the same framework with more or less complex functionalities (for packaging, fruit or milk for example). The tool was constructed from 2007 to 2009 by an external consultant, based on an initial design by the company Ecobilan in 2006. The tool was used to obtain certification of products in the United Kingdom by the Carbon Trust in 2008 and subsequently revised and updated. Additionally, it was submitted for analysis to an external auditor, the French environmental agency, and went through two peer reviews in 2009 and 2010. The tool is revised once a year for minor technical updates, and more major emission factors update.

[41] Source: internal methodological guide for the excel tool

Date	Event
2006	Interaction with Big 4 consultant, conceptualisation of excel tool « to be »
June 2007	Construction of first excel tool by external consultant
July 2007	Presentation of the excel tool to water division environmental managers
August/September 2007	Test of the tool for four countries
January 2008	Calculation of footprints for all water divisions for 2007
January to December 2008	Carbon Trust certification on UK products
January to June 2008	Workshops to adapt excel tool to dairy division
July 2008	Presentation of the excel tool to dairy division environmental managers
September 2008	Announcement of the -30% target
2009	Medical and Baby division: expansion of the tool

Table 0.5.6: Construction of the excel tool

The individual footprint excel tool is used for three different purposes: budgeting (once or twice a year depending on the division), reporting once a year, and simulating project impact on the footprint for planning purposes.

The consolidation tool at corporate level is used for reporting numbers annually in the sustainability report, calculating progress towards the -30% target of GHG emissions reduction between 2008 and 2012, and to animate and understand the progress through an analysis of the drivers of reduction.

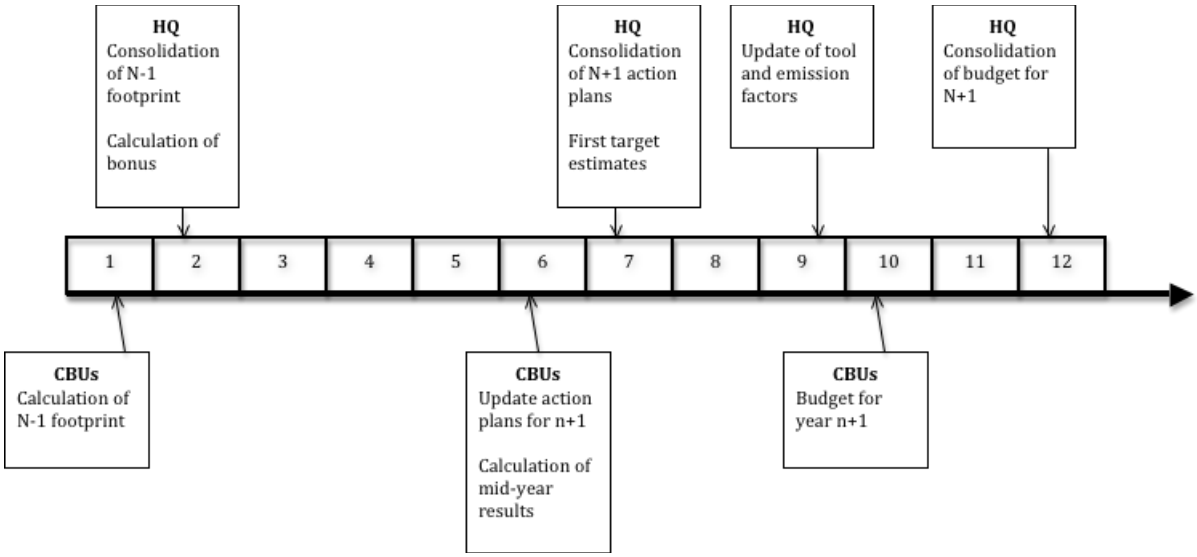


Figure 0.5.4: Yearly process of carbon accounting

7.2.2 ERP based tool

The ERP based tool mirrors the excel tool and is composed of different emission factor books (energy, ingredients, manufacturing and warehouse sites), a calculative tool, and a link to the finance ERP for activity data. Some more complex emission factors such as fruit, milk and logistic are still calculated in excel sheets outside of the ERP system and entered manually.

The ERP system allows live data to feed carbon accounting. Carbon accounts are closed monthly and allow carbon master to see their results on a monthly basis compared to yearly basis with excel. The other major difference with excel is that all products that are produced or distributed are taken into account, instead of the extrapolation that is the basis for the excel based tool. However, contrary to the excel tool that is used by all CBUs around the world, ERP Carbon is only available where the finance ERP is working.

The ERP Carbon was co-constructed (as a co-innovation project) with the global ERP supplier in 2009, tested in two CBUs in 2010 and has been rolled out in over 30 countries in 2011 and 2012. A business intelligence tool with reports has been deployed end of 2012, to allows for strategic analysis of data.

7.2.3 Other data collection systems and the convergence of systems

The GHG Protocol Corporate Standard is currently managed through an external web system, unconnected to the excel tool or the current ERP Carbon tool. The GHG Protocol calculation tool is however linked to the environmental KPI information system by a backload of energy and refrigerant data from the KPI information system into the GHG Protocol web system.

Additionally, the company has a legacy, but recently upgraded, system for collection of environmental key performance indicators, mainly related to regulatory demands. This tool is deployed in all business units and updated once a year. It collects energy, water, waste and other environmental performance indicators.

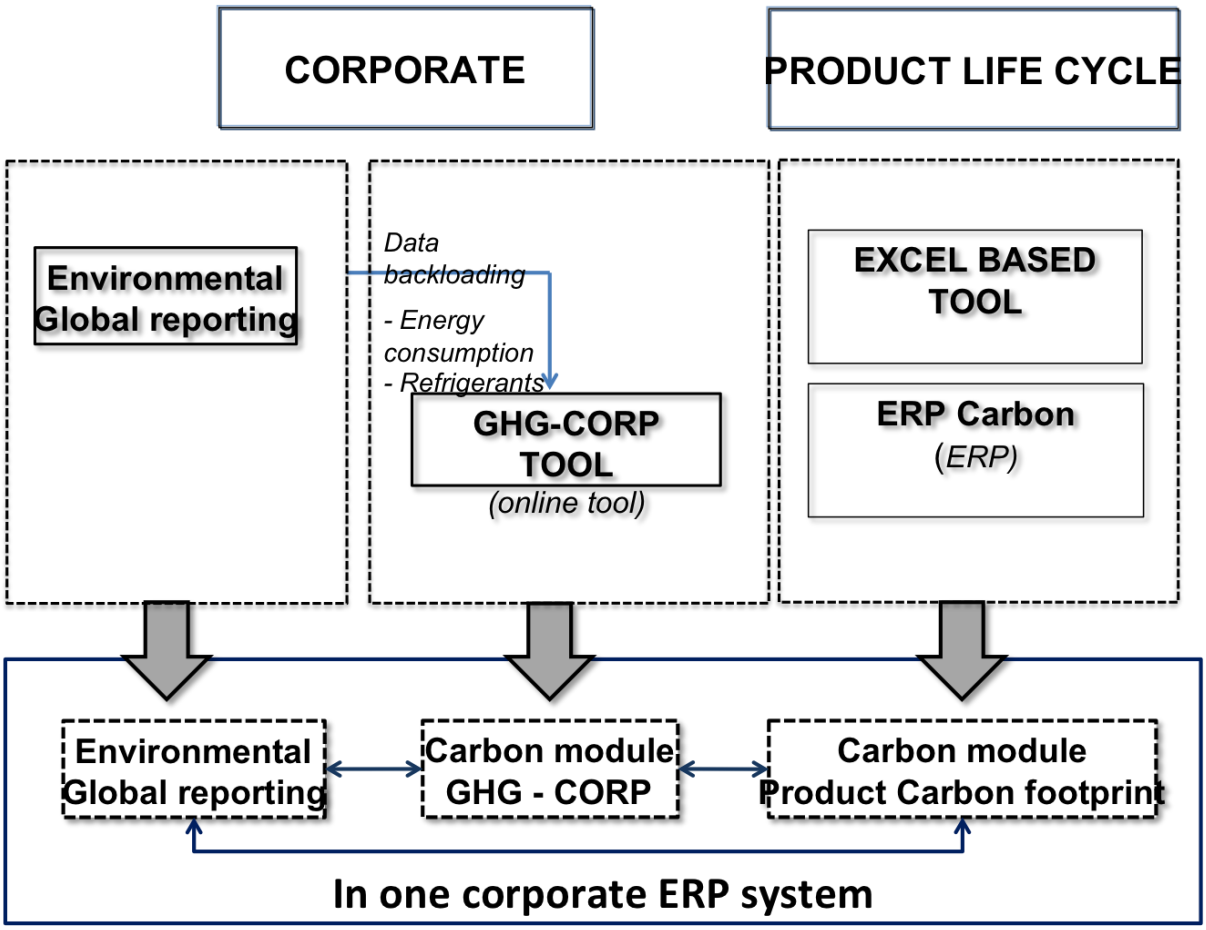


Figure 0.5.5: Convergence of tools

7.3 Carbon masters

The company created a community of 110 Carbon Masters ("facilitators and champions in each subsidiary of the Carbon Reduction Plan") in 2008. First named "carbon expert", carbon masters were appointed in each subsidiary, to be responsible for measuring CO2 emissions and to prepare a suitable action plan for their reduction. There were no guidelines given on how the "carbon master" should be chosen, and also no indication that a new function should be created. Most of the time, first carbon masters were actually quality managers, research and development managers, and supply chain managers or else, who added this topic to their job.

In 2012, most carbon masters have full time jobs related to the environment, and if not, have been able to create small teams, mostly comprised of younger employees that are responsible for carbon accounting, while carbon master retained strategy related work, simulations, and projects with other departments of the CBUs.

7.4 Carbon controlling (HQ)

Carbon controlling at headquarters was a team composed of three people, a nature CFO, and two "carbon controllers". The team was in charge of the quality of carbon accounting (both their own and GHG Protocol based accounting) and lead the process of automation through the project with the ERP global provider. Moreover, the team was responsible for answering to sustainability ratings including the CDP, doing the annual reporting on carbon, and doing strategic monitoring of the rapidly evolving carbon accounting field.

7.5 Carbon accounting's network of support

Carbon accounting was supported by a set of consultants. One consultant is a specialist of life cycle assessment and monitors all changes to the excel tool, as well as to emission factors. One consultant has built the consolidation system, and has been on hand as support for CBUs having technical issues with the tool. A global environmental consultancy has lent a web-based tool for the collection of GHG Protocol related data.
Carbon accounting was also supported through peer reviews by academics, a big four firm and the French environmental agency (ADEME) as well as a critical review by Carbon Trust when it certified specific products for the UK in 2008.

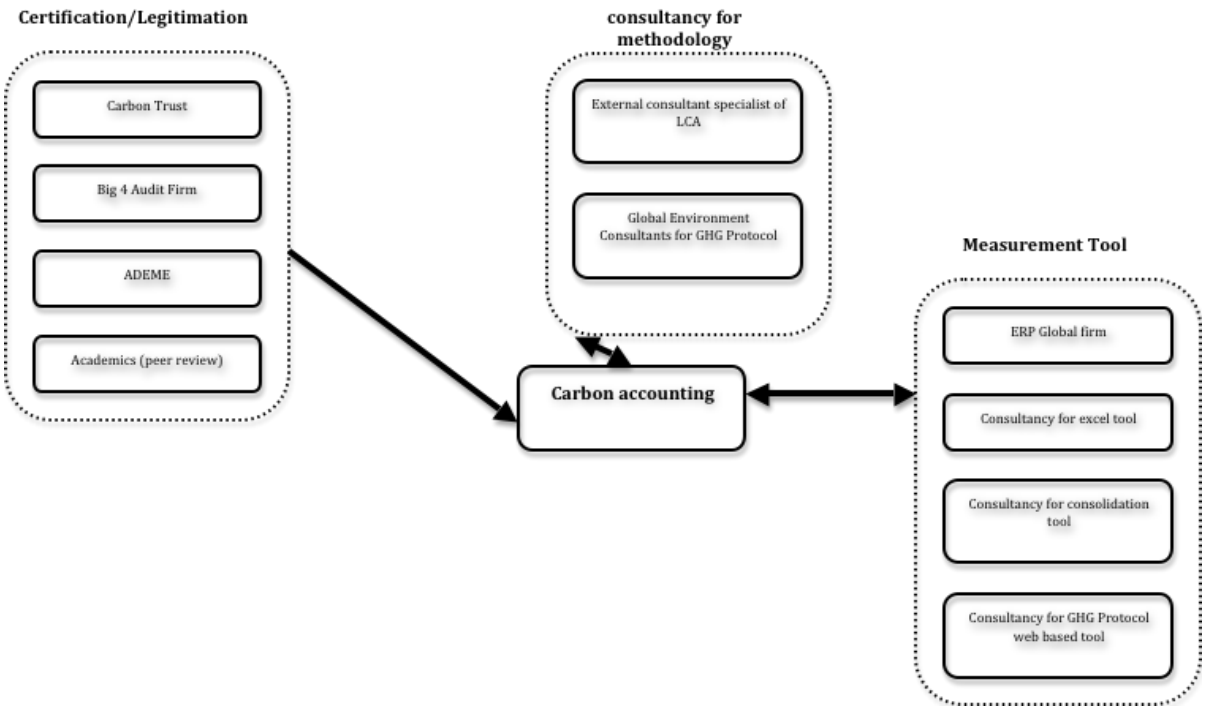


Figure 0.5.6: Network of support around carbon accounting

7.6 Performance measurement and green capex

The carbon footprint reduction objective was integrated into the bonus system applicable to all general managers of country business units and group directors (1400 people in total[42]) from 2008 to 2012.

An additional tool to was added to allow for long-term environmental investment to happen. Criteria for "green" capex projects were modified to allow projects to be considered that would not fit in the traditional financial criteria. Tonnes of CO2 saved per million of Euros of investment was added as a criteria to consider the project under the green capex scheme. The payback period was calculated using a monetarization of CO2 at about 15 Euros per tonne saved. The criterion for a decision was still made on payback, but included the CO2 saving monetized.

7.7 Stakeholders around carbon accounting

In the case of carbon accounting, multiple stakeholders influence the way carbon accounting is performed inside a company.

The first group is linked to regulations. Carbon accounting is confronted to, in the case of France, the disclosure of scope 1 and 2 since end of 2012, and the reporting of site emissions under the European Union ETS. Regulators might influence the scope of accounting (French does not ask for scope 3 as part of mandatory reporting) and the methodology (French regulation requires to follow ISO 14064 type methodology, EU ETS has its own methodology). Other impacts include the multiple developments of competing standards from state bodies, such as the recent organizational environmental footprint (OEF) and product environmental footprint (PEF) methodologies by the European Union.

The second group is specialized institutions such as FAO, Plastic Europe and the institut de l'élevage (Breeding institute in France), or other institutions that might be involved in defining standard geographical or sectorial emission factors. Emission factors are half of the equation in carbon accounting and can have great impact on the final result. Moreover, other rules of carbon accounting can be impacted by those institutions, such

[42] Rapport Développement Durable, Synthèse de la Stratégie, 2009

as the rule to take into accounting recycling at the end of life of a material or at the beginning of the new life of the recycled material.

The third group of stakeholders is all the trade unions and working groups around sustainability, who seek to define sectorial rules and product category rules (PCR). This affects the functional unit, boundaries and emission factors decisions in carbon accounting.

The fourth group are private standardizing bodies which include the WRI/WBCSD led GHG Protocol initiative, but also the ISO and the BSI for PAS 2050. They impact carbon accounting when they revise their standards (PAS 2050 2008 to 2011), and when they issue new standards (the 2011 scope 3 standard and product standard from the GHG Protocol initiative).

The fifth group is composed of NGOS and the media in general. They can target companies saying that they do not account for enough (reduced scope), or that they use a more beneficial rule of accounting (e.g. a TV media last year when into the details of one specific rule of carbon accounting of one product and accused the company of greenwashing).

The last group is composed of sustainability ratings, and more particularly those related to carbon (CDP, climate counts…). Sustainability ratings can be potentially legitimacy carriers for companies on the CSR topics, but can also be delegitimizing when they target "non-respondents" (such as the CDP or the Forest Disclosure Project do) or unusual responses by companies (such as when the company was targeted for reporting no risks related to climate change in an early version of CDP response). They have therefore an impact on how external stakeholders, more particularly investors when it comes to the CDP, perceive the company.

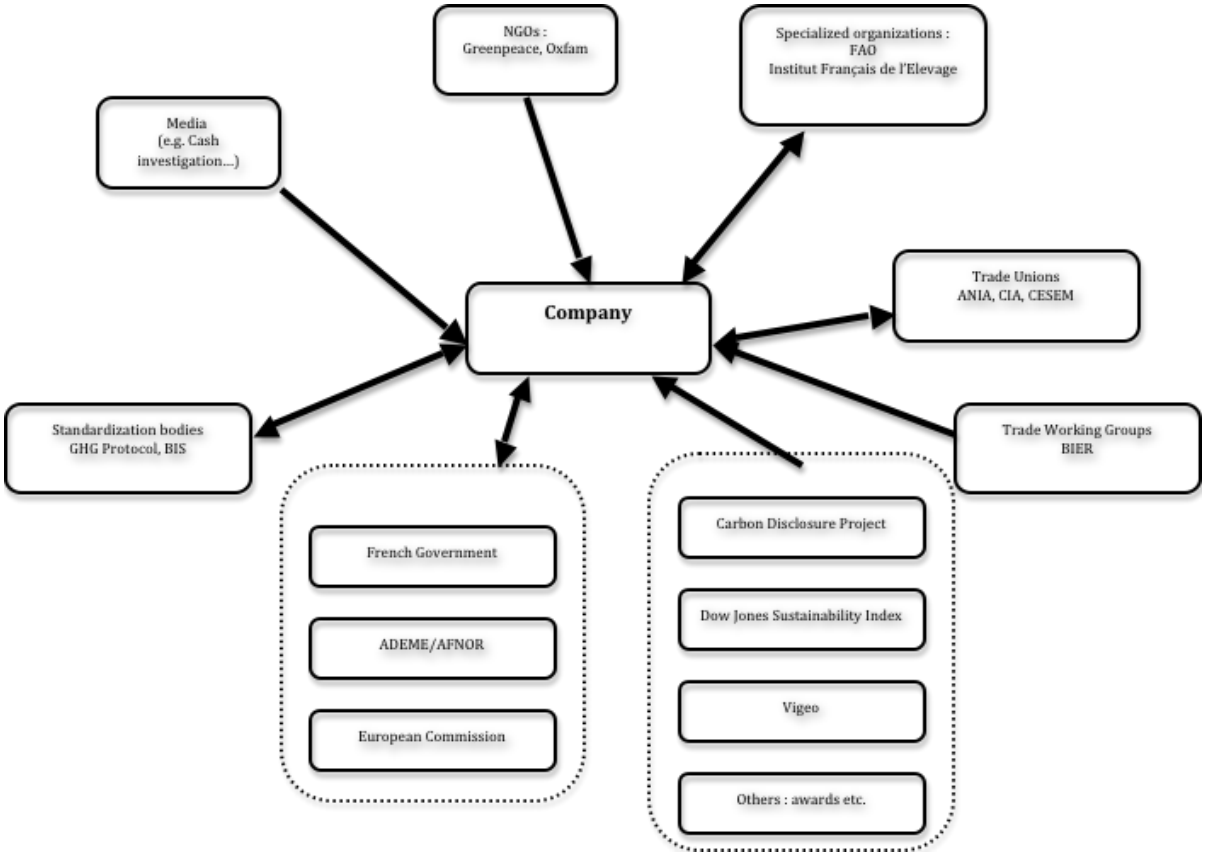


Figure 0.5.7: Key stakeholders around the carbon accounting of the case study company

1999	Company selected into the Dow Jones Sustainability Index
2006	Company responded to the CDP for the first time
2009	Recognized as the benchmark company in its category in terms of environmental reporting by the Dow Jones Sustainability Index
2009	Ranked N°1 in the food sector in the 2009 index of the Ethibel Sustainability Index and APSI Eurozone
2009	Figures in the 2009 honour roll of the "100 most sustainable corporations in the world" released by Innovest
2010	New Economy Magazine Best Carbon Reduction 2010 for France[43]
2010	Company responded to the water disclosure project in the first year
2012	Company responded to the forest disclosure project for the first time

Table 0.5.7: Sustainability ratings

8 Conclusion of chapter five

This case study company is representative of global MNEs that are at the same time accused of being responsible of much of the environmental damage caused to the planet and at the same time, part of one of the mechanisms powerful enough to produce the

[43] http://www.theneweconomy.com/winners_articles.php?article_id=645 (Accessed January 13th 2011)

necessary changes to this degradation. Moreover, it is an interesting case study with a long history of dealing with CSR topic, an example of hybridity (Baxter & Chua, 2003).

Summary of chapter five

The case study company has a long history of corporate social responsibility action that is anchored in its "dual economic and social project" dating back in the 70s. Despite this strong identity, environmental topics have only been rarely at the forefront (to the exception of the 1971 and 1992 emblematic actions vacances propres and eco-emballages) until recently.

A new more integrated approach of CSR was developed after 2006 with four pillars including "nature". Based on this new program, a nature team was implemented in 2009 and carbon accounting was designed to be at the forefront of the efforts of the company towards the environment. This was publically visible with the pledged target of reducing the company's GHG emissions by 30% between 2008-2012.

The company is the field for both article 2 and 3 based on the participant observation of twelve months as a carbon accountant in the headquarter nature team.

Overview of the three articles

This research explores the notion of management accounting innovation from the perspective of its creation, its adoption and practice. The innovation under study is the development of environmental management accounting. The three articles mobilize institutional and practice theories.

The first article tackles the question of how innovations get created and on the path to institutionalization. The perspective taken is to focus on the actors and their strategies, the who and how of the institutionalization process. It contributes to institutional theory by defining what institutional work elites use to maintain power, despite the threat exercised by a new phenomenon, here environmental concerns, on their dominant position. It further contributes to the literature on genealogies of management accounting innovations by not only focusing on the cultural, geographical and historical context of the innovation process, but by introducing a perspective on strategies of actors.

The second article provides an understanding of the particular moment in the institutionalization process, which connects the innovation created with the potential users, that is the moment of adoption of the innovation. Through an in-depth case study of one organization, the article uncovers the process of the non-adoption of a carbon accounting methodology. The article contributes to institutional theory by stating the role played by internal legitimacy in the decision of non-adoption, and how it was recombined with external legitimacy to reinforce organizational legitimacy of the organization. It contributes to the literature on management accounting innovations by introducing the crucial role played by internal legitimacy in the adoption process of innovations, and also by stating that internal legitimacy could also be the foundation of legitimacy and thus a factor of success in the adoption process of innovations.

The third article analyzes the practices surrounding an accounting innovation in a multinational. Through the analysis of practices at local and central levels, the article allows to understand further how accounting practice contributes to strategy emergence. Furthermore, the article makes a contribution to the literature by showing how strategy can emerge both at local and global levels simultaneously, showing that

strategy-making can be a co-emergence process especially at the stage of the introduction of an innovation.

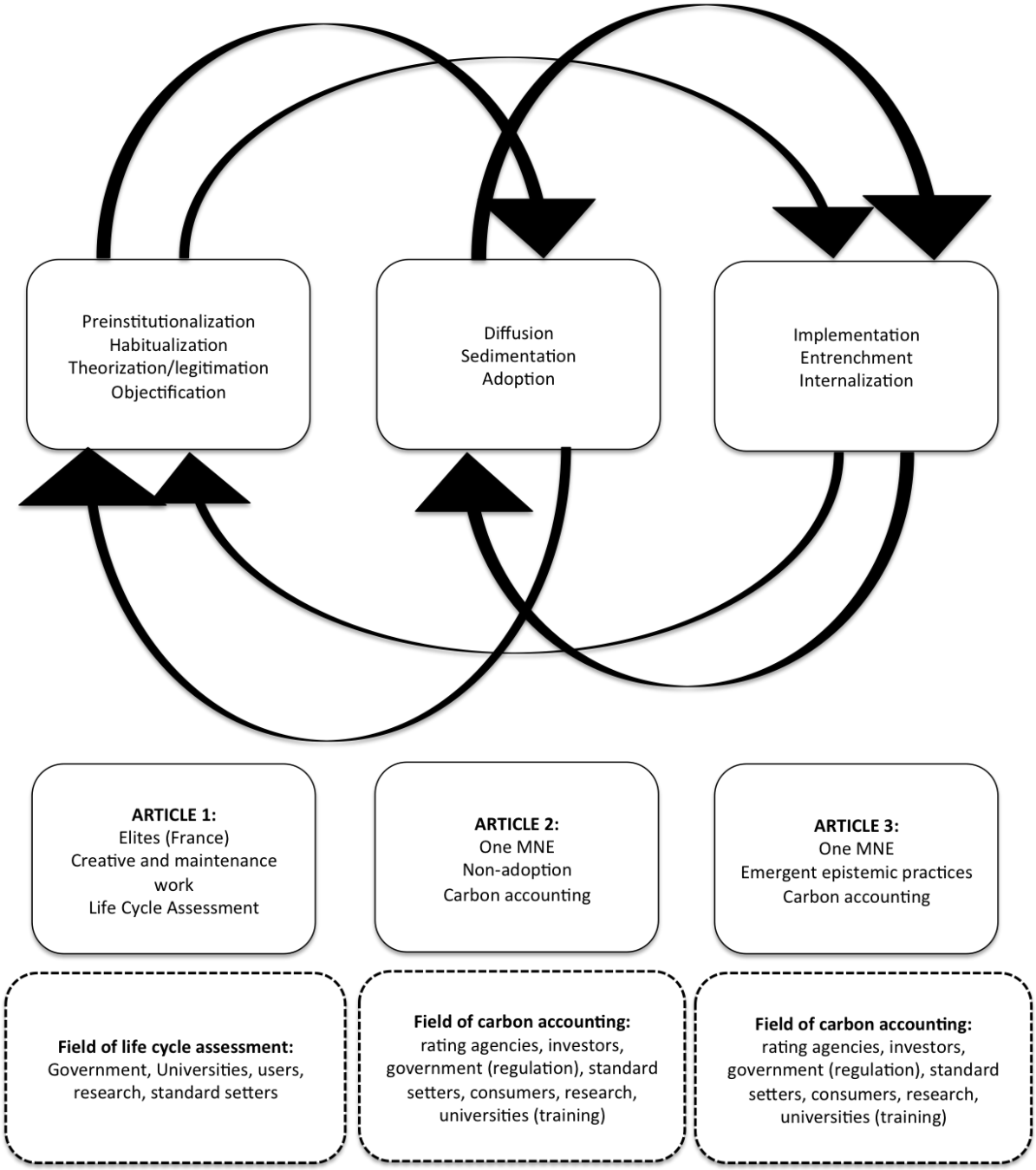


Figure 0.6.1: The institutionalization process of innovations

Article	Research Question	Theoretical Question	Theories in use	Research methods
From Ecobilan to LCA: the elite's institutional work in the creation of an environmental management accounting tool	How can environmental management accounting tools be created, by whom and with what strategies?	What is the role of national elites in the institutionalisation of management accounting innovations?	-Institutional theories -Institutional work	-Interviews (20) -Secondary data
Carbon accounting: from conflict of legitimacies to the interplay of legitimacies	What is the process of adoption and the consequences on the adopting organization? How can an accounting innovation become the centre of a conflict of legitimacies at the time of adoption?	How does a new accounting practice become the centre of a conflict of legitimacies?	-Institutional theories -Organizational legitimacy -Internal legitimacy	-Participant observation -Interviews (13) -Secondary data
Epistemic accounting practices and the emergence of a climate change strategy	How do EMA tools translate into organisations' practices?	How does an emergent accounting practice intersect and intermingle with an emergent strategy in daily practical coping praxis?	-Practice theory -Epistemic practice	-Participant observation -Interviews (30) -Secondary data

Figure 0.6.2: Overview of the three articles

ARTICLE 1 – FROM ECOBILAN TO LCA: THE ELITE'S INSTITUTIONAL WORK IN THE CREATION OF AN ENVIRONMENTAL MANAGEMENT ACCOUNTING TOOL

SUMMARY

FROM ECOBILAN TO LCA: THE ELITE'S INSTITUTIONAL WORK IN THE CREATION OF AN ENVIRONMENTAL MANAGEMENT ACCOUNTING TOOL

Keywords: écobilan – life cycle assessment – elites – institutional work

Aim: This article analyses the role of the French elite in the creation of the innovation "écobilan" and their strategies. It shows the institutional work developed by the French elites in the making of an environmental management accounting tool, using creative work to maintain their power and status as the French elite. It also shows how écobilan – later name life cycle assessment, escaped the elite realm to become the opposite of the shape it had given the tool originally, showing that institutional work has only temporary effects.

Design: This article is a genealogy of an environmental management accounting tool overs a period of 22 years, and combines semi-structured interviews and analysis of secondary data, including archives, books and press articles.

Theoretical background: The concept of "institutional work" (Lawrence & Suddaby, 2006) is mobilized to shed light on the strategies of the elite in the conception of an accounting innovation.

Findings: The article demonstrates that in the French context, elites were the main actors in the institutionalization process of the tool "écobilan". By explaining the role of particular agents in the making of an environmental management accounting tool, this article furthers our understanding of how environmental issues are shaped and accepted in the French context. Moreover, uncovering the strategies deployed to create the tool gives a particular insight on how environmental accounting tools play a crucial role in power relations, rendering environmental performance visible to some but invisible to others.

Value: The article contributes to institutional theory by defining what institutional work elites use to maintain power, despite the threat exercised by a new phenomenon, here environmental concerns, on their dominant position. It further contributes to the literature on genealogies of management accounting innovations by introducing a perspective on strategies of actors and therefore not only focusing on the cultural, geographical and historical context of the innovation process.

From Ecobilan to LCA: the elite's institutional work in the creation of an environmental management accounting tool

Abstract

I explore the institutionalization process of environmental management accounting tools in France. Based on the concept of institutional work, I analyse the role of the French elite in the institutionalising life cycle assessment (LCA) in France and the consequences thereof. This paper will focus on the following research questions: what is the role of national elites in the institutionalisation of management accounting innovations? How did the French elite contribute to its dissemination into companies, what are the elements and circumstances that contributed or restrained the institutionalization of those tools in the French context? The study follows the tool historically from the 1990s to 2012, looking at the different phases of the institutionalization process. This research shows that not only the social and cultural environment but also the agents and the "work" also shape what tool is created, and institutionalized to measure the environment in a particular context. I seek to contribute to the management accounting innovation (MAI) literature by focusing the strategies of actors involved in the making of an MAI. Moreover, I intend to define the type of work elite do in institutional change and maintenance. Through the genealogy of écobilan, I show that institutional work can have various intertwined levels, and that creative work can be one strategy deployed in a wider institutional maintenance work.

Keywords: écobilan, life cycle assessment, elites, institutional work, management accounting innovation

I would like to thank all those who agreed to be interviewed in relation to the Ecobilan/LCA history in France and interviewees of the exploratory phase of the study. Interviewees do not necessarily endorse my analysis, which is my sole responsibility.

1 Introduction

This paper seeks to better understand how management accounting innovations are created and developed, as well as how and why they become detached from the original rationales to become "something else". In particular I will focus on the role of actors, their strategies in innovating, while paying particular attention to the specifics of the cultural and social environment in which the ideas develop and where the actors carry out the strategic development of the management accounting innovation.

Management accounting innovations (MAI) have been thoroughly studied from the point of view of diffusion (Alcouffe et al., 2003; Ax & Bjørnenak, 2005; Bjørnenak, 1997; Firth, 1996; Lapsley & Wright, 2004; Malmi, 1999; Marimon et al., 2012; Mellett et al., 2009; Nassar et al., 2011). Diffusion studies emphasize the effectiveness of innovation, the characteristics of innovation and the role of propagators (Zawawi & Hoque, 2010).

More recently, a different approach has been advocated to narrate the story of accounting innovations that stresses "disjuncture, accident and a view of the history of ideas as a fragile accomplishment" (Cooper et al., 2012). It reflects upon how accounting is constitutive, notably how it makes some things visible and renders other invisible. For example, MAIs have been analyzed through the lens of actor-network theory, identifying key actors and intermediaries, trying to unfold the creation of innovation over time by following the network of actors, the intermediaries and the inscriptions (Cooper et al., 2012; Jones & Dugdale, 2002). These studies allow capturing how the innovation changes as the idea travels and how practices vary as they diffuse, through the process of translations.

Furthermore, genealogies of MAIs have emphasized the historical and cultural context in which they are brought to life (Burchell et al., 1985; Edwards et al., 2002; Loft, 1986; Miller, 1991). Miller and Napier (1993) emphasized that "we need to examine accountancy as outcome, as an historically and geographically localized result of the composition of various lines of force". Hopwood (1977) had also called to look for the "institutional processes that can both facilitate and constrain the development of accounting". The study of the institutionalization process of innovations has emphasized the role of social legitimacy that innovations need to acquire to become "institutionalized" (Gehrke & Zarlowski, 2003; Harun et al., 2012), and how this legitimacy can be gained through tactics such as analogy (Etzion & Ferraro, 2010).

While social and institutional forces at work have allowed understanding of the shaping of different accountings, attention to the locus of the production of management knowledge (actors) (Jones & Dugdale, 2002) and the work of actors have often been limited, when it comes to describing the making of accounting tools. In 1980, the question: "what agents have been involved in (accounting's) emergence and development?" had already been raised by Burchell et al. (1980), but still remains to be further explored, as for example new history, according to Napier (2006), should bring more exposition to actors such as the state, the media and trade unions.

Management accounting innovations have been said to be the preserve of practitioners (Miller, 1991), while the story of ABC emphasizes the role of management consultants in the dissemination of the tool (Jones & Dugdale, 2002). In other cases, academics have played a crucial role in developing the discounted cash flow technique in Great Britain (Miller, 1991). This shows that no one particular type of actors has the preserve of management accounting innovations, and conditions explaining the construction of historical agency need to be further explored, because not just anyone can articulate ideas about accounting that will be heard or believed (Oakes & Miranti, 1996). Therefore this paper tries to understand not only to the historical factors that have led to the innovation, but also focuses on actors involved in shaping new techniques of accounting and what strategies are advanced for their (techniques) adoption (Miller & Napier, 1993). Through this analysis, I will respond to a call made by Hwang and Colyvas (2011) to look at the "institutional construction of actors", and how "institutional contexts determine what sorts of actors would perform what kinds of institutional work".

This paper describes the making of the tool initially called écobilan in France in the 90s by focusing on the actors involved, the institutional context in which they are embedded, and the institutional work they have used to bring this tool to life. It then goes on to emphasize how the initial tool became "something else", trying to escape the initial framework it was built around.

I seek to contribute to the management accounting innovation (MAI) literature by focusing the strategies of actors involved in the making of an MAI. Moreover, I intend to define the type of work elites do in institutional change and maintenance. Through the genealogy of écobilan, I show that institutional work can have various intertwined levels, and that creative work can be one strategy deployed in a wider institutional maintenance work. Thus, this paper will concentrate on the following research

questions: what is the role of national elites in the institutionalisation of management accounting innovations? How did the French elite contribute to its dissemination into companies, what are the elements and circumstances that contributed or restrained the institutionalization of this tool in the French context ?

The purpose of my paper is to better understand the role played by the French elite in the making of écobilan through their institutional work that shaped the nature of the tool. By exploring the role of particular agents in the making of an environmental management accounting tool, I further our understanding of how environmental issues have been shaped and accepted in the French context. By focusing on the role played by the elites, I respond to the call made by Jones and Dugdale (2002) for further research in the "locus of the production of management knowledge". Moreover, uncovering the strategies deployed to create the tool gives a particular insight on how environmental accounting tools play a crucial role in power relations, rendering environmental performance visible to some but invisible to others. Accounting is both a stake and an instrument in a constant struggle for domination; it participates in the production, attribution and reproduction of specific interests (Farjaudon & Morales, 2013). Therefore the fact that the French elite has trusted the écobilan creation process to shape what could be measured and how according to the elite's codes and principles. Moreover, I further the analysis of Kaplan (2012) and Currie et al. (2012) that elites tend to do use both creation and maintenance work upon recognising a potential threat to their status, trying to defend the status quo and "adjusting to change in a way that continues to favour (…) powerful actors", under cover of the creation of a new institution (in our case, écobilan). By specifying what kind of institutional work elites use to maintain and enhance their status and power, I contribute to investigating elite institutional work by showing how fragile maintenance efforts can be, and how a tool built by and for the elite can gradually become something else. This paper also responds to recent calls to study the power elite and their command posts at both global and local levels (Kaghan & Lounsbury, 2011; Zald & Lounsbury, 2010).

The rest of the paper is structured as follows: in the first section I will specify the theoretical framework used for this study and in the second section I will further describe the research design. In a third section I will develop the findings concerning the

emergence and further institutionalization of life cycle assessment in France. The final section will discuss the findings and conclude.

2 Accounting innovations, elites and institutional work

2.1 Accounting innovations "genealogies"

My story of accounting innovations stresses "disjuncture, accident and a view of the history of ideas as a fragile accomplishment" (Cooper et al., 2012). Miller and Napier (1993) emphasized that "we need to examine accountancy as outcome, as an historically and geographically localized result of the composition of various lines of force". Hopwood (1977) had also called on us to look for the "institutional processes that can both facilitate and constrain the development of accounting". Genealogies of MAIs have emphasized the historical and cultural context in which they are brought to life (Burchell et al., 1985; Edwards et al., 2002; Loft, 1986; Miller, 1991). The focus of genealogies on the constituting of innovations, particularly on the conditions, events, traces of power and expert discourses that have shaped their existence (Edgley, 2013). They are unofficial histories seeking to explore the many "small" ways in which techniques of knowledge emerged and spread (Loft, 1986). Additionally genealogies need to take into account the more programmatic aspects of accounting innovations, such as idealized schemas for representing, analysing and seeking to rectify bigger "problems" associated with broader aspects of economic and social life (Miller, 1991).
Stories of accounting innovations have emphasized the role of particular agents such as management consultants (Jones & Dugdale, 2002) and academics (Miller, 1991). However, attention to the locus of the production of management knowledge (Jones & Dugdale, 2002) needs to be revived. The construction of historical agency needs to be further explored (Oakes & Miranti, 1996). Moreover, there is a need to study actors within their institutional contexts, since it determines "what sorts of actors would perform what kind of institutional work" (Hwang & Colyvas, 2011).

2.2 The role of the elites in accounting innovation

2.2.1 The French elite

"A ruling elite (…) is a controlling group less than a majority in size that is not a pure artefact of democratic rules. It is a minority of individuals whose preferences regularly prevail in cases of differences in preference on key political issues" (Dahl, 1958). An elite

is usually composed of individuals that have influence and positions in authority (Genieys, 2011). Elite is also characterized by certain specific sociological attributes. These can be the social background, the academic origin, the religious or cultural values, or the membership of a community (association, military, union). Murphy (2008)also defines elite further as: "an interconnected power elite (Mills, 1956) drawn from different fields, possessing various forms of capital in varying combinations (Bourdieu, 1986), coalescing through conscious network-building (Rischard, 2002)and common "habitus" (Bourdieu, 1994)". Elites are different from professionals and experts or social reformers (Chiapello & Berland, 2009). Indeed, social reformers are not in position of power (when elites are in positions of authority), and professionals have control over the professional behaviour of the members of an occupation, and have the possession of a monopoly over particular skills (Goode, 1957) when elite is not characterized by its particular skills, but by its sociological attributes as well as its influence and authority positions.

The French elite is characterized by its academic origin (Bourdieu, 1989). It embodies at the same time the social origin, the cultural origin, and the future belonging to the economic and political elite in France. Academic origin follows through the elite, and accountability to social formation is maintained (Lasswell, 1952). As Birnbaum (Birnbaum, 1978) states, it is not sufficient to say that the French elite has a high level of higher education, but it is important to recognize that the elite receives training nearly uniquely from the Grandes Ecoles.

The selection of elite based on the academic path is a particular French process. Elite schools start with a "preparatory course" that constitutes what Bourdieu calls an institution rite. The scholarship is based on building "efficacy in working habits", rapidity and rigorous habits of working (Bourdieu, 1989). After the preparatory course, there is an entry exam to elite schools, that then defines who becomes part of the elite, and who does not. Elite schools in France are constituted mainly of scientific schools (Polytechnique, Centrale, Mines, les Ponts et Chaussées), the ENA (Ecole Nationale d'Administration) and the "Normale" schools. Under the fifth republic (current), the scientific elite schools and the ENA have been the main pool of the ruling class (Birnbaum, 1978).

Our focus in this paper is on the elite from scientific schools (particularly Polytechnique, Mines) as they have framed the environment topic in France. The Grandes Ecoles' mandate is to produce individuals with strong scientific competence, they are expected to train the "technical intelligentsia" (van Zanten, 2009). Polytechnique contributes to the emphasis of mathematics as the screening tool of the best students, and as the symbol of educational achievement (Bernard, 2010). Polytechnique is a two hundred year old school, built right after the French Revolution in 1794, "(it) has a unique symbolic value in the national imagination. It embodies the qualities and flaws of academic excellence and social success "à la française". Created in 1794 in the wake of the Revolution, heir of the encyclopaedist ideals of the Enlightenment, from the beginning, its history conferred the legitimacy of a daughter of the Republic who recruits the best" (Belhoste et al., 1994). Scientific engineers "à la française" define themselves as:

> *"Promethean hero that lies at the bottom of each engineer dominates nature by his knowledge and rationality. It defies the elements and calls for his courage and commitment to self-transcendence. It is a radical headwind against all forms of politically correct thinking and refuses any compromise with the spirits supposedly more gullible and malleable" (Férone, 2011)*

Furthermore, Polytechnicians are said to carry the following values:

> *"Values inherited from Descartes and the "Lumières": (objectivity) and also from Auguste Comte and the Saint-Simonians: (the will to build). They must not in any case deny those values, even when we are talking ecology. They should then not: let themselves be manipulated by those who scientifically use emotions to reach an objective that is not always the defence of environment; give up growth, nor the development that humanity really needs, even "in pretext of sustainability". (Bourdillon, 1996)*

Polytechnique is traditionally where the future managers of the French industry are trained and the main way to access the "grands corps d'état" of Ponts et Chaussées, Mines and Armement (Birnbaum, 1978). As de Saint-Martin (1971) demonstrates "The French bourgeoisie finds in the Grandes Ecoles, that place the reproductive function of social and economic capital before the function of knowledge transmission, one of the most effective instruments of its domination".

After Polytechnique, students are assigned to a technical "corps", and finishes scholarship at the application school related to it (Bernard, 2010). One of the most prestigious is the "corps des mines" dating back to 1794, together with "the corps des

ponts", although to date the "corps des mines" is the one with the most influence (Bernard, 2010). The corps des mines is composed of the top students of Polytechnique, as well as two from the Ecole Normale Supérieure, and two from the Ecole des Mines. "Choosing les Mines is since (1794) a way to display your rank (rang de sortie) until the end of your life" notes historian André Thépot (Association Amicale des Ingénieurs des Mines, 2012). It is also a good path for directing one of France's multinationals: "Being "mineur" (from le Corp des Mines) is like holding a title of the Ancien Régime. It remains a good passport to run a company" (Biseau, 2002). Moreover "The X-Mines are still incredibly supportive of each other. They know each other, they are intimate. This machine is formidably effective" (Biseau, 2002). Understanding the network of le Corps des Mines decodes a lot of what happens around managers in the CAC 40 companies and also some of France's strategic orientation, such as the "all nuclear" decision (Biseau, 2002). Indeed until the 2000s, the making of the economic elites thus seems to refer mainly to the structure of the state, the school dynamics sustaining entrance to elite and, more generally, to the class hierarchy (François, 2010). François (2010) notes the surprisingly stable origins of the French economic elite, stating that globalization, financialization and economic liberalisation have had very little impact on the profile of those who govern the French economy.

2.2.2 Elite as agents for innovation

In the 1950s, elites were seen as "traditional, status groups who represented reactionary survivals and obstacles to modernization" (Savage & Williams, 2008). Elites are therefore usually not regarded as "a likely locus of change because of their embeddedness and privilege" (Greenwood & Suddaby, 2006). The elites are more likely to gain from entrenched positions within their institution structures and therefore, would be less likely to resort to institutional work to trigger institutional change (Riaz et al., 2011). However, dominant actors in a given field may have the power to force change though they often lack the motivation (Battilana, 2006). Several explanations to why agents are thought to escape this embeddedness and entrenchment (Kilfoyle & Richardson, 2011) have been exposed in the literature. First, entrenched agents such as elites can become exposed to institutional contradictions, for example through boundary bridging and boundary misalignment (Greenwood & Suddaby, 2006). Second, the existence of multiple alternatives can allow a skilled agent to navigate between them

(Boltanski & Thévenot, 2006). Entrenched agents can become entrepreneurs, event though they are marginally positioned within a social system, if their deviance is not censored (Battilana et al., 2009). Furthermore, elite actors (…) can respond to an external threat to their power, through institutional work (as) a creative act (Currie et al., 2012).

Institutional entrepreneurs contribute to institutional change, but their contributions can combine with others, in a "distributed agency" and there is a need to explore further how actors respond to one another's efforts, and "how the accumulation of those contributions leads to a path of institutional change or stability" (Lawrence et al., 2011).

2.2.3 Institutional work: what work?

As Perkmann and Spicer (2008), I argue that an innovation becomes an institution due to institutional work performed by various actors (Lawrence & Suddaby, 2006). Genealogies of calculation must look at "the strategies advanced for their (techniques) adoption" (Miller & Napier, 1993). In a situation of possible change, there is a need to understand what strategies will entrepreneurial actors deploy, and why certain strategies are chosen over others (Rojas, 2010).

Lawrence and Suddaby (2006) have categorized some type of work, such as "mimicry, theorizing and educating", as holding more potential of institutional entrepreneurship on the part of small, peripheral or isolated actors. On the other hand, they have suggested that some elites may operate disruptive work such as disconnecting rewards and sanctions from behaviours. This suggests that there is an association between the type of work and the type of actors involved. Furthermore, elites have been associated with maintenance work, where they would use institutions to reproduce their position (Fligstein, 2001). Although maintenance work has been said to be characterized by its routine work (Peton, 2012), recent work has suggested to the contrary, that maintenance work could be associated with institutional change, for the purpose of reinforcing more essential institutions, such as the ones that constitute elites as such (Kaplan, 2012). Kaplan (2012) describes a self-conscious business elite who advanced a new framework that only readjusted the system as a way to preserve "western civilization", although they had recognized the inevitability of social change. In a study of the healthcare profession, the institutional work of healthcare professional managed to leave institutional arrangements relatively untouched and even enhanced the social

position of the professional elite (Currie et al., 2012). To respond to external threats, elite actors can respond through creative acts, which are both purposeful and active (Currie et al., 2012). For example, elites of the legal profession, having been threatened by a new regulation, managed tocreate a new professional ethos that apparently helped to strengthen their hold (Flood, 2011). Therefore, institutional work for elites might be less a matter of defending the status quo, and more about adjusting to change in a way that continues to favour more powerful actors" (Currie et al., 2012).

I seek to contribute to the management accounting innovation (MAI) literature by focusing the strategies of actors involved in the making of an MAI, here elite agents. Moreover, I intend to define the type of work the elite do in institutional change and maintenance. Through the genealogy of écobilan, I show that institutional work can have various intertwined levels, and that creative work can be one strategy deployed in a wider institutional maintenance work.

3 Research design

The focus of this research is to unpack the genealogy of an environmental management accounting tool, focusing on the actors involved, their work and the institutional context in which they are embedded. I believe studying the genealogy of accounting tools brings about the how and why tools that we commonly use today were incepted and diffused. "Such an unofficial history (genealogies) seeks to explore the many 'small' ways in which this technique of knowledge emerged and spread" (Loft, 1986). Genealogies explore the identification and explication of the factors causing the accounting, whilst being attentive to the changes in meaning that accompanies their emergence (Miller & Napier, 1993). Different calculations are deployed according to different objectives or ideals, and present practices are an outcome of disparate events and processes (Miller & Napier, 1993) that need to be further explored and analysed.

Firstly, this research takes a longitudinal approach to studying the institutionalization processes of life cycle assessment in France over a period of twenty years (Tolbert & Zucker, 1996). This allows seeing different contextual phases and different processes of institutionalization up to now. I will also be able to analyse power relations and networks at play and "locate the processes historically" as stated by Ball and Craig (2010). I will focus on the particular French context, as there is a need to address the localized conditions out of which practices emerge (Miller & Napier, 1993).

The case study chosen is the development of the tool once called écobilan, now institutionalized as "life cycle assessment" (analyse de cycle de vie) in France. LCA is now an institutionalized tool for environmental assessments:

> *"In 2011, we can say that LCA is recognized as an internationally standardized tool in widespread usage, comprising the existence of a broad and active community of LCA users and especially as one of the few multi-criteria tools to assess the state of the environment" (Costedoat, 2012)*

France was the first, (with Canada), to standardize the methodology in the early 90s. The particular attachment of France to the tool to these days, emphasized by the recent experimentation of the labelling programme, makes it a particularly good example of an institutionalized EMA tool in a national context.

Making institutional work visible requires rich, detailed case studies (Lawrence et al., 2009). Therefore, although the institutionalization process is studied *ex post*, data has been thoroughly collected from actors of the institutionalization process, from archival data of the French environmental agency, from books and from press articles, as well as by attending a workshop on life cycle assessment in November 2011.

This research was conducted in two steps. First, I conducted an initial exploratory study during five months, where the different possible institutionalization forces for EMA tools in France were explored. This initial research allowed a better understanding of the institutional context for environmental topics in France, and to identify successfully institutionalized EMA tools as potential case studies. I was able to identify two EMA tools as having been particularly successfully institutionalized in France. One of the tools was much younger than the other allowing one to observe only a short period of about 10 years, therefore the écobilan, allowing one to observe institutional work throughout a period of a little over 20 years, was chosen to illustrate the institutional work of actors in the creation and institutionalization process of an EMA tool in France.

Interviews were conducted with French researchers, members of the parliament involved in law making related to sustainability reporting, a former environmental director of a French company, who had an important role in the making of ISO 14001, as well as a manager from ADEME[44] (French environmental agency). ADEME is a public agency, under the supervision of both the ministry of ecology and the ministry of higher education and research. It is involved in the implementation of public policies in the

[44] ADEME : Agence de l'environnement et de la maîtrise de l'énergie

areas of environment, energy and sustainable development. I also met with the accountants' association sustainability group, read the debates related to the making of NER[45] law in 2001, attended a workshop on the Grenelle, as well as a consultancy conference on carbon accounting. To complete the exploratory research, I interviewed international experts on EMA involved in the US EPA (Environmental Protection Agency) project in the 90s and in the making of the EMA report at the United Nations, to get an understanding of how EMA had developed outside of France.

	Number of interviews	Minutes
Academia	4	154
Parliamentarians	1	29
Consultants	2	114
US EPA/Tellus institute Environmental accounting project, UN EMA project	4	176
French environmental agency	1	57
Former French environmental director	1	76
Total	13	606 minutes

Table 1.1: Interviews for the exploratory first phase

The second step of the research was conducted from January 2011 to March 2013. Because of the tentative focus on institutional work of actors, identification of major actors was key to elaborate the genealogy. Actors were not selected on the basis of their belonging to the French elite, but on the basis of their role in the institutionalization process of écobilan. However, for the period from 1990 to 2000, as well as for people connected to the former consultancy Ecobilan, a vast majority of interviewed actors are from the French elite, as defined in the next section. Names of contacts within the consultancy Ecobilan were first obtained via the book from the two journalists Blouet and Rivoire "l'Ecobilan" written in 1995. Names were further collected through collection of press articles related to life cycle assessment in France. Two key contacts were made through personal network. Further interviews were made through snow balling, asking interviewees to provide names of key actors in the life cycle assessment history that could provide further highlights. Contacts were not always easy to make due

[45] New economic regulations (NER) law: loi sur les Nouvelles Régulations Economiques (loi NRE). The article 225-102 was the first regulation in France to oblige listed companies to communicate on the social and environmental consequences of their economic activities

to the fact that many people involved in the écobilan's creation and institutionalization process have either left the field, retired or simply did not want to reflect on that period. Some contacts required over a year before acceding the possibility of an interview. Interviews allowed access to the making of life cycle assessment through different angles and time periods. First I was able to conduct interviews with consultancies, but also receivers (users in the industry), governmental agencies, as well as one non-governmental organization (NGO) actor. I was also able to access people that were active in the beginning of the period (1990-95), sometimes actors that were active from the beginning of the 90s until now, and actors that were more active recently.

	Number of interviews	Minutes
Academia	2	40
Consultancies	9	528
NGO	1	25
French industry	4	228
Government/governmental agencies	4	186
Total	20	1006 minutes

Table 1.2: Interviews for the second phase

Interviews were also conducted by the author face-to-face whenever possible or by phone if geographical distance required it. Interviews were all recorded, and notes were taken during the interview process. Questions were tailored to each respondent, as their particular role in the development of life cycle assessment was different. However, topics included the development of the methodology, the strategy of the consulting firms, strategy of clients, limits of the tool, standardization of the tool in the French and international context, the evolution of the market of LCA in France, the role of the government and governmental agency into the development of LCA, and the most recent period with the impact of Grenelle on the latest developments. Four interviewees asked to re-read extracts from their interview, and made modifications for clarification purposes, but also for one, to take out company names involved. One interviewee asked me to specifically destroy any interview data once the research was over.

Alongside the interviews, secondary data was collected from the media (archival search on Lexis Nexis with the words écobilan, analyse de cycle de vie, bio intelligence service, and the names of prominent actors of the field), manuals, and the journal from the elite school Les Mines "Responsabilité & Environnement". Accessing secondary data such as

manuals enabled me to see how LCA was objectified and packaged. I also had access to the archives of the French environmental agency. Moreover, I attended a one-day workshop from the association AFITE[46] in November 2011, called "Reinvestir l'analyse de cycle de vie" (reinvest life cycle assessment). AFITE is an association "whose members consider that the dynamic and balanced protection of the environment (...) must be drawn from adequate technical and regulatory measures, supported by a neutral, technical and scientific approach attentive to the expectations of society" (AFITE, 2013). The collection of secondary data allowed for triangulation of data, to show that independent measures go in the same direction, or at least do not contradict our results (Miles & Huberman, 2003).

Type of source	
Interviews of second phase	16,7 hours (20)
Interview exploratory first phase	10 hours (13)
AFITE training recording	2 hours
Books	878 pages (4 books)
Press articles (Lexis Nexis)	1192 pages (557 articles)
Press articles (other)	97 pages (25 articles)
Other sources (archive, congress presentations etc.)	551 pages (22 documents)
Standards	3 standards (the French one from 1994, and the international ISO standards)

Table 1.3: Overview of sources

Time period	Pages
1990-1995	453
1995-2000	217
2000-2007	536
2007-2012	1512
Total	2718

Time period	Minutes of interviews
1990-1995	368
1990-2000	304
1995-2000	42
1995-2012	238
2000-2012	54
Total	1006 minutes

Table 1.4: Sources in terms of time period

[46] Association française des ingénieurs et techniciens de l'environnement.

I analysed both interview transcripts and all secondary data described above with the qualitative data analysis software Dedoose[47] that allows line-by-line coding of data, and 512 excerpts were coded. The analysis conducted was thematic content analysis, where codes have been inferred by theory on institutional work, also complemented by additional codes that emerged from the analysis of the material. An additional coding linked to time periods was added to facilitate restitution. General codes came from both theory (creative institutional work, maintenance work) and general themes from the interviews (the company Ecobilan, the tool, elite relations). Some codes were renamed and recombined after several rounds of analysis, such as "theorizing and defining work", which is renamed "locking work" or elements of the strategy of the firm Ecobilan, which are renamed "gatekeeping work".

Themes
Institutional work (creative)
Maintenance work
Institutional agency
Ecobilan (company)
Écobilan (tool)
Elite relationships
Field
Institutionalization
Recent events

Table 1.5: general themes from coding

4 Findings

4.1 Institutional context of environmental topics

Institutional contexts determine what types of actors perform what kinds of institutional work (Hwang & Colyvas, 2011). Ecologization of the French society has been slow, because ecology has long been illegitimate in the eyes of the French. The elite have now given an official stamp to environmental protection in France. Neither NGO groups, nor political groups in France have been major actors of the environmental scene in France since the 70s.

The green movement goes back to the 1960s, with the foundation of WWF and the publication of seminal books, such as "Silent Spring" by Rachel Carson. It quickly picked up the 1970s, fuelled by environmental catastrophes such as the Amoco Cadiz, Seveso or

[47] Dedoose, formerly called EthnoNotes, is a qualitative data analysis online software, designed by experienced social science researchers using psychological and anthropological research methods. It has been in existence for the last 13 years.

Torrey Canyon. At the same time, the first worldwide political declaration of 1972 in Stockholm marked the recognition of an ever-growing environmental issue. However important the environmental issues had become worldwide, ecology was rapidly marginalized in France whether in politics or in associations. This marginalization is mainly linked to the exceptional use of civil nuclear energy to provide electricity in France. The wide use of nuclear power plants in France contributed to create a clear and strong bond between nuclear use and the French national identity (Hecht, 2007). However, the environmental NGOs in France have clearly had in mind, since the beginning, the reduction or stop of the use of nuclear power to provide energy in France. They were therefore stigmatised as not only anti-nuclear but even clearly "anti-France", since they were touching a national identity issue. Scientific elites have particularly been linked to the nuclear industry. In the beginning of the 1970s, France made a radical choice of producing the majority of its electricity with nuclear power. Instead of opening the debate on this high-risk energy, the government has always decided to leave this energy in the hands of elite engineers (Corps des Mines), who compose in majority the nuclear industry's staff, especially in the French electricity provider EDF (Bezat, 2012). Nuclear has always been considered a question of national security and independence, outside the realm of ecology: for example, the French president excluded it from the Grenelle agenda (Bezat, 2012).

Moreover in the 70s, the public opinion was barely preoccupied by environmental questions. The population was sparse in vast regions, and pollution did not reach most of the French population. French also have a "firm and Cartesian belief in progress", which was against the idea of ecologists, which put into question some of the technological innovations such as nuclear power (Giblin, 2001). Therefore, democratic and civic mobilization around these issues has been very low in France, and is still very low.

Even in politics, "ecology was delayed in becoming an important political question for a long time" (Jacquiot, 2007). This is because in France, ecology, at least until the mid 80s, was confined to the protection of nature, and was not associated with the defence of environment as a parameter of human health, which would have helped its acknowledgement by the general public and politically speaking as well (Jacquiot, 2007). The thought style of the French elite and how it is applied to the environment, defines what is acceptable, and closes off other perspectives that could be embodied in NGO

discourses or environmental political parties. A thought style "leads perception and trains it and produces a stock of knowledge" (Douglas, 1986). It penetrates the minds of members, defines their experience and sets the poles of moral understanding (Douglas, 1986). Therefore, "the thought style not only frames the way issues are addressed but also closes off alternative and incompatible perspectives" (Murphy, 2012). The environment is first and foremost a scientific problem:

> *"Environmental problems have today almost always a scientific connotation. Through the implementation of technologies, by interactions between domains such as biology, chemistry, physics, etc… or even modelling. The scientist is indeed involved almost against his will into environmental issues. Discourses about the environment must obviously be subject to the control of experimental knowledge. We hear too often public discourse which are totally disconnected from scientific truths" (X-Environnement, 1996)*

The environment is a topic that is measurable and quantifiable. Decisions related to the environment have to be taken based on quantified outputs:

> *"Research in the field of environment requires specialized assessments and extreme precision in general, it involves large methodological difficulties. It is important not to philosophize before having measured" (X-Environnement, 1996)*

Elite engineers are considered to be the most suitable resource to deal with the environment:

> *"The environmental scientists must have a strong multidisciplinary scientific culture and be able to synthesize a variety of elements of various origins. It seems to me that students from the French system of Grandes Ecoles and particularly of the École Polytechnique are able to assimilate complex problems quickly. They have the training and the general spirit of synthesis which should enable them to contribute effectively to solving major environmental problems" (X-Environnement, 1996)*

Elites were also present in the state apparatus for the environment, both at ministry and environmental agency levels. As the environment entered the French government as a ministry in 1971, it had to be measured. "Science was not in our mind, the science of vague things" according to a Mine engineer in the first French ministry of the environment (Moyen, 2007). It was then staffed by elite engineers:

> *"My second concern was the establishment of task forces because I felt strongly the need for early action on the environment, and I had to bring together practitioners of administration provided with a solid theoretical training and good practice. I found them in, of course, the engineers of Rural Engineering, Water and Forestry, among mining engineers (Ecole des Mines), familiar with the industrial world, its techniques, its constraints and its harmful effects, and among civil engineers (Ecole*

> *des Ponts et Chaussées), practitioners of the interventions on major infrastructure and experts of the risks they may pose to the natural environment." (Poujade, 2007)*

Ecologists in the 70s were denunciating the "technocracy", that is, specialists that in the name of science would decide in the place of politics (Lalonde, 2007). When the French environmental agency (ADEME) was created in 1992, it quickly focused on being pure technical experts (Escande, 1993), driven by elite directors from Polytechnique and ENA.

4.2 Threats to the elite

In the early, 1990s, several potential regulations were being talked about, and emerged as potential threats to the French industry, with a strong need to understand further the potential effects of the expected regulations. Industries appealed to the Ecole des Mines to carry out first impact studies:

> *"One of the first environmental life cycle assessment studies that I am aware of in France concerned the steel industry. It was carried out at Ecole des Mines de Paris and corresponded to life cycle inventories, which were incomplete, because the study primarily focused on energy and CO2; actually the main purpose of this study was to anticipate the potential effects of a carbon tax on the steel industry. It was performed in an academic context, but led to the idea that a demand for LCA studies would raise in a context of strong environmental regulation and environmentally-based competition between (e.g. packaging) materials…" (Consultant, interview 2)*

> *"At the time, there was a strong context of environmental regulations at European level, with projects that could seriously impact some industry sectors. (…) The demand for life cycle assessment (LCA) was therefore in many cases based on the industry need to anticipate the potential impact of regulatory projects, to get figures on which negotiations could be based, or to get an idea of weak and strong 'environmental' points of specific products or materials in comparison with their competitors. In short, LCA was used in a defensive or preventive way in many instances; only in a few cases at that time were LCAs used in a proactive way, for instance in the eco-design of new products or services." (Consultant, Interview 2)*

> *"It is fundamental to construct a coherent inter-sector approach to guarantee the defence of the interests of the French industry on the international scene" (Greave et al., 1996)*

The tool écobilan was seen as a mean to defend the industry, or prevent potential attacks from competitors or emerging regulations. Additionally, écobilans were used against attacks from ecologists:

> *"The big manufacturers started asking their engineering teams to look at the, let's say life cycle, to try to quantify the impacts and risks. They published that and clearly, they were criticized by people who found that it was too favourable and*

> *that they didn't take everything into account. Therefore, a reverse push by the ecologists and some scientists and at that moment neutral players came on the scene. People who therefore created the expertise to perform analyses in the 1980s and in the very early 1990s." (Consultant, interview 14)*

> *"At a market level, there were also materials (notably packaging ones) which were promoted or attacked on the basis of environmental claims (generally based on a single criterion, without considering a comprehensive set of criteria and potential impacts)." (Consultant, interview 2)*

4.3 Creation of the company Ecobilan as defensive work

The consultancy Ecobilan was built with a defensive role for the French industry, helping develop the expertise of écobilans in France. It was a way to counter the threats to the French industry with pending European regulations and taxes, but also counter internal threats from ecologists, targeting French products. This defensive maintenance work was sustained through creative work: developing a new tool, and a new service around it:

> *"(For Ecobilan) it was meeting an expectation in France, both the government and manufacturers said: We want life cycle assessment expertise in France" (Consultant, interview 17)*

> *"So that we got in touch with The French environmental agency and the government as soon as the company was founded to say: These are the types of services we can provide to the country." (Consultant, interview 6)*

> *"You have to understand that Ecobilan was started for combative reasons, for reasons of competitiveness between governments. And for us it was an important tool to place the discussion, not let the discussion be monopolized by the Scandinavian countries." "One of the reasons we started Ecobilan was precisely to counteract the German influence in the regulatory systems, especially at the European level, because at the time France was under heavy pressure in Brussels about the packaging directive." (Consultant, interview 4)*

Ecobilan was created in the laboratory in economics of Ecole des Mines, CERNA[48]. At that time in the laboratory, there were several theses in economics about competitiveness between materials and research into materials at the Ecole des Mines, which was considered a point of excellence for the school. Research on life cycle assessment, as a concept, already existed, and research had started at the laboratory. First contracts started to come in through the relationships of academia and industry:

[48] Centre d'économie industrielle of Ecole des Mines (Center of Industrial Economy of Ecole des Mines)

> *"It was a Mr. X, I think, who was an industrialist working for (the chemical industry), and who at the time at Ecole des Mines also managed the biotechnical elective. So it was someone who made his career in industry and actually he is the one who made the request at the time, I don't know if it was, if he formulated it as a life cycle assessment, but in any event, he was the first one to order research in terms of life cycle assessment." (Academic, interview 3)*

At that time, the founder of the company Ecobilan started working on the topic with academics, and to develop the methodology:

> *"Finally, it was the time when there was no specialist, should I say, there were very few specialists, it was easy to get into this... To acquire that expertise and get up to speed because it was the beginning." (Academic, interview 3)*

> *"And then for six months, together we are going to think not about the concept but on the way to apply it, the methodologies, etc., and we will develop a methodology that we will…." (Academic, interview 1)*

Gradually, contracts came in and the founder saw the commercial potential of the tool. When the founder felt that it could stand on its own two feet, as CERNA was playing the role of an incubator, he created his consultancy called Ecobilan. Ecobilan was first founded in 1990 with the help of two CERNA researchers as partners of the start-up, and developed quite quickly through networking:

> *"And all of this played out against the backdrop of the kind of discreet lobbying, I would say, no press, no… Let's say, not zero outside communication, only single, person-to-person contact. I suppose it's a rather unique way to launch a small business and that was only possible because of Corps des Mines networking." (Consultant, interview 8)*

> *"And to help them right away, I don't really remember for sure, but I think that (the steel industry) signed another contract with them, a little bigger financially, to get a foot in the door. And things went quickly. They had lots of customers right away." (Industry, interview 15)*

A few former doctoral students from les Mines followed the founder in the start-up consultancy, among which a polytechnician, and one from Agro Paristech. Another Agro Paristech who had also done some work for CERNA at that time, became the first employee of Ecobilan. At the end of 1990, there were already 3 to 4 people salaried from Ecobilan. Very quickly, Ecobilan had up to 30 employees, and a subdivision in the United States. Most employees from Ecobilan were generalist engineers from the French elite schools, mainly Polytechnique and Les Mines (Blouet & Rivoire, 1995).

4.4 Creative work

4.4.1 Mobilizing work

The ability of a new institution to become sufficiently diffused depends on the willingness of actors to adopt it (Zietsma & McKnight, 2009). The consultants of Ecobilan strongly mobilized elite ties from academia to industry, and to government. They used networking to create a coalition in favour of the new tool and services. The French environmental agency was one of the first to be mobilized through contracting for écobilans to be done:

> *"They quickly became for-profit, with strong support from The French environmental agency and a few big customers." "The French environmental agency issued lots and lots of orders." (Consultant, interview 14)*

Secondly, the economic elite from the French industry was also mobilized:

> *"Clients, hey, they were all former Corps people." (Consultant, interview 17)*

> *"The Ecole des Mines [engineering school] is closely tied to the Corps des Mines [corps of engineers]. The Corps des Mines is or was especially heavy industry and therefore aluminium, for example. So that there were a lot of the engineers from the Corps des Mines in a certain number of industrial sectors and the phenomenon of networking, networks were used, especially the network of Mines engineers, to get orders." (Academic, Interview 3)*

Finally, strong ties were made with the ministry of environment directly:

> *"There are lots of people like those people and they were interested in two things: one was that there was direct access, if you will, to top-level CAC 40 businesspeople, and two, to people in the cabinet at the ministry for the environment." (Consultant, interview 8)*

> *"There was lobbying in the ministry by executives, especially X. The idea was to get the ministry for the environment to understand that at cabinet level, not at department level, that the position of France was the position of Ecobilan. To simplify, roughly speaking, that's what it was." (Consultant, interview 8)*

The French government sustained écobilans by initiating research programmes on methodological issues. The main program was on agricultural and food products. Launched in 1992, it was co-financed by the ministry of Research and the ministry of Agriculture, as well as twelve companies of the food sector.

4.4.2 Mimicry work with respected elite professions

Attempts to leverage existing sets of taken-for granted practices, and to associate the new with the old are ways to ease adoption of innovation (Lawrence & Suddaby, 2006).

The new "profession" was associated first with Anglo-Saxon strategy consultancies, through price and entry points in companies:

> *"As far as rate is concerned, it was very important. From the beginning, our prices for our consultants were like those of the big U.S. consultancies. And that changes everything for the development of a small business." "It was sold immediately (…) as high-end consulting, and therefore at a high day rate." (Consultant, interview 8)*

> *"As a consequence, it was often the strategic directions of industrial groups (or their federations) which were our customers; not their environmental departments. The matters were rather strategic" (Consultant, interview 2)*

It was priced as a high end strategic product: companies invested between 200,000 francs to 1,000,000 francs[49] per study (Alberganti, 1993) or 7000 francs[50] per day (Blouet & Rivoire, 1995).

Secondly, it was associated with the profession of chartered accountants (experts-comptables), to be associated with the idea of a highly ethical profession, and the idea of "expertise":

> *"So the strategy was truly to create the market, and (…) to do it with a very high level of excellence and ethical standards." (Consultant, interview 6)*

> *"One key credo of Ecobilan, and a message that Ecobilan used to convince customers and sell its services, was the idea that accounting and assessment of material and energy flows would progressively become an absolute necessity for the industry (just as financial accounting had become one)… (…)The inventories (or 'écobilans') were the basis of such accounting. To further the comparison with accounting: the idea was that, just as there exist internal accountants and chartered (independent) ones, there would be a need for the industry to internalize LCA expertise and carry out their own inventories and LCA exercises; but that there would always remain a need and room for independent experts, which could certify inventories or LCAs, just as chartered accountants certify companies accounts…" (Consultant, interview 2)*

More than just associating écobilan consultants with chartered accountants, there was a willingness to create a truly new and independent profession that would be similar to auditing work, when écobilans would eventually become internalized.

4.4.3 Identity work: elite tool for and by engineers

The tool écobilan was framed as an innovation for and by engineers. It was the first time that an integrated tool enabled the measurement of the whole of a product, and thereby,

[49] 200 000 francs is 30 490 euros and 1 000 000 francs is 152 449 euros
[50] 7000 francs is 1067 euros

the impact of a public policy. It was the first time that there was a global approach incorporating aspects of water and waste, together, with going into raw materials and aspects of sub-products. It was quickly labelled revolutionary and purely scientific:

> *"At the time, if you like, this type of tool did not exist, and this comprehensive quantitative approach really shook up minds and revolutionized the way of doing things. There was no doubt about it." (Government/Governmental body, interview 10)*

> *"And that was precisely the basis on which Ecobilan was founded, by saying: (…) we will begin work to provide companies with decision-making tools that they can understand and use, that they are accustomed to using, I mean tools for an engineer, as it were." (Consultant, interview 7)*

> *"When you're an engineer, because it's an elite corps, they are still people, besides the fact that people with power are also people who still have scientific training. So, we used an approach that was not at all environmentalist in the stricter sense of the term." (Consultant, interview 8)*

4.4.4 Gatekeeping work

As a new business founded and animated by elite engineers, entry barriers were consistent with the strategy of selling high-end services. The elite engineers identified previous failures (Cooper et al., 2012) and presented solutions to "impossible" technical problems:

> *"To consider another aspect of the strategy, it was to resolve the problems that the others had not resolved. Therefore, to go after markets that were said to be impossible." (Consultant, interview 6)*

They targeted three markets deemed impossible:

> *Agriculture: "we have loops like that that ask questions on the extension of the system, and so when we attacked it, it was still a subject of academic research, and people stumbled around"*
> *The construction industry: "in the field of construction, the écobilan was deemed unfeasible and impossible to do, it's too complicated, too particular"*
> *And electronics "it was too complicated, you would never be able to do it" (Consultant interview 6)*

Through mimicking high-end consultancies and selling high-price, they were able to mobilize resources for research and development, a key to sustain their leadership:

> *"And there, it was a big contract with the (food industry) and a somewhat founding one with a reserve of revenue that made it possible to recruit and develop." "It was sold immediately (…) as high-end consulting, and therefore at a high day rate. And therefore, I'd say that the company had time to really think about and develop its product and its analysis project." (Consultant, interview 8)*

After locking resources for research, they also locked access to the construction of a database. By being leaders on the market, they were collecting the most data and building the strongest private database on the market place:

> *"But like what we were saying a little while ago, that assumes a powerful tool, the capacity to store and process large databases. And frankly, it is always tough for competitors" (Government/Governmental body, interview 10)*

> *"And the second lock at the time of the method, it was access to databases" (Consultant, interview13)*

Through their leadership Ecobilan consultants also framed the first software:

> *"There was a tool workshop, to define somewhat how to perform the calculations. Therefore, at the same time we provided consultancy, we also developed a software tool, which is designed to make calculations easier, since in excel, it isn't easy." (Consultant, interview 5)*

4.4.5 Theorizing and defining: locking work

The consultants from Ecobilan had resources for research, and as they worked for different industries, they continued to build on methodology. They wanted the external norm to equal their way of doing things, and standardization (defining work), was part of their strategy to demonstrate leadership:

> *"First, since we pretend to demonstrate leadership, we have a duty to take part in standardization since it is being done, and, second, this standardization must be done with a good level of excellence so that competition between service providers happens at the level where we place it. So that we don't get eaten up by substandard services that have a low level of reliability in terms of both inventory and interpretation." (Consultant, interview 6)*

> *"On the écobilan, it has always been, by and large, the richest version possible, that is to say, to say what is normal is to do the job that we are doing, that is to say, completely. The methodology of the company had to become the norm, (...) you say that the standard, it must be that one has to behave like Ecobilan. The principle of any company trying to standardize it to say I'm the standard and others follow me" (Consultant, interview 8)*

> *"France - precisely because it had the expertise of the company Ecobilan - was the first country in the world to standardize écobilan (eco-balance), which later became the standard for Life cycle assessment, France supported it internationally .If you do a line by line comparison of what was in the original French document and the ISO standard 14040, it shows how small the differences are" (Government/Governmental body, interview 11)*

4.4.6 Maintenance work for the French elite

LCA was used in the writing of the packaging waste directive, to help "unfocus" on the end of life impact of materials such as plastic. In 1994, after three years of intense negotiations and lobbying, the European Parliament voted a director on packaging waste. It fixed for the European Union, the percentage of recycling and recuperation to be achieved in a few years for domestic waste. What was at stake was not only ecological but also mainly economic.

> *"In short, the écobilan, via its multicriteria way of doing, allowed to break a hierarchy and it worked because the directive has not been purely German-inspired." (Consultant, interview 8)*

> *"That's why what is at stake, according to (the head of Ecobilan), through the European directives or international protocols" is not only the protection of the environment, but a competition between institutional systems, the industries, patterns of consumption and territories" (Escande, 1994)*

French experts tried to impose a burdensome and expensive procedure at European level, hoping to thereby making obsolete national systems in place or planned in other countries for eco-labelling.

> *"For the European eco-label, the ministry of the environment worked with the company Ecobilan. Therefore, we had a very rich écobilan to decide on the criteria for the European eco-label for paints and varnishes. Then after that, we did the same thing in France. We did research on trash bags based on LCA, that is, a very rich LCA. Here too, this was work that went to Ecobilan, who won the bid each time." (Government/Governmental body, interview 12)*

> *"French experts, who got a late start on environmental protection, try to impose a cumbersome and costly process in Europe. They hope to make the national systems either in place or planned in other countries obsolete. This intellectually attractive logic of perfection involves an absolute certainty. The certainty that écobilans based on an approach intended to be scientific are the only serious bases for obtaining a label." (Perez, 1993)*

4.5 Elites countering elites

4.5.1 Building too big

Ecobilan soon became a monopoly on the market, winning all bids and contracts on the French market:

> *"Right now, that's who got all the research contracts with public agencies (The French environmental agency and the Research and Agriculture ministries) and virtually all the bids put out in France for French and European eco-labelling." (Blouet & Rivoire, 1995)*

They started looking internationally, to convince others that try to take worldwide leadership on the écobilan market:

> *"Together, friends of Ecobilan and my team at (steel industry), we said: but it would be really good to internationalize our business. We at (steel industry), we manufacture steel in Germany, in the U.K., and throughout the world. And we're going to try and convince our friends abroad and competitors, but especially foreign colleagues, to do the same thing (écobilans)." (Industry, interview 15)*

> *"Ecobilan's strategy was to be a pioneer and the best in eco-balance applications for companies and government agencies, in France and possibly in Europe, therefore with the idea of taking leadership necessarily in France and in the entire market. In any case, that was the ambition we already had, it was therefore about leadership in eco-balance applications. Therefore necessarily in France and also abroad." (Consultant, interview 6)*

They also monopolized the representation of the écobilan consultancies from France on the international market and associations:

> *"Using the reference of the Ecole des Mines [top engineering school], it established itself among manufacturers as the French specialist on the subject, then, in a ricochet effect, among the international scientific community. So that representatives of Ecobilan are the only French nationals on the board at Setac or at Spold." (Blouet & Rivoire, 1995)*

4.5.2 Elites countering elites

After a few years, the economic élite represented in the clients of Ecobilan started to be afraid of the proportions and power that the Ecobilan consultants had gathered:

> *"Our biggest concern was to grow and become central because I remember the environment director at a steel company at the time, (…) therefore a relatively major player who came to see us, (…), a guy with a pretty a good sense of humour, he was Mr. Environment for the president of a steel company, who at the time headed the members of the Corps des Mines [corps of engineers], 'I've come to get a look at the head of the octopus.' he said jokingly, but he's a guy who knew that the team in place had clout on the topic." (Consultant, interview 8)*

> *"They were terrified by the idea that (Ecobilan) could become a public monopoly, (…) but, it's a public service and it is the only way to guarantee, you need a state agency" (Consultant, interview 4)*

Moreover, Ecobilan was a tool that was "intrusive" in its approach and revealed internal matters they did not always want to show:

> *"Developing an eco-label triggers fierce discussions. What is at stake from a business viewpoint is huge and manufacturers feel concerned, whether they are for or against the labelling approach. Most of them at first perceive each design*

> *advance as a threat, from the global cradle-to-grave vision down to the tiniest detail of life cycle assessment. The eco label reveals aspects of their businesses they were in the habit of managing alone." (Ventère, 1995)*

> *"One consequence of our point of view, that the naysayers have considered a large anomaly, is that we managed to put on record in the standard the internal critical review. And of course, you know that a critical review is an audit made by a third party. And we did write that the third party, it can be a colleague, and it checks the quality of work. Being understood vis-à-vis the outside, independent third party is more credible. That's it. This was to say that we considered ourselves qualified." (Industry, interview 19)*

The ministry also realized that using écobilan was not a sustainable strategy and backed off from eco-labels' use of it:

> *"It started out very strong. And after we went backwards, that is, in my book I talk about how we decided to base eco-labelling on écobilans. But it's a very strong start; it was a direction that they didn't stick with. We went backwards, that is, écobilans are a bit expensive. And after, we did normal research, simplified research and silly research which are not especially life cycle." (Government/Governmental body, interview 12)*

Finally, the French environmental agency also expressed doubts related to the consultancy. They had black-boxed the tool, so that is was now difficult, or impossible, to evaluate them anymore. The agency was all the more suspicious since the tool had been externally developed:

> *"And you can easily imagine that for a while, it was difficult to make a quantitative judgment about what Ecobilan was doing. (…) But when you have a company and only one company, and you have a hard time, (…) because of the weakness of the tools you had at the beginning, you have a hard time trying to make an evaluation. So that was also the second aspect of the business, how to evaluate the work being done, because when it comes down to it, you are not exactly facing a black box, but it's hard getting into it, because you don't have the tools for it." (Government/Governmental body, interview 10)*

> *"So that, it eventually emerged as one of the tools of this policy, but I can say that initially, it was truly ideological debates on the subject. (...) This may also be an external tool that has not been developed by the Ministry of the Environment, which was not developed by the French environmental agency. So you just imagine the suspicion that there may be to the extent that the original culture is one that is not of this nature, which is rather a culture we will say holistic, poorly quantified" (Government/Governmental body, interview 10)*

To allow for the methodology of écobilan to gain independence, the sanction was "denaming":

> *"First, you notice that we gradually went semantically from the term Ecobilan to the term life cycle assessment. You know what it's about; the idea was to separate the name of the company from the name of the method, a classic approach. (…) There was Ecobilan, and the other product is called écobilan. And so the separation that was made was to say, ah, there is Ecobilan the company, and then there is life cycle assessment, the method. So that's the first significant contribution as a way to clarify the things we are speaking about. We were talking about the company, but we were talking about the tool." (Government/Governmental body, interview 10)*

4.6 Elite withdraws support to life cycle assessment: 1995-2007

In 1995, the consultancy was sold to Dow Chemicals. They were in a position where their quest for excellence was starting to cost too much:

> *"Therefore, the birth of LCA (life cycle assessment) as a design tool. And that, I believe that Ecobilan pioneered it. Moreover, they lost lots of money. That's where all of a sudden, their eyes were a little bit too big for their stomach. They thought they could do a complicated thing too quickly. They got caught up in big pieces of software that they could no longer finance." (Consultant, interview 14)*

The founder left, as well as several consultants from the beginning of the consultancy.

The sale of the consultancy has great consequences on the business. They lost customers in the industry, but also the French environmental agency:

> *"So we lost an entire insulation industry overnight, and that was it. Some companies said: Are we really going to work with a company that is a subsidiary of a chemist. Aren't they competitors, after all.... So we had, that was why they quickly switched us to Radian and faded into the background." (Consultant, interview 17)*

> *"We also realized that the French environmental agency was not thrilled to work with people who were now 'Americans'." (Consultant, interview 14)*

The market faded, a phenomena of saturation appeared, and suspicion from industrials was growing:

> *"Then there was something we realized, it was like a fad, and there was saturation. I mean that at a given time, glass bottle was pitted against plastic, paper diapers against cotton diapers, dishwasher against washing dishes by hand." (Consultant, interview 14)*

> *"To let you know what manufacturers think, when I retired in 2000, no one replaced me in my company for the position of performing LCA. In other words, in my mind, the LCA market did not at all start at the beginning of the decade." "I think there was a standstill because, I don't know how to say this, consultants started to be too much in a mindset of 'Give us your products and we will tell you what you have to do.' Yes, that was like the buzzword at one time." (Industry, interview 19)*

Competition developed but outside of France:

> *"So, we won these two contracts at the same time the same year, in 1999 or 2000. That let us take off, because we developed a great deal, greatly improved methods. It put our name out there. It helped me consolidate teams, because they were big budgets. And the reality today is that our sales in France are half as much. And today, we are the leading service provider for the environmental division of the European Commission. That is, we are the only French service provider." (Consultant, interview 13)*

4.7 Democratization work and demonizing work: 2007-2012

4.7.1 Democratization work

> *"It's an ambitious title, but we gave it a lot of thought and I want to stress this by saying that if the term "reinvest" was clearly emphasized, it was to show that there is real urgency, I think we'll all agree, to look at this concept again, to take new ownership of it in a certain way and for many, in any case, to contradict, if I may say, and reverse the opinion that some have (…) that LCA is a black box." (AFITE recorded conference, 2011)*

New customers started to emerge in the late 2000s, with the expectation of environmental labelling regulation. The distribution industry and the construction industry started to build interest in life cycle assessment:

> *"Another point which is major and more recent is the awareness that distribution has come to. For my part, I like that because you can view distribution precisely as the people at the interface of the company between the company and customers." (Consultant, interview 17)*

> *"Through the standard ISO 14025, which was very important, which refers to the communication of environmental data, we got involved in the communication of environmental data for construction products published in a database called INIES[51] that just set a record for exceeding its 1,000th database record. That is, its 1000th FDES or LCA data sheet. That's a success. It's a success and it's not over." (Industry, interview 19)*

Moreover, efforts were made to localize expertise on life cycle assessment, and develop access for small and medium enterprises. In 2010, a consultancy of North of France created a website and a network called "Réseau avniR[52]", which organized a international congress on LCA in November 2010 and serves as a connection point between public actors, researchers, professors, and the industry.

[51] The French database of reference on the environmental and sanitary characteristics of construction products

[52] Platform for life cycle assessment (Plateforme pour l'analyse de cycle de vie)

> *"In the region of Nord-Pas-de-Calais, the avniR platform, by CD2E[53] and designed to promote the work of local eco-companies, intends to 'contribute to the rapid development of local skills in the area of environmental labelling and provide the average company with lessons learned so that it can take action,' describes Jodie Bricourt, manager for the project." (Descamps, 2012)*

One consultancy developed an online platform for a life cycle assessment called "Instant LCA", which allows non-expert users to measure and compare environmental impacts for different products in the same product line, without needing to be an expert in life cycle assessment. Life cycle assessment is being "democratized". The increased interest in the issue of "carbon, also participated in the renewal of interest for life cycle assessment, and participated in the development of more databases and better tools (Schiesser, 2012).

Finally, the labelling experimentation launch based on article 225 of the Grenelle 2, boosted the demand for life cycle assessment services. The stake was to go from one criterion (carbon) to multi-criteria, based on LCA methodology. The experimentation started on July 1st 2011 and ended in 2012. 168 companies took part in the experiment.

> *"The same thing happens with labelling. There are 1,200 people involved in the AFNOR-Ademe platform, therefore they try to understand. So you can imagine, that's not bad, 1,200 people, including many in companies or professional federations. That boosts LCA, so again, that, that's very good."(Government/Governmental body, interview 12)*

As a result of new regulation, simplification of the tool and the "spillover" effect of interest in carbon, there was a boom in small companies and the price of the service went down considerably.

> *"Another trend in the evolution in France in the life cycle assessment market is the startup of lots of small companies, lots of small businesses in the last five years. It really took off, I'd say, the number of life cycle assessment service providers. They start up based on individual expertise and then afterwards form alliances. But there are lots of former Ecobilan people, but there are other ways, too. O2 expanded quite a bit, the eco-design consultancy O2." (Consultant, interview 5)*

> *"In recent years, we went from spending several hundreds of thousands of francs to perform LCA for a few products, to spending several thousands of euros per LCA (simplified on top of it), and that's for several hundreds of thousands of products analyzed." (Schiesser, 2012)*

[53] Association for Development of eco-enterprises (Association Création Développement EcoEntreprises)

In 2007, a group of industrials including Renault, Areva, SEB, Veolia Environnement, in partnership with research institutes, created the CREER[54] to develop non-competitive research on eco-conception. Research networks have also emerged in France: ELSA is a research network of south of France, built between different schools in 2008, federating researchers but also creating new trainings on LCA for students. Another research network is the association EcoSD[55] that regroups today more than eighty researchers from eighteen institutions, including Ecole des Mines, fifty doctoral students and thirty industrial companies.

Democratization work has provoked simplified tools, the booming of consultancies, and the spread of life cycle assessment as a "logic" for accounting for the environment:

> *"And with that law that will take effect soon, I think things again will explode. So, companies will need help producing not one or two data sheets, but hundreds of data sheets per company. So between that, the building industry, environmental labelling, plus carbon footprint which as we said was a success by The French environmental agency, and now, there are services that cost less than before, also. There are financing packages from the French environmental agency from time to time for carbon footprint and eco-design." (Consultant, interview 5)*

However, there are still fears that, the economic elite will impose their vision through the use of life cycle assessment:

> *"But I fear that the smaller companies, if you put the obligation of environmental labelling, that small businesses will, have trouble keeping up with large companies. And that large companies will impose their worldview, their questions" (Other, interview 16)*

4.7.2 Demonizing work

Demonizing work provides for negative examples for public consumption, of what the institution should not be (Lawrence & Suddaby, 2006). For example, the focus on carbon instead of multi-criteria analysis is being rebuffed as primitive:

> *"We lost a lot of quality of analysis and we came back to the old way, which is a fairly primitive stuff. The CO2 assessment (bilan CO2), what one said at the time of launching Ecobilan is that it exists since 1973 roughly in the United States (...). It's like a single-criterion analysis. It does not account for the whole reality and the variety of situations." (Consultant, interview 8)*

The incorrect use of the methodology is regretted and demonized as "paternalism" and "avoidance behaviour":

[54] Cluster Research Excellence in Ecodesign & Recycling
[55] Réseau de chercheurs en Eco-conception de Systèmes pour un Développement durable

> *"I do not think there are many people who exploit fully this tool today, that is 'correctly'." (Consultant, interview 8)*

> *"So that's how we ended up with people who battled for, then I give you the choice: the simplified écobilan, carbon assessment (bilan carbone), life cycle thinking, so it is without any quantification, checklists and so on. (...) The lobbying agreed by and defended by these people is that écobilan (eco-balance) is too expensive and it's too complicated and therefore, as people are poor and foolish, we must do things that are weak for them. So it's forms of paternalism. So it was a hidden or implicit agenda that has resulted in many battles. A variant of that too, there are industrial sectors who claim to reinvent écobilan (eco-balance), and recreate the methodology from scratch. (...) All this is in a sense it is avoidance behaviour." (Consultant, interview 6)*

There are still barriers to changing the structure of the business model of making life cycle assessment and a refusal to create a pyramidal structure in consultancy work:

> *"I proposed (…) a business where we would do environmental labelling, on a large scale, with, not engineers but technicians in a pyramid structure, with executives, engineers and technicians, like any industrial company and not just top-level engineers to do environmental labelling for products, for all French companies. Therefore, something where you need a volume of people and businesses… Not 30 people, in the end, if we succeed in getting all the companies that work, I don't know, there will be 1,000, 2,000, 10,000 people who will do that all the time in France, therefore there will be job opportunities for everyone, and rather systematic work, a…." (Consultant, interview 17)*

> *"We are still doing fine-tailored work and we have to move to large scale, you could say!" (Consultant, interview 17)*

However, the tool is being reinvented by Ecobilan alumni, to make it seem relevant to new concerns (Cooper et al., 2012). Numerous tools and concepts based on the LCA platform are now being standardized. The organizational LCA (TS14072) and peer review process (TS14071), led by a former Ecobilan alumni are entering the normalization process.

> *"If we want to continue to compare properly, it should be noted how to make a critical review for example. So there will be a standard for critical reviews. Recent developments, there is a life cycle assessment for organizations to integrate for companies that have many products in one view" (Consultant, interview 5)*

> *"One day, that will apply to the entire portfolio of companies' products. Companies will be judged on the company's global LCA. That's clear." (Consultant, interview 13)*

5 Discussion

> *"The LCAs are becoming so complicated that soon, even the experts will not understand them anymore ... Already, critical review becomes cumbersome. These studies thus become very expensive and out of reach for those who do not have sufficient financial resources. Isn't there a risk that LCA becomes an additional tool to consolidate the power of the powerful, allowing them to show that their product is the best, that their approach is the greenest?" (Vincent-Sweet, 2012)*

5.1 Elite work

Elite work, because of their inherent embeddedness, has been defined in previous literature (Greenwood & Suddaby, 2006; Boxenbaum & Battilana, 2005) as being able to reach out, bridge, and connect with the external world to 'break' the embeddedness and be drivers of change. However, to the contrary, this paper demonstrates that the elite has conducted creative work in a way that everything was connected back to their own elite status, without making any efforts to connect with others. Instead of reaching out, the work was conducted to strongly identify the new tool with elite identity, and to construct strong locking mechanisms that would avoid any non-elite interference with the making of and using of the tool. Allies that were mobilized were also exclusively from the elite group. Mimicry work was based on other elitist professions, such as chartered accountancy and management consultancy. Mimicry work with chartered accountancy is a way to 'naturalize' the tool, to establish it as if native in the economic arena. Additional to this, mimicry work with prestigious Anglo-Saxon consultants brings distinction, esteem and reputation. Identity work was conducted to keep a strong elite identity, which must "to promote moral excellence and obtain or retain an honourable status, (…) take great care of the 'representation' it will give of itself to society". This explains the importance of ethos, that is to say, the self-image that we forge and that should be as appreciative as possible to increase the auctoritas, the "decisive and effective influence of an individual or of a community on the actions or the decisions of others" (André, 2011).

Moreover, the elite developed strong locking mechanisms in their theorising and defining works. This was clearly to avoid that the tool would ever be democratized and used outside of the elite realm. Theorizing is "the development and specification of abstract categories" (Greenwood et al., 2002). Symbolic power relates to the ability to define legitimate classifications, which also set limits upon cognition (Cooper et al.,

2011; Everett, 2002), and therefore theorizing is a strong means for an elite to maintain their power over the innovation. Knowledge of the social world, according to Bourdieu (1985): "and, more precisely, the categories that make it possible, are the stakes, par excellence, of political struggle, the inextricably theoretical and practical struggle for the power to conserve or transform the social word by conserving or transforming the categories through which it is perceived". Defining is the construction of rule systems that confer status or identity (Lawrence & Suddaby, 2006), such as creation of standards. In the case of écobilan, it acted as a strong locking mechanism, inscribing into the norm the technical excellence in methodology, advocated by the elite consultants.

As I have defined what type of work the elite have used to create an innovation while trying to maintain the power of the French industry, it is also interesting to note the absence of certain types of work. For example, there was no educating work, although it is said to be "necessary to support new institutions" (Lawrence & Suddaby, 2006). There was also clearly no research centres developed outside of the Ecobilan consultancy, and theorizing was quasi absent in France after élite consultants left. Whether certain types of work were consciously avoided can be questioned, since educating would have probably meant simplifying a tool that was meant to stay high-end, complex, technical and out of reach of the mainstream.

5.2 Relative importance of actors in the institutionalization process

This paper disagrees with the view that within a constitutive network of support in the creation of a new accounting, all actors have the same important in determining the future of the tool (Alcouffe et al., 2008). Although elite cannot be defined as a sole "institutional entrepreneur" either, the network of support around the construction of LCA as an EMA tool was clearly conducted in the first five years by a small group of elite engineers from the Ecobilan team. Moreover, the role played by other members of the elite to first support the initiative, then take control of the tool, withdrawing it from the claws of first consulting group, demonstrate that actors have varying importance in the development of the tool.

5.3 Elite counter elites: fall of grace

The creation of new institutions is the work of a wide range of actors, not only institutional entrepreneurs, but also of "those whose role is supportive or facilitative of

the entrepreneur's endeavours" (Lawrence & Suddaby, 2006). In the case of écobilan, it is the work of an elite group of consultants, originated from engineer schools and "corps des Mines", but also the work of supporting actors such as the French environmental agency, the network of ex-corps industrials, and the French ministry of environment. However, this coalition of support is fragile and temporary, and the growing power of one part of the coalition (here the consultancy), can be viewed as a threat, as for example, when Ecobilan lobbied for the creation of a chartered accountancy of the environment. For the French industry, it was considered a threat to their discretionary power (Ramirez, 2001). As a consequence of the growing consciousness of the power accumulated by the consultancy, during the French standardization of the tool écobilan, it was renamed "analyse de cycle de vie". The name "écobilan" was a site of struggle, in the battle to monopolise the legitimate right to name (Farjaudon & Morales, 2013). These struggles over definitions are not neutral, since they embody changing positions of power (Everett, 2003).

5.4 Struggle for the elite tool to diffuse and become "democratic"

LCA is an example of a management innovation that was made complex and high-end so as not to appeal to a wide audience, to the contrary of others such as standard costing (Armstrong, 1985). The way it was created is contrary to what is expected of an innovation to spread (Djelic, 2008), that is to be simplified ad universally applicable.

Life cycle assessment was black-boxed according to the methodology, and the norms developed within the consultancy of Ecobilan in the early 90s. It has been acknowledged, that the French standard greatly influenced the international ISO standard. Therefore, life cycle assessment was black-boxed as being the most complete, the most high-end technical tool, with no interpretative flexibility (Qu & Cooper, 2011). Contrary to standard costing, that was made "too simple" by engineers and was later "stolen" by accountants (Armstrong, 1985), life cycle assessment was inscribed in the standard as very complex. Contrary to accounting technologies that are made on simplified representation to appeal to a wide audience (Armstrong, 2002), life cycle assessment is still often considered unapproachable by small and medium enterprises for example. This is despite the fact that the rationale of social and environmental accounting is "that it should result in greater openness and responsiveness to wider

social interests, the social philosophies inherent in the design of the approaches and procedures should not be at variance with the underlying rationale" (Hopwood, 1978).

5.5 Accounting's constitutive role in policy making

Napier (2006) said that the constitute role of accounting have been scarcely analyzed. The story of the creation of life cycle assessment demonstrates how accounting can be constitutive of how policy makers' views are shaped by accounting. Indeed LCA was used in political debates over recycling for the 1994 European directive. The use of LCA results changed the policy for recycling in the EU completely, proving that a 100% recycling policy would not be entirely beneficial to the environment. LCA was further used in eco-labelling debates in France and in the European Union. Today, LCA is the backbone of the experimentation for environmental labelling in France. LCA is thus constitutive of what is considered "good" or "bad" for the environment in many environmental regulations today.

6 Conclusion

This paper has explored the emergence of a new environmental management accounting tool, formerly called "écobilan". It has emphasized the role of particular agents in the innovation process, linking the historical and cultural conditions under which the innovation took place, and the possibility for agency to take place. Furthermore, the particular strategies developed by the French elite in developing and black-boxing the tool were emphasized. In a second phase, the consequences of this black-boxing were acknowledged, in the difficult diffusion and translation of the tool into companies.

I contributed to the management accounting innovation (MAI) literature by focusing the strategies of actors involved in the making of an MAI, here elite as institutional agents. The elite combines a strong ideological foundation and has a significant power base (Marriott, 2010), which can explain their role in determining key accounting innovations in a specific country base. Contrary to existing literature on elite work (Greenwood & Suddaby, 2006) I defined the type of work the elite do in institutional change and maintenance as locking mechanisms and also noted what work they do not do (such as educating). Through the genealogy of écobilan, I showed that institutional work can have various intertwined levels, and that creative work can be one strategy deployed in

a wider institutional maintenance work. Within creative work, different combinations of work can be used, and certain actors are more likely to use some than others, depending on their institutional environment.

Appendix

Academic origin	Number of interviews
Corps des Mines	3
Mines	2
Grandes Ecoles (Engineer)	4
Grandes Ecoles (ENA/Normale)	2
Engineers	3
Other	1
Unknown	5
Total	20

Appendix 1.1: Academic origin of interviewees

Maintenance work			
Creation work			
Mimicry	Identity	Gatekeeping	Locking work
			Theorizing/Defining

Appendix 1.2: The three levels in institutional work of elites

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ARTICLE 2–CARBON ACCOUNTING: FROM CONFLICT OF LEGITIMACIES TO THE INTERPLAY OF LEGITIMACIES

SUMMARY

CARBON ACCOUNTING: FROM CONFLICT OF LEGITIMACIES TO THE INTERPLAY OF LEGITIMACIES

Keywords: Internal legitimacy – external legitimacy – carbon accounting – organizational identity – institutional theory

Aim: This paper describes the introduction of a new accounting tool in the form of carbon accounting, in a multinational organization. The study uses institutional theory to understand the introduction of the new accounting tool and its confrontation with the external organizational field of carbon accounting. It explains in a longitudinal study over five years how an internally created carbon accounting tool was confronted with external constituents' requirements, and how the conflict of legitimacies unfolded.

Design: This paper mobilizes participant observation in a single case study and interviews.

Theoretical background: The study uses institutional theory to understand the introduction of the new accounting tool and its confrontation with the external organizational field of carbon accounting.

Findings: This paper shows how internal legitimacy can be the foundation for organizational legitimacy, and how it can complement external legitimacy in building the organizational legitimacy of a company.

Value: This paper makes two contributions. It suggests that external and internal legitimacies are not opposite but two facets of the same manifestation, organizational legitimacy. Secondly, this case study emphasizes that internal legitimacy can be the foundation of organizational legitimacy.

Carbon accounting: from conflict of legitimacies to the interplay of legitimacies

Abstract

This paper describes the introduction of a new accounting tool in the form of carbon accounting, in a multinational organization, using participant observation and interviews. The study uses institutional theory to understand the introduction of the new accounting tool and its confrontation with the external organizational field of carbon accounting. It explains in a longitudinal study over five years how an internally created carbon accounting tool was confronted with external constituents' requirements, and how the conflict of legitimacies unfolded.

This paper makes two contributions. I suggest that external and internal legitimacies are not opposite but two facets of the same manifestation, organizational legitimacy. Secondly, this case study emphasizes that internal legitimacy can be the foundation of organizational legitimacy.

Keywords: Internal legitimacy – external legitimacy – carbon accounting – organizational identity – institutional theory

1 Introduction

Regardless of the fact that accounting plays many complex roles in organizations and society (Burchell et al., 1980), its association with rationality is one of its distinctive features (Weber, 2003, 1927; Ansari & Euske, 1987; Carruthers & Espeland, 1991; Mouritsen, 1994). In a world of conflicting stakeholder demands, organizations are driven to incorporate ceremonial accounting tools that demonstrate an organization's commitment to a rational course of action (Covaleski et al., 1996). Expectations of what is acceptable exist in the institutionalized organizational field, and organizations are expected to passively conform to and consequently adopt the related accounting systems, if they want to maintain or gain legitimacy (Dillard et al., 2004). Therefore institutional theory has often been used to describe accounting choices made to conform to external parties and the institutionalized practices of the field organizations belong to (Abernethy & Chua, 1996; Collier, 2001; Modell, 2001; Tsamenyi et al., 2006). External parties seem to be willing to grant legitimacy to organizations that implement institutionalized accounting systems, whether this implementation is symbolic and contributes to a form of window dressing, or not (MacLean & Behnam, 2010).

However, Oliver (1991) claims, "institutional theory has tended to de-emphasize the ability of organizations to dominate or defy external demands". Indeed, decoupling (Meyer & Rowan, 1977) has often been considered the only natural outcome of using accounting strategically as a legitimating institution (Richardson, 1987). It is believed that accounting systems are implemented to satisfy institutional demands, and should not compromise with day-to-day activities (Carruthers, 1995). However, resorting to decoupling as a response to external demands entails consequences such as strong resistance from internal constituents (Tsamenyi et al., 2006), the misappropriation of means to meet internal constituents' ends (Collier, 2001; Moll & Hoque, 2011), the institutionalization of misconduct (MacLean & Behnam, 2010). Organizations resorting to decoupling risk unintended consequences such as poor employee involvement which affects morale (Wood, 1991) and fosters cynicism (Boxenbaum & Jonsson, 2008), the loss of organizational memory (Tsamenyi et al., 2006), the loss of external organizational legitimacy (MacLean & Behnam, 2010), and being misclassified as a social actor (Whetten, 2006). These consequences are often the manifestation of dissonant legitimacy perceptions between insiders and outsiders (MacLean & Behnam, 2010).

Therefore, although institutionalists have begun to attend to the uneven basis for legitimacy over different types of audiences (Deephouse, 1996), Moll and Hoque (2011)as well as MacLean and Behnam (2010) posit that not enough attention has been given to institutional demands from within an organization. Indeed it seems likely that insiders' perceptions differ from the perspective held by external stakeholders (MacLean & Behnam, 2010). Legitimacy is granted by a large audience that includes insiders as well as outsiders (Elsbach, 2006) and therefore there is a need to better understand internal legitimacy defined as the organization members' perceptions of the appropriateness or acceptance of the legitimation institution (MacLean & Behnam, 2010), in this case, the accounting system.

Organizations receive conflicting demands from constituents from inside and outside, therefore questions arise on whether organizational legitimacy can be realized through internal or external legitimacy, or if both can cohabit. Furthermore, is external legitimacy always the one that rules over other legitimacies to sustain organizational legitimacy? I would like to elaborate on the consequences of a conflict between legitimacies in relation to multiple audiences, following the study by O'Dwyer et al. (2011) of the legitimation process of assurance for sustainability reporting. Accounting has been conceptualized in legitimacy studies as a legitimating institution (Richardson, 1987). In this study, I seek to explore how a new accounting practice became the centre of a conflict of legitimacies and how internal legitimacy played a crucial role in maintaining organizational legitimacy, albeit in interplay with external legitimacy requirements.

Climate change and global warming has come under the spotlight in the last few years, following the ratification of the Kyoto Protocol, the beginning of the European Union carbon trading scheme, the Nobel Peace Prize attributed to Al Gore in 2007 for his focused attention to global warming, the initiatives such as the Carbon Disclosure Project (CDP), the GHG Protocol or the new French law Grenelle 2 that requires from 2012 on that companies report their carbon emissions. My empirical focus is on a new emerging practice, organizational carbon accounting.

I focus on an organization, where instead of drawing from the institutional context and choosing an existing carbon accounting methodology, the carbon accounting system was built internally from the very beginning, without reference to the externally recognized methodology. Carbon accounting methodologies were already in existence (the GHG

Protocol standards 2001 and 2004), but they were not considered to be compliant with the company's internal values and how it conceived its relationship to the outside world. The company embarked, in 2007, on building a carbon accounting system that would match their organizational identity, and espouse values of credibility and internal engagement. The accounting tool had in five years gained considerable internal legitimacy.

The case study provides an understanding of how accounting's internal legitimacy plays a crucial role in building organizational legitimacy. It also provides an illustration of a conflict of legitimacies between an internally trusted accounting system and distrust initially expressed by external constituencies. The case illustrates that conflict of legitimacies can result in cohabitation, and I posit that both internal and external legitimacies are necessary to construct organizational legitimacy. Furthermore, the case study adds the concept of relational legitimacy (Tost, 2011) as an important additional facet of internal legitimacy thereby refining our understanding of how insiders grant, or retain legitimacy to their organization.

The remainder of the paper proceeds as follows: the next section explores accounting as a legitimating institution, distinguishing between externally granted organizational legitimacy and internally granted organizational legitimacy. The field of carbon accounting for organizations is introduced and its legitimacy-granting modalities. The qualitative research method is introduced and the case setting is described. It is followed by the case analysis, which demonstrates the importance of internal legitimacy for organizational legitimacy as a whole. The last section discusses the case findings.

2 Theoretical perspectives on legitimacies

2.1 Organizational legitimacy

Legitimacy has been described as "perhaps the most central concept in institutional research" (Suchman, 1995; Colyvas & Powell, 2006). According to Weber (2003, 1971) an order is legitimate if it can be believed to be exemplary and of binding nature. The legitimacy of the social order is binding to organizations that are part of that social order, and constitute moral obligations, which they need to comply with. Legitimacy constrains, constructs and empowers organizational actors (Suchman, 1995). It can be defined as "a generalized perception or assumption that the actions of an entity are

desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995).

"The firm is granted de facto legitimacy at birth because of its legal status, and then it can become a tradition in the sense of Weber's traditional legitimacy" (Breton & Côté, 2006). However, legitimacy can grow, be called into question, it can also be lost and recovered (Suchman, 1995; Breton & Côté, 2006). Therefore, its role is critical in determining "the development and endurance of organizations" (Tost, 2011). It is seen as providing a "reservoir of support" that contributes to the survival of an organization (Dowling & Pfeffer, 1975; Tost, 2011). "Persons or institutions who lose legitimacy find it difficult to enter into processes of social exchange as their partners do not rely on their compliance with social rules" (Palazzo & Scherer, 2006). External organizational legitimacy hence shapes the support and behaviour of external stakeholders such as investors (Pollock & Rindova, 2003). Being externally legitimate for an organization can also shape loyalty from internal constituents (Tyler, 2006).

Expectations of what is acceptable exist in the institutionalized organizational field, and organizations are expected to passively conform to and consequently adopt the related accounting systems, if they want to maintain or gain legitimacy (Dillard et al., 2004). A central issue for legitimacy research is therefore identifying who has collective authority over legitimation in any given setting (Deephouse & Suchman, 2008). For example, in Tsamenyi et al. (2006), the new accounting and financial information was imposed by the head office of the group, in response to regulatory requirements. Deephouse (1996) states that only certain actors have the standing to confer legitimacy and focuses on government regulators and public opinion, and while acknowledging that other studies could focus on intellectuals and funding agents, they are all part of the group that are external to the organization which they lend legitimacy to. Often, legitimacy is implicitly conflated with external legitimacy (Crilly et al., 2012), and legitimacy is framed as something acquired only from external audiences (MacLean & Behnam, 2010).

2.2 Decoupling materializes external legitimacy prevalence

Decoupling is a materialization of the prevalence of external legitimacy claims at corporate level, which obscures insiders as potential legitimacy carriers of the organization (Moll & Hoque, 2011; Tsamenyi et al., 2006). Decoupling (Meyer & Rowan, 1977) is an organizational response to pressures from the field to incorporate a new

practice and refers to the situation where the organizational structure or practice is distinct from actual organizational practice, that is, it is not integrated into the organization's managerial or operational processes (Dillard et al., 2004). Decoupling allows maintaining external organizational legitimacy, while not having to implement fully or at all, the new practice. When tools are adopted on a ceremonial basis, and when "minimal adoption" happens, it is that the tool is not internalized, therefore it is said to be loosely coupled or decoupled.

When ceremonial adoption occurs, it means that employees "do not have the knowledge and the cognitive categories they need to correctly understand and interpret the practice" (Kostova & Roth, 2002), the practice becomes suspect because it is not consistence with their values and beliefs (Kostova & Roth, 2002). As a consequence, internal constituents might come to distrust the new practice imposed from the field or to apply it in a very loose and decoupled way (Collier, 2001).

Furthermore, resorting to decoupling as a response to external demands has the consequence that internal constituencies tend to exert their strategic agency to manipulate the new practice to their advantage by resisting it (Tsamenyi et al., 2006), using the tool to meet their own ends (Collier, 2001; Moll & Hoque, 2011), or covering illegal practices such as misconduct via the decoupling phenomena (MacLean & Behnam, 2010). The organizations' performance can be affected by poor employee morale (Wood, 1991) and cynicism (Boxenbaum & Jonsson, 2008), the loss of organizational memory (Tsamenyi et al., 2006), and finally by the ultimate counter-result, the loss of external organizational legitimacy (MacLean & Behnam, 2010).

2.3 Internal legitimacy

Stories of decoupling illustrate the consequences of choosing external legitimacy over internal legitimacy. To understand how the image of legitimate accounting can be upheld externally, internal legitimacy demands need to be better understood (Moll & Hoque, 2011). Internal legitimacy is defined as "internal legitimacy refers to the acceptance of an organization by its internal constituencies" (Kumar & Das, 2007). A new practice acquires internal legitimacy, "when the employees view the practice as valuable and become committed to the practice" (Dambrin et al., 2007), consequently the adoption of the new practice can be said to be active and internalized (Kostova & Roth, 2002). Internal legitimacy can take several forms, the most important being to

achieve internal cognitive legitimacy, that is having new practices be coherent with organizational identity. Additionally, internal legitimacy can take the form of pragmatic internal legitimacy in addition to internal cognitive legitimacy.

Internal cognitive legitimacy

Cognitive legitimacy is based on the ability to accommodate an innovation with existing cultural schemas (Suddaby & Greenwood, 2005). Internal cognitive legitimacy is acquired by a new practice when it does not conflict with current internal ideals, when it is viewed as natural and inevitable (Dambrin et al., 2007), more specifically; cognitive internal legitimacy is constituted via congruence of the practice or tool with organizational identity (MacLean & Behnam, 2010). Organizational identity is defined by the central and enduring attributes of an organization, what the organization must do to avoid acting out of character (Whetten, 2006). The attributes must be at the same time distinguishing, central and enduring in time. They define what is considered appropriate action for the organization (Whetten, 2006).

For instance, O'Dwyer et al. (2011) explores how internal legitimacy failed to be gained for sustainability assurance practice. Legitimacy for the new practice tried to be secured via a former financial auditor, playing the role of the "bridge" between the new department and the internal department of risk, but the new practice was persistently inconsistent with internally existing and prevalent values, and therefore was not accepted. O'Dwyer et al. (2011) infer that a new emerging practice needs to gain internal legitimacy and be consistent with internal values, or organizational identity. Tsamenyi et al. (2006) also describe how a new accounting and financial information system was in conflict with the values of local employees. It was inconsistent with the "paternalistic culture and autonomy of local employees". On the other hand Yazdifar et al. (2008) describe the successful implementation of a new system by the organization mainly because of "its attention to the values and taken-for-granted assumptions" in the subsidiary where the implementation was taking place.

Pragmatic internal legitimacy

Pragmatic legitimacy rests on the self-interested calculations of an organization's audiences (Suchman, 1995). It is based on its perceived practical consequences or instrumental value (O'Dwyer et al., 2011). For example, in the research in the Omega company, Scapens and Roberts (1993) demonstrated how a new system was considered

a potential threat to the autonomy of the business unit as it attempted to make the unit managers more visible to the divisional management. Furthermore, there were fears that a 'divisionally designed' system would not meet the local needs of the unit companies (Scapens & Roberts, 1993). In this case, pragmatic internal legitimacy was violated.

Consequences of not considering internal legitimacy

As Moll and Hoque (2011) contend by citing Boxenbaum and Jonsson (2008): "systems that are "persistently inconsistent with how organizational members see themselves" may bring about reactive behaviours on the part of such constituents". Boulding (1967) states "a loss of internal legitimacy leads to disorganization of behaviour and an inability to perform an assigned role".

The penalties of inconsistent or incoherent organizational practice are severe and limit the ambiguity accepted with the identity discourse (Czarniawska-Joerges, 1997) quoted by Whetten, 2006). Organizational identity helps an organization not to be misclassified as a social actor (Whetten, 2006). Organizational identity is also said to be indispensable for most fork-in-the-road choices, especially if the new course of action is considered out-of-character by a legitimating audience (Whetten, 2006).

2.4 Conflicts

Organizations are often accountable to an extensive number of constituents with expectations that can often be conflicting (Ashforth & Gibbs, 1990). Legitimacy contains a temporal dimension, which allows legitimacies to evolve and to be confronted throughout time (Suchman, 1995). Legitimacies can reinforce each other, but can also conflict with each other (Suchman, 1995). Often, conflicts of legitimacies have been analysed at the level of an organizational field (Modell, 2003), between different constituents' interests. However conflicts can also arise when external legitimate practices enter the organization and are seeking internal legitimacy.

Moll and Hoque (2011) conclude the conflict between the externally legitimated budgeting system and the internal users by saying that the internal constituents' interventions "proved successful", meaning that one legitimacy "won" over the other. O'Dwyer et al. (2011) talk about the "nature and extent of the difficulties involved in aligning the attainment of (the) different legitimacy types", focusing on the differences between the legitimacies and the importance of the adequacy of legitimation strategies

with the targeted audience. Collier (2001) describes the conflict between external regulators and the ethos of police managers and how the police managers finally were able to use the externally requested resource allocation structure to support their technical work as a police force.

However, these conflicts arise once an externally legitimated and requested accounting practice is brought in, in an organization that tries to resist it. In some cases, resistance is played down and the accounting is accepted over time through the use of power (Tsamenyi et al., 2006), in other cases the new practice is used by internal constituents to achieve their goals (Collier, 2001).

2.5 Conclusion

Internal legitimacy has been scarcely studied (Kumar & Das, 2007; MacLean & Behnam, 2010; Moll & Hoque, 2011; O'Dwyer et al., 2011) although the consequences of not considering it are important on the organizational integrity of companies and their performance. Dissonances between external and internal legitimacy perceptions often occur at the stage of the adoption of a new accounting tool, and they need to be resolved, and tensions flattened (MacLean & Behnam, 2010). Therefore, this paper seeks to answer whether external legitimacy always rules and if the main source of organizational legitimacy come from internal legitimacy. Furthermore it aims at understanding whether internal and external legitimacies always conflict or if they can interact in the constitution of organization legitimacy.

To the best of my knowledge, there is little literature on an internally legitimate accounting tool that won over the externally legitimated and imposed new practice. Therefore, in this study, I seek to explore how a new accounting practice became the centre of a conflict of legitimacies and how internal legitimacy played a crucial role in maintaining organizational legitimacy, albeit in interplay with external legitimacy requirements.

3 Legitimacy in the field of carbon accounting

In the field of global climate change and business organisations, several institutions such as the World Resources Institute (WRI), the World Business Council for Sustainable Development (WBCSD), the Carbon Disclosure Project (CDP) have already suggested legitimate action frames for measuring and accounting for organizational GHG

emissions.

Carbon accounting standards have a growing importance in organizations' carbon strategy, mainly because since carbon measurement is in its infancy and still contested (Milne & Grubnic, 2011), results of different organizations are rarely comparable. This is mainly due to the "uncertainties, complexities and challenges involved in accounting for carbon dioxide and other GHGs" (Milne & Grubnic, 2011), and the currently existing tensions between the goals of accuracy, consistency and certainty across fields (Bowen & Wittneben, 2011). Therefore, organizations tend to appeal to "procedural legitimacy" (Suchman, 1995), which is significant in the absence of clear outcome measures (Scott, op. 1992). The reliance on standardised methodologies allows process justification to be substituted for outcome justification (Herrbach, 2005). Therefore making sure you follow a particular standard and being able to prove it, "demonstrate that (an) organization is making a good faith effort to achieve valued, albeit invisible, ends" (Suchman, 1995). Green (2010) defines the GHG Protocol standard as a set of general principles and a "how-to" on how to conduct a GHG inventory. It also serves as a conceptual framework to conceive responsibility of emissions with boundaries and scope concepts (Green, 2010). The standard was also meant to be flexible in its implementation: "if certain non-essential parts of the standard were objectionable, they could simply choose not to implement them" (Green, 2010), lowering the possibility of comparison of results. Therefore, the GHGP can be categorized as a process standard, which provides direction for action (Brunsson & Jacobsson, 2002).

The GHGP is based on accounting principles: "This was considered important because it is widely expected that GHG emissions will have a financial value in the near future and need to be accounted for in the same way as other financial assets or liabilities on the balance sheet"(GHG Protocol, 2001).

It is also widely considered auditable: "The 'first edition' standard (…) have also been subjected to a rigorous review from KPMG to ensure they are consistent and capable of generating information that could be independently verified". The GHGP states that it "is designed to develop a verifiable inventory" (GHG Protocol, 2004). This goes hand in hand with another of its main goals, which is to be readily communicable to external stakeholders.

The use of interpretive schemes of the financial community allows a shared understanding of carbon performance by the whole finance community (investors,

auditors, corporations). Since accounting is "the language of business", using accounting principles and framework allowed executives and managers to make sense of what they would do in terms of carbon accounting, and what competitors would also do (Macintosh, 1995). The GHGP embedded itself in the "cultural and cognitive schemes" of financial accounting. It was deliberately chosen to resemble closely financial accounting, to "ensure the greatest compatibility". This alignment with the financial sphere's value system has until now been a great factor of success for the GHGP, as I will show below in the development of a network of carriers and promoters.

After the emergence of the norm in 2001, the GHGP's life cycle followed a "tipping point" (Finnemore & Sikkink, 1998); an important number of actors had chosen the norm. Voluntary governmental initiatives, industry associations, non-governmental initiatives endorsed the GHGP as the "one and only" way to measure GHG emissions (Green, 2010). Beyond this tipping point, "the binding nature of the norm extends to such an extent that all actors recognise norms as binding" (Sunstein, 1996). Adopters are not just "passive mediators" (Bebbington et al., 2012) but carriers of the values embodied by the GHGP to the organizations. It is important to see that many carriers came from governmental initiatives or industry associations, thus organizations were circled by initiatives that endorsed the Protocol.

The legitimacy of the GHGP is also based on the partnerships that were initially developed. The partnership with the WBCSD brought from the start access to the world's leading companies that were able to road test, contribute and use the standard. A second key partner was the US EPA's funding of the standardization process and adoption of the GHGP via its Climate Leaders' program. It "lent legitimacy to the efforts of WRI and WBCSD" (Green, 2010). The US EPA is the national American environmental agency, which has been involved from a very early in environmental accounting initiatives (see the environmental accounting project started in 1989 that lasted until 2002). Its involvement "served to reassure firms that the Protocol's rules would be taken seriously by the US government" (Green, 2010).

Characteristics	GHG Protocol Corporate Standard
Year of standardization	2001 (revised 2004)
Scope	A corporation
Source of emissions considered	Energy sources by site
Scope	Scope 1, 2 and 3
Boundaries	Control or equity share approach (financial consolidation)
Main Stakeholders	Investors
Methodology	Financial accounting
Principles	Relevance, completeness, consistency, accuracy, transparency
Cognitive orientation	Financial analysts/financial accountants
Source of information	Invoices
Verification	Audit
First companies (Initiators)	BP
External Output	Public reporting, participation in GHG markets

Table 2.1: Characteristics of GHG Protocol

The domination and legitimacy of the GHGP to report carbon performance is currently reaching the point of being of a "binding nature". Not using it signals that an organization is not being part of an environmentally conscious community of corporations. In addition to being the norm, the most credible and thus legitimate sustainability rating, the CDP (41% high credibility in SustainAbility's report, only second to the Dow Jones Sustainability Index) advocates the use of the GHG Protocol (GHGP). The endorsement by the CDP has also lead to having the vast majority of the reporting companies using the GHGP: "the short answer to who uses the GHG Protocol is almost everyone. Over 85 percent of 2487 companies who took part in a 2010 Carbon Disclosure Project survey either directly used GHGP or did so through participation in a climate change program" (Ranganathan, 2011). The CDP readily advocates through the format of its questionnaire and the recommendations it makes, to use the GHGP to measure corporate emissions. Their climate change reporting framework (CDSB, 2010) endorses the GHGP as a source "that informs the characteristics" of the information (p.14) and the GHGP is a "recognized GHG emissions reporting scheme" (p.19). The questionnaire asks for scope 1, 2 and 3 emissions[56], which is a concept developed by the WRI in the first GHGP (Green, 2010).

[56] Scope 1 represents direct GHG emissions, scope 2 represents electricity indirect GHG emissions and scope 3 represents all other indirect GHG emissions

"It is clearly in (their) interest to earn a favourable CSR rating. A good rating brings awards, applause, sales and reputation. It reduces the likelihood of "churn" when consumers, investors or employees mobilise against the company (…). In turn, a poor CSR rating can shake the economic foundations of a company's operations" (Marquez & Fombrun, 2005). Companies that have good results boast about them (see Siemens' website about their 2010 results) and use them to legitimate their carbon climate strategy and results (Deegan, 2002).

	Signification structure	Legitimation structure	Domination structure
Carbon Disclosure Project	Finance markets	Represents 655 institutional investors with $78 trillion in assets	41% credibility just behind the DJSI (Rate the raters report)
GHG Protocol	Financial accounting	Partnership with WBCSD;US EPA endorsement	Did not allow for competing standards to emerge (ISO 14064 is a copy of the GHG Protocol)

Table 2.2: How the CDP and the GHG Protocol structure carbon accounting for organizations

4 Research Design

I acknowledge the recent development of environmental management accounting tools, and in particular of carbon accounting tools that allow organizations to quantify and monitor their environmental impact. I focus on the link between the outside (the institutional field) and the inside of an organization that is faced with the decision to adopt a new environmental accounting tool, from the perspective of the organization. I explore, from the organization's standpoint, the strategy of adoption and its consequences externally and internally. Particularly, I focus on the legitimacy impact and consequences of the implementation of a new environmental accounting tool.

Following Tolbert and Zucker's (1996) advice to analyse institutional processes over time, and to overcome looking at legitimacy as an outcome or result of a process, thus allowing us to see the legitimacies conflict unfold, I conducted a longitudinal single case study over five years. Moreover, to be able to experience the decision, the implementation and its consequences both on the external side but also on the internal constituents of the organization, I conducted a single case study research from within

the organization. Since this research focuses on the micro-level processes linked to legitimation, I conducted participant observations (Spradley, 1980) and spent twelve months full time as a member of the nature team[57].

4.1 Data collection

Contact with the company was made in early 2010. At that time, the initial carbon accounting tool on excel had been in use for two years running, and the transfer into the ERP system was starting. The company allowed me to become part of the nature team. I was therefore a full time member of the nature team, reporting to the nature Chief Financial Officer (CFO) for twelve months. Over the first period at the end of 2010 and beginning of 2011, I was able to witness the result of a legitimacies conflict that had happened at the end of 2009 and the beginning of 2010, by participating in meetings on the implementation of a second carbon accounting system. I was able to witness the disarray caused by the realization that their in-house accounting was not certifiable. At that time, interviews were conducted with the former environmental director, the new nature manager, as well as the two major divisions' environmental directors, who had been in charge of carbon accounting since 2007 and 2008. During this phase, an initial understanding of the conflict between inside and outside was gained. In a second period from November 2011 to July 2012, I came back to a relatively calmer and more relaxed team, who had made peace with the conflict they had experienced a year earlier. As the implementation of the second carbon accounting system was on-going, a more in-depth understanding of the conflict resolution was gained. I was also able to conduct further interviews with the initial team that had started carbon accounting in 2007, including the consultant who had developed the tool and has continued to be owner of the model until today. Moreover, interviews were conducted with four top managers of the company, including two members of the executive committee, in charge of the carbon strategy and more generally the nature strategy of the company. Deeper understanding of the "legitimation crisis" was finally gained during the feedback meeting where first results of the research were presented back to the nature team, in July 2012.

Through this insider access into the company, I participated thoroughly, as a full member of the nature team in all nature team meetings and all meetings related to carbon accounting system implementations, quality, standards and convergence. Notes

[57] "Nature team" is the name given to the environmental team at headquarters

and observations of meetings were taken in different notebooks, totalling over two hundred pages. Some meetings were audio-recorded when allowed, so as to retain them for the post participation observation period, as illustrations of instances of discussions related to the strategy and the accounting. As I was directly reporting to the nature CFO, I was able to have daily conversations and exchanges on the development of carbon accounting with the CFO, the consultants involved in the development of the carbon accounting tools and the nature controller. As an insider to the team, I was also allowed access to presentations, meetings minutes, informal conversations and email exchanges around the development of carbon accounting in the company. Earlier presentations and earlier models of the tools and user guides were accessed through interviews with the initial implementation team in 2007.

In total, thirteen formal interviews were conducted in the company: the former environmental director, seven interviews where the interviewees reflected on the early implementation of the tool and on the development of carbon accounting in the company, the nature manager, two top managers and two managers from the executive committee, in charge of the nature strategy. The interviews allowed me to gain insights into the creation of the accounting, since participant observation started at the time of the crisis in 2010. The transcription of the feedback meeting organized on the research in July 2012 was also used for the detailed accounts given on the legitimacy crisis and additional comments made on the initial analysis made.

4.2 Data analysis

All interviews and meetings were transcribed and analysed using a qualitative data analysis programme named Dedoose[58], which allows interview transcriptions and other qualitative sources to be coded line by line. Codes can be drawn up from three obvious sources: existing research questions, theory, data, but also and more importantly the interaction of these three elements during the conduct of the research (Anderson-Gough et al., 2005). A total of 290 excerpts from the transcriptions were coded around key themes. Themes were inductively coded at first from the field data, around the decision taken to implement a new nature strategy, the choice of carbon as the indicator, and the initial development of carbon accounting. In a second analysis, more themes were added

[58] Dedoose, formerly called EthnoNotes, is a qualitative data analysis online software, designed by experienced social science researchers using psychological and anthropological research methods. It has been in existence for the last 13 years.

according to the theoretical framework of legitimacy, including the development of a strong internal legitimacy and the legitimacy crisis. Attention was given to the elements of organizational identity that were mentioned, as well as the adherence of the employees to the carbon accounting strategy.

Data was also gathered around the institutional field of carbon accounting, to understand the meanings and ideals carried by external stakeholders such as the GHG Protocol and the Carbon Disclosure Project. Data includes the newsletters of the GHG Protocol, the carbon accounting standard itself, the reports of the carbon disclosure project, reports on sustainability ratings from Sustainability[59] and an interview of the director of the GHG Protocol.

4.3 Case context

The company that I contacted to undertake my research has a history of being innovative in corporate social responsibility topics. The company is a medium size multinational in the food sector. This company is a typical example of hybridity, a transitional form of organization that is an example of blending, where "the possibility of new alternative accounts of management accounting practice (…) are no longer bounded by organizations and society, but accommodate their fusion and permeability" (Baxter & Chua, 2003). It represents a transitional organization form that is an example of private organization "grappling with their increasing community and environmental responsibilities" (Baxter & Chua, 2003).

The founder of the company in 1972 made a speech in Marseille that became the foundation of what has been called the dual economic and social project of the company:

> *"[The founder] opened a large part of management of economic activity where he said: 'stop looking at yourself, your inputs, your outputs and take care of your people and take care of your environment'. That's the starting point." (Interview 13)*

[59] Sustainability is a world-renowned think tank and consultancy on sustainability issues, founded in 1987 by Elkington and Hailes.

A first emblematic action towards recognizing the company's impact on its environment was "Vacances Propres"[60] in 1972:

> *"Then, in [72], you have the Vacances Propres [Clean/Green holidays] operation. There, [the founder] finds that he has a direct impact through his direct and degrading operations on the environment. And he tells you: I can actually say that it is the responsibility of public authorities, but I can also take things in hand and take care and ensure that the country does not get stained and soiled in the literal sense of the term, the country in which I operate." (Interview 13)*

In the early 70s, the environment was not yet a fashionable topic in France, but the founder of the company had recognized early on the impact of new consumption modes, especially the non-reusable packaging. It was an idea that was "ahead of times, before regulation, before fashion" (Vacances Propres, 2012). The same idea was behind the establishment of "éco-emballages"[61] in 1992. Both programmes represent the idea behind the discourse of Marseille that the responsibility of an organization does not stop at the gates of a factory. They both also embody the proactive behaviour with which the company acts upon issues they think should be dealt with, without waiting for public authorities to take over. Since 1972, the company made its own the need to manage not only financial resources, but also social and environmental resources.

However, coming into the year 2000, the management of the environment inside the company was considered as being very much compliance driven, with a limited scope on its factories:

> *"Because the first phase, which was 2000-2004 is 'yes, anyway, it should be done,' so there was no hesitation, no animosity on the part of all our decision makers to say 'good then, let's do it,' because it is the law, basically because it is the law." (Interview 1)*

> *"It was in the days when we had a management of the environment through three indicators, which were water, energy and waste. So it was something very very industrial and operational." (Interview 5)*

The environmental component of their dual social and economic project had become dormant. The company had to acknowledge that after 10 years:

[60] Vacances propres is the name of the campaign to raise awareness and encourage the public not to dump waste (déchets sauvages) and to sort waste. It aims at fighting against the dumping of waste in nature and recreational areas. This campaign is supported by the association "Progrès et Environment" created for this purpose 40 years ago by some business leaders of fast moving goods companies, who had identified in 1971 the issue of waste as critical (Vacances Propres, 2012).

[61] Eco-emballages aims at ensuring extended producer responsibility for managing the end of life of their household packaging. Its mission is to drive the structure for sorting and recycling to the benefit of the consumer-citizen resident

> *"We had environmental objectives and they were regularly reached, they were maintained a little on an ongoing basis, they were not at the heart of our priorities, they were there and we followed them regularly, but they were not at the heart of our priorities." (Interview 14)*

While a need for change in the way the environment was dealt with was acknowledged, the new strategy was not easily redefined:

> *"And I thought that beyond the commitments that the group had by the year 2010 and that were important, of reduction, of consumption, of a number of resources, I was looking for a way to articulate more strongly still our business approach and its relation to natural resources." (Interview 9)*

Looking at other "hybridized" companies was one source of inspiration. Consumers started to show an environmental awareness that the company could not ignore. The company was also orientating its strategy towards providing healthy food, and realized it could not talk about health, without talking about nature:

> *"In 2007 we needed to integrate the environment not say like an adjustment variable, a compliance variable, but as an activity that could be really beneficial for both driving performance internally and then also adding value to products, adding 'nature" value to products." (Interview 1)*

A new strategy was formally launched in 2008, with four core strategic priorities that were "health, for all, nature and people". This new strategy was closely aligned with the newly redefined mission "bring health through food to as many people as possible".

Correlated to that new strategy, a new accounting for carbon was created as early as 2007. Accounting systems can be said to bring a form of "stability" in a hybridized context (Baxter & Chua, 2003), although they can also shed light on invisible contradictions especially between symbolic power (external legitimacy) and internal legitimacy.

5 Findings

5.1 To discard or not to discard

In 2010, the Nature CFO, whose mission was to get certification for the internally built carbon accounting system, came to realize, through discussion with an external consultancy, that it would never happen:

> *"My brief when I took the position was: you take what is there, this measure we began to do, and have it certified. And it took me a few months to understand that with all this mess that we had with [consultancy manager], we argued every day in*

> *every single meeting. But it led me to understand that these things, I could never have them certified, in the state they were in, and that still holds true. Because it may be certifiable for one product, but it will never be for the addition of all products." (Recorded meeting)*

For six months, the Nature CFO discussed the possibility of certification to no avail:

> *"In the first meetings I had, of course, in 2009, in which the whole discussion took six months, [consultancy manager] did not understand what I was talking about. And I did not understand why he told me that the sum of all the LCAs would not give me the GHG [Protocol number]. And he did not understand how I could say something as wrong as: the sum of all will give the total GHG [Protocol number]. And we spent 6 months like that." (Recorded meeting)*

The external consultancy issued two reports, at the request of the company, showing the discrepancies of their accounting with the GHG Protocol standard. At that time the Nature team was put under pressure:

> *"He came with a big pail of vomit", "it was two very tough moments [c'était deux moments super chauds], when we believed that we would have to scrap everything (…) and after we had to explain to the Chief Information Officer that he had spent so much time developing the [ERP] system, and now he was scared to go and see his boss to say: it's useless. Okay it was a few millions, but…" (Recorded meeting)*

The message delivered was basically to restart everything using the GHG Protocol methodology as the norm for carbon accounting. At the time the tool was built, between 2007 and 2008, the former environment team had not realized, how central to the field of organizational carbon emissions, the GHG Protocol had become.

5.2 Non-adoption of GHG Protocol

In 2006 and 2007, at the start of reflections on carbon accounting, there was already a carbon accounting standard for organizations in existence, the GHG Protocol Corporate Standard. However, it was not chosen as the retained methodology:

> *"I think there is still one thing that shocked me at first, is that when you are looking closely at the GHG Protocol, Scope 1 and Scope 2, it was very: I deal with what I'm really able to control, and it was like: in the end, I've got nothing to do with the packaging, it is outside, the transport I request, it is out and so on. And I felt that this GHG Protocol approach was very American, very business oriented, saying: here we are able to act, the rest, well, after all, it is not our fault." (Recorded meeting)*

> *"Anyway, for us, it was an aberration. (…) It could not work, we would have been limping along on three legs, it was wrong." (Interview 5)*

Indeed, it did not fit the company's own identity and their way of looking at their responsibility towards the external environment. Doing a limited accounting based only on financial control[62], and excluding activities that were externalized such as packaging or transportation did not make sense.

The internally built accounting tool was constructed to calculate based on the entire value chain. The accounting was based on ISO 14040, the LCA approach:

> *"Can there be an indicator that allows us to relate the entire value chain, because the idea is to say we really have to [measure it], and here this is the company speaking, not the factory, this is the company that will actually account for its footprint." (Interview 1)*

The life cycle approach represented the "true" organizational accounting, versus only the factories, compared to the GHG Protocol that is entity based (site based) and therefore sticks to the narrow vision of environmental responsibility. An extension of the dual project is the "extended responsibility" concept, which was coined by the founder when he said, "the responsibility does not end at the factory gate". This explains why the GHG Protocol scope 1 and 2 was considered an "aberration".

Looking for external credibility of the tool

Credibility for the internally built accounting tool was first embodied through the constant quest for preciseness. For example, after realizing the importance of a major raw material in the total footprint of the company, they decided on the development of a new specific tool to ensure the preciseness of emission factors. This tool was co-developed with external experts:

> *"So we decided to invest with the Institute of animal husbandry (institut de l'élevage) in the development of a tool. That is to say, a sub-tool provides information about the farm, and after that we can do our own consolidation by saying: here, actually in these countries there were three types of farms: small farmers, medium and large farms. In that country, we measured large farms, it is at that level. So we invested in the construction of a tool to generate information to be able to generate a lot of precise measures to be as refined as possible vis-à-vis local information." (Interview 1)*

[62] In 2006/2007, the scope 3 standard did not exist and companies were reporting only scope 1 and 2. Equity share and financial control organizational boundaries exclude a lot of activities such as externalized transportation.

The company developed a unique database of raw material footprints in each country in which it produces. Anchoring their data set locally was important to achieve credibility of the calculations. Preciseness was important also because it linked back to the possibilities for action:

> *"Where it is important is that a parameter of action must be precise, because if we give a decision-maker information by saying 'ok, listen up, you are about 30% there' and then you go ask him to make a 30% reduction, it won't hold up." (Interview 1)*

One last step was started during the year 2008. The excel carbon accounting tool, measuring product carbon footprint, was submitted to peer review:

> *"But it seemed to us important that the tool be credible and recognized externally (…) The tool has been constructed with an external expert, but there is no evidence that it is done according to the methodology that goes well, etc.. So the way to make the tool a credible tool for people from outside, without going into a 3 hour explanation, is to use a peer review process coordinated with external experts who give their opinions. And we have an official opinion, and we can say: look, this process was reviewed." (Interview 8)*

The different divisions submitted the tool to external peer reviews. In the United Kingdom, the Carbon Trust certified some products for the British market. In 2009, the environmental director explained in a press article:

> *"Our LCAs which deal with the product from the farm to the end of its packaging life, attribute 60% of GHG to the farm portion. This average is the result of 1400 measures taken on our dairy products all around the world. The LCA was done with the help of Price Waterhouse and validated by Carbon Trust. It is currently under peer review by ADEME." (Press)*

However gradually, credibility of the measure was put in question internally:

> *"However, I think that relative to LCA experts, we might have a little more difficulty. We probably have credibility because indeed we are an actor that has long worked on the topic. This is not why we have accuracy in our execution or our way of doing things. So for me, certification is absolutely necessary for precisely everything we did outside the framework, being within an LCA framework, to make sure we do not have an Achilles' heel that will be our downfall." (Interview 5)*

At the same time in 2008, the company decided to set a public target of 30% carbon emissions reduction over 4 years. This target required the carbon accounting to move from a product level to the group level. This consolidation of product footprints to get to the corporate footprint has no previous precedent and was not standardized. The consolidation of individual product PAS 2050 was not a recognized way of accounting for carbon reduction efforts at the organization level. Interviewee 1 acknowledged:

> *"So we are in a field that is still very exciting and new. And what struck me right away was that the tool we are setting up, it is a specific and unique tool of [our company]. So at some point, you need to certify it anyway. If you don't certify it, we will not.... And I had in mind initially to provide environmental information on products. So in fact I oriented the certification initially around that. So we have to certify the tool, the methodology and then also the measurement itself, therefore we went for the double qualification with Big 4 and with Carbon Trust. And honestly, I wasn't thinking too much about the certification of information for reporting."*

5.3 Risks of non-adoption

With the target of carbon emissions reduction set, the company started to communicate about the results and achievements. The results were obtained via the carbon accounting tool built internally, and the specific consolidation methodology developed internally. However, the emissions reduction target was set on a different scope from the accounting. Carbon accounting was done on the whole life cycle, while reductions were measured on a limited scope, excluding raw materials. The "direct scope or responsibility" that included packaging, industrial activities, logistics and end of life, did not correspond to any boundary notions set by existing carbon accounting standards such as the GHG Protocol. These differences started to create confusion in the discourse of the company towards external stakeholders. A good example of the confusion created by the use of their own scope of responsibility is a critical article by well-known consultant and environmentalist Bruno Rebelle[63] (2011):

> *"On the one hand, we had to wait until the end of the presentation to understand that the reduction commitment relates only to the limited area of the direct responsibility of the group, the famous "Scope 1". Let's admit, however, that the people responsible for this reporting did not hide the fact that this scope represented only 45% of the overall emissions. So the 30% reduction on this limited scope does only represent a global commitment of 13.5% ... Least inspiring, you have to admit..."*

The non-use of the scope categories also led to disconnecting corporate communication to the response to the CDP questionnaire. Indeed, the CDP acknowledges through the questions the use of the GHG Protocol as the legitimate organizational carbon accounting. This forces the company each year to use a different reporting system to report GHG emissions, a system that does not allow them to explain very well increases

[63] Bruno Rebelle is a French consultant, former director of Greenpeace France and number two of Greenpeace international until 2006

and decreases in performance versus prior years, since it is totally disconnected from the carbon management accounting system used by the country business units.

The company had tried to gain legitimacy by communicating to external stakeholders their results using a brand new carbon accounting and with a consolidation process that was unknown externally. There was no pre-existing knowledge about their accounting, leaving the company with mistrust in their accounting system, which external stakeholders could not relate to –as not being representative of a legitimate expertise.

External legitimacy could also have been gained through the development and consolidation of networks of support (Gendron et al., 2007), especially since the company is well known for co-innovating and thus, creating this kind of network. However, the network was not used:

> *"It is clear that for CO2 we worked on our own, although [Big 4] was used to make our tool." (Interview 3)*

They invested in a tool to become autonomous from external consultancies, in both the calculation and the animation of the reduction target.

The company then tried to get their accounting audited. However it was not possible, since the LCA methodology is peer reviewed, not audited, and also because their consolidation methodology was unknown externally.

5.4 Building their own accounting methodology

In 2006, the environment director of the company, who had been in place since 2004, had been made responsible to look for an indicator that would help monitor the nature "health" status of the company. His criteria for the indicator were that it should be measurable, certifiable, auditable and synthetic. Water, carbon and biodiversity were screened as potential indicators. Carbon was quickly retained as the indicator to drive the future strategy. First it was one that everyone could relate to:

> *"A means of creating a battle, that is create communication and then creating the dynamics." (Interview 1)*

The new indicator would represent the organizational change that they hoped to drive related to the environment. Therefore, it had to be a topic that would relate to every employee in the company. It was also an indicator that spoke to the company's own sectorial environmental issues, such as agriculture. It would be able to relate the whole of the company's activities, and translate the performance of the whole value chain

(Interview 1). Last but not least, there were already methodologies in existence to calculate carbon emissions:

> *"Therefore, the choice of CO2 was made to have a kind of crystallization on which we could install a variety of mechanisms, reporting, metrics, information systems, etc." (Interview 9)*

The possibility of measuring the performance of the new nature strategy was key to their ambition to drive change. Already the mechanisms of accountability were central to the future of the strategy.

In 2007 the environmental director asked an external life cycle assessment (LCA) consultant to build a first excel tool to account for each product's life cycle carbon emissions. The accounting had to be internalized. Contrary to organizations that would request one-off LCAs to consultancies, the company wanted to gain control over its accounting. Moreover, it was not feasible and too costly to ask for thousands of LCAs to be conducted externally, and the carbon accounting project was to build an organizational carbon accounting to encompass the totality of products sold and to repeat the accounting exercise over the years. The tool was tested in France in the water division, then in four different countries over the summer of 2007, testing the feasibility of the accounting and the difficulty of accessing activity data. The creation of the tool was constructed around the goal to build strong internal legitimacy for the tool.

Pragmatic internal legitimacy

As they wanted to drive performance in the reduction of carbon emissions, they mirrored carbon accounting on the financial management accounting system, by brand and by product, to be closely aligned with management responsibilities, as they existed in the company:

> *"So the idea of measuring by product, makes it much more refined, we could go much further in the investigations of the action plans, when we ask a carbon accountant to see what the action plans are, of course he can [come back] with action plans that are related to large quantities [of waste], the energy policy of the subsidiary, what we can do. But it won't go very far. And our objective anyway was to say, beyond the figures, we want to have an ambition that is a stronger ambition than simply a trend ambition." (Interview 1)*

The environmental director also thought that product environmental labelling would become a possibility in the future, and that the company would want to communicate

results at the product level. The primary external audience of the company was the consumers, and the accounting also had to be communicable to them.

Another organizational identity feature is the decentralized structure of the company that they name "glocal management". It means that although the strategy can be decided at the top, it acknowledges the fact that the accounting had to be accepted, understood and performed at the business unit level, and by everyone. Leadership is local and proximity management is advocated. This is mirrored in the deployment of the carbon accounting tool, made in excel to be used by everyone, and managed locally via a new role called "Carbon Master".

By deploying the tool down to all subunits and empowering each team to act upon carbon emissions reduction via the carbon accounting tool and their carbon masters, the management team communicated to the local teams that they believed each of them was a key person to achieve success in the dual project. People felt that the achievements of the organization were also their own personal achievement. Employees felt proud about the initiative:

> *"Because these are citizens who at one point, acknowledge that their organization is something they are proud of and about which they can talk to their friends at Sunday or Saturday night's dinner." (Interview 13)*

They also felt empowered as actors of not only their business but as active citizens in their daily jobs:

> *"What mobilizes, is to understand, in fact, to grow in awareness that when you are an actor, that you are in a factory, in logistics, marketing, on the packaging, on the milk, to understand the environmental impact of what you do every day and of the decisions you take, so I think it's encourages in-depth behaviours that are behaviours that change the business." (Interview 9)*

The employees felt respected as empowered employees, dignified citizens that were both acting for the company and for societal well-being.

Finally, in 2009, a new team called "nature" was put in charge of the environment and more specifically in charge of driving the carbon performance and accounting of the company. A general manager coming from the management of business units and with a marketing background was put in charge. This was considered key for the internal legitimacy:

> *"The fact that it is directed by someone who comes from the business world was a key to success. Because someone who comes from business is the best placed to tell a CEO: 1/ here's why I know that what I'm asking you is doable. I have done your job, so I know what your capacities are and your constraints. And 2/ here is why I think that what I'm asking you may be worthwhile for your business. And I am credible and audible when I speak to you about it, because I did your job, because I come from the business world." (Interview 13)*

The change of team also signalled the importance the environmental topic was being given. The former environmental director was linked to the previous narrow vision of performance in the plants. Although having initiated the new carbon accounting in 2006 and 2007, he did not have the legitimacy to impose, as a "non-business" person, the changes requested with the new nature strategy that included getting general managers on board.

Relational legitimacy

Once the accounting excel tool had been tested in the first division and the first countries, it was extended to the second division in 2008. The second division has a business model that is a little more complex. Working groups with people from several functions were created to reflect on the carbon accounting tool:

> *"(The environmental director) was very happy because he said, look, this is the first time we have around the table pretty much all the functions. It really is a cross-departmental project. And that is true, he said: I am very happy because this is the first time we have everyone here, knowing that so far, the environment, it was just the plant dimension and direct impact, but ultimately, that is only a part of the total impact of the product. So it is true that this type of project, it lets [us] work in all areas. And that's really great." (Interview 7)*

The making of the tool reflected the organizational change that they wanted to create. The environment was not anymore a topic for plants, but a topic that relates to each and everyone, whatever function they belong to. The implementation was being gradually built up in the divisions, engaging all functions, and countries one by one. By creating an excel tool, everybody could master it. This was also one crucial dimension of the accounting tool being built:

> *"If you really want it to be an indicator that is a shared indicator, alive within the company, it has to be put everywhere. It should also be made available to the president as well as in all the country business units." (Interview 1)*

Carbon accounting had to become understood and used by everyone, as it was the conviction of top management:

> *"And we wanted to keep it light, because it is a group transformation plan. And for me, having an army of 400 guys (at headquarters) in Paris that make CO2 reduction, it is good for reducing CO2, but it does not transform the organization. For me, my true success is when I'm in a factory in Germany, Belgium and Algeria, and that the team leader tells me about his efforts to reduce CO2. Because I think that if this guy, who is my N-5, if he is convinced, he understood, even if one day I stop pushing, I have an army of 3,000 or 10,000 people in my division who are convinced and who will carry this ambition forward." (Interview 13)*

Top management wanted carbon accounting to become natural to everyone. They believed it would be more efficient if embedded in daily practices than if it was to be managed at headquarter level. The carbon accounting tool was further implemented in the two remaining business units in 2009.

By the end of 2008, the two major divisions of the company had calculated their base line year for carbon, and were starting to create budgets for the reduction of carbon emissions. The measure was gradually being internalized:

> *"Having chosen CO2 because it had the advantage of being able to be globally measured by everyone and everything, it's really part of the emulation that has arisen, because at that time, we could cascade goals everywhere, benchmark them against each other. In the management conventions (meetings), employers, nature champions of different divisions set their figures one against the other: I did minus seven this year, you five, etc.. It's silly but it has created a kind of competition and emulation that the absence of a measurement system would not have allowed." (Interview 9)*

Moral legitimacy

Moral legitimacy is gained when things are done "in the right way" and is gained against a wider societal field that can consider the goal of the tool to fulfil moral legitimacy of the organization. Here, moral legitimacy tried to be acquired through certifiability of the tool, and through maintaining the connection to their strong external moral legitimacy, gained through the forty years of actions linked to the dual project.

Certifiability was a criterion for choosing carbon as the environmental indicator for the company. At the same time as the tool was being gradually built in the different subunits, one of the United Kingdom's divisions that had come under harsh environmental criticism in 2006 and 2007, decided to partner with the Carbon Trust to pilot the new carbon accounting standard for products, the PAS 2050[64]. In 2008, several

[64] The PAS 2050 is the carbon footprint standard for product, base on ISO 14040 and 44 LCA standards

products were certified in the United Kingdom with this new standard; therefore it was decided to choose the PAS 2050 as the standard to be certified against:

> *"There was a meeting between the French environmental agency and UK, where we realized that there was a battle of standards and that they would win. There was a story like that. So I no longer remember when it was this meeting. But there was a time when it became clear that the British standard would prevail (…) In addition it was the time when Tesco launched its policy: I will do 4000 products, etc.. Between the Carbon Trust and PAS 2050, they grew phenomenally, relative to a GHG protocol that concerned only activities with a limited scope 1 and scope 2 approach, so that our choice was quite easy." (Recorded meeting)*

While choosing the standard for certification, the company was looking to appear more advanced than others:

> *"(If) a subject is a subject that will be important for consumers, we must make the difference. We are in a competitive world. So if I start working on a subject, I have to be the, or one of, the best. The best guarantee of being the, or one of, the best is to set realistic ambitions. On the one hand, to transform the way I do things, and on the other hand to ensure that I am making a sufficient breakthrough, relative to what is done, to be the best. So there's the idea of: if I go for it, I'm not in it to participate, I'm in it to win." (Interview 13)*

As it had been doing with the inception of éco-emballages and Vacances Propres, the company also wanted to be proactive in the development of external standards and measurement rules:

> *"We will also be involved upstream with legislators and standard setters so as not to be "followers" but to be proactive on recommendations that we would be able to do following our [tool] construction." (Interview 1)*

For example, the environmental director initiated talks on the rules for milk allocation[65]:

> *"(The company) initiated the implementation of this work within the Food and Agriculture Organization (FAO) to get out of this mess which was a constant search for a balance between us that we could not get out of because there were interests that were interests different from the carbon matter. So we asked the FAO for a ruling. We participated in the work (…). We asked them to bring in experts, people who would make a ruling. After the rule, it is favourable or less favourable for us, but it is the rule." (Interview 1)*

Since the dual project is now 40 years old, and the company has initiated key projects such as éco-emballages in the past, stakeholders tend to think:

> *"We will always be more demanding and more in demand vis-à-vis (your company). Because we think that if we make you move, we would be able to move the industry. So this is both an acknowledgment of what we do." (Interview 13)*

[65] Allocation of GHG emissions of a cow between the different sub-products (meat, leather, milk)

Inside the company, it is acknowledged that:

> *"And a company like (ours) must be at the forefront, or in any case, part of the trend of social responsibility issues." (Interview 14)*

This acknowledges why the environment team was willing to choose "the best standard" at the time (PAS 2050), and its willingness to be the best in terms of carbon generally. The company is also one that functions with challenges:

> *"That is to say that (our company) is a very competitive business, where people like challenges, where people like to win. And to propose a challenge that isn't one, this is the surest way to ensure that your challenge will be stored in a drawer and will be worked at every once in a while. So it is a matter of internal mobilization and the engagement lever. This is a company that engages on bigger challenges than itself." (Interview 13)*

Cognitive internal legitimacy

The new carbon accounting reflected upon the dual social and economic project – the core of organizational identity - of the company in a very significant way, provoking strong adherence of employees to the goal of carbon emissions reduction. The organizational identity of the company is based on the dual project, on its people centred engagement, its growth mind-set with local leadership and proximity management, as well as its agile organization (Investor Seminar presentation 2011). The key feature of the organizational identity of the company is the dual social and economic project launched in the 70s by the founder. As Interviewee 13 puts it:

> *"What interests me is first to have the impression of doing something useful for society while meeting the objectives of my shareholders. I think it's pretty good, and the synthesis between the needs and expectations of civil society and the needs and expectations of my shareholders without opposing them"*

Being an employee of this company means that you account for both goals in your job.

The new nature team, as of 2009, was managed by two sponsors at the executive committee level, one from the business and the other being the Chief Financial Officer (CFO):

> *"It helps to have someone who will look to put systems that are solid, build them and gradually integrate them based on financial accounting standards, which are a priori the most solid standards of the group." (Interview 6)*

Symbolically, the functional attachment to the finance function was a strong commitment to building credibility in carbon accounting, with "solid standards", audits

and certification. A new nature CFO was also integrated in the nature team. Her mission was to obtain certification of the carbon results calculated with the internally built carbon accounting tool. She was a former auditor, management accountant and investors relations' manager and had therefore knowledge of what external stakeholders were looking for in terms of legitimate accounting.

They decided to bring carbon inside the core information systems of the finance function, by initiating the co-innovation of a carbon accounting tool with a major ERP software provider, which would mirror the excel carbon accounting tool:

> *"So the fact of putting carbon inside it, there was a very strong symbolism and the fact that we're in co-development with [ERP] - there was a kind of extremely strong symbolism of commitment from [the company], to make the issues of nature enter, to make them move from the carebears [bisounours] world and 'That's nice, the planet' and I do not know what the babas of Larzac and all that, to something thoroughly processed within systems, at the heart of the best articulated processes, the most technological of [the company]. This is why we switched and spent money to switch from Excel to the [ERP] system in which we entered the CO2." (Interview 9)*

5.5 Blending legitimacies to maintain organizational legitimacy

After realizing that the GHG Protocol was inevitable in terms of external recognition and use for external communication, the nature team took two decisions: one was to build a "patch" GHG Protocol accounting system, the second was to reconcile both accountings in a "convergence project".

The nature team developed a plan to build a "patch" GHG Protocol accounting system, "low cost", with the help of an international environmental consultancy. In 2011, the GHG Protocol accounting system was tested on four country business units, to be rolled out in 2012. This system allows accounting for all scope 1 and 2 emissions on 100% of the company's sites, with operational control approach. The GHG Protocol accounting was presented as a compliance matter to the subunits. The company recognised that to communicate externally, to get trust in the system and legitimacy they had to go through the use of GHG Protocol:

> *"Ultimately at the time, there was the GHG protocol, all the reporting authorities and such-like, all swore only by it. So if we wanted more, finally it was to say: we did studies of CO2, we developed tools and things like that. We have measurements; we took actions to reduce [CO2]... If we don't talk about it, particularly through the use of GHG [Protocol] for reporting, how will the investors know, how will the stakeholders know? And at the time, it was the reference." (Interview 5)*

The nature team was also getting frustrated over the non-recognition of their efforts:

> *"When we realized that it would take ages and ages [to get our own tool certified], we told ourselves, we will not allow people who are on much narrower scopes, pass for people more serious about the subject." (Recorded meeting)*

There was a need to use the GHG Protocol to be recognised through better grades in the CDP rating, and therefore to have their internal efforts and accounting system legitimised via the use of the "patch" system. The company had no doubt that taking responsibility over the life cycle was the ultimate sign of being serious about reducing carbon emissions. The frustration not to be certified was high. Internally though, reduction efforts measured through their own system was still more important:

> *"I prefer to reduce than to certify. Certify, we will. And B, it does not mean that we should not do it. But if certification is shifted by 3 months, I don't care. We will do it, it is mandatory it is prioritized; it is in the Top 20. But not in the Top 10 ..." (Interview 4)*

The discourse is one of compliance to external requirements through this certification, but in the nature team, it still did not get priority over using the internally built carbon accounting tool to reduce carbon emissions.

The "patch" GHG Protocol accounting system was a web-based tool managed by an external consultancy. It was considered the solution to an emergency situation. To avoid any confusion with the existing tool, it was presented as a compliance requirement. The accent was put on the article 75 of the French law Grenelle 2, requiring French companies of more than 500 employees to report their carbon emissions by end of 2012. Great care was taken to avoid asking carbon master to report data on the GHG Protocol at the same time as the other carbon accounting's cycle. Training sessions on GHG Protocol for each step were put in place via the web, and the tool was prefilled with the maximum of information before carbon masters had to go and fill GHG Protocol required carbon information. As it was a supplementary requirement on carbon accounting, the nature team tried to avoid confusion with the existing tool and extra data work.

The Nature team built a slide explaining the different carbon accounting methodologies and how they could be reconciled. The convergence project was seen as the "solution" to the apparent conflict between the two accounting methods; one was representing strong internal legitimacy, and the other one being the key to gaining external legitimacy. Indeed, it meant that the original carbon accounting did not have to be abandoned, and

that external legitimacy could be achieved via the GHG Protocol methodology with minimal impact on the existing accounting structure. As the "patch" GHG Protocol tool was implemented, emission factors were harmonized between the two accounting methods. Subsequently, the convergence project tried to make all connections possible between the existing accounting and the new one to be added. For example, in the project of integrating GHG Protocol based accounting in ERP, it was decided that all data already measured through the company's initial carbon accounting would be the platform for the new GHG Protocol based accounting. Therefore the legitimate data gathering was based on the initial carbon accounting system. Only additional information specific to the GHG Protocol not already collected would be requested. The same decision was taken for emission factors, saying that the platform for emission factors would be the one used until now. Great care was taken so that the tool built in 2007 would not lose its internally gained legitimacy. The convergence project was tested on a subunit, reuniting the results of the GHG Protocol Corporate Standard for the year 2011 with the sum of 237 product LCAS representing the total turnover of that subunit.

The company also gradually built a network around their efforts. From 2011 the company communicated more intensively about their carbon measurement and reduction efforts. First, in December 2010, the CFO was invited to the Accounting for Sustainability Forum, and was able to communicate on his company's environmental action and carbon accounting. The nature CFO was also invited to present the co-innovation information system with ERP at the October 2011 PCF World Forum. The announcement read "How to calculate, analyse and manage the Carbon Footprint of 35000 products", which clearly stated the company wide efforts on carbon made by the company. On December 6th 2011, the company and ERP jointly presented to the press their co-innovation. Although most rankings were based on being able to compare carbon emissions based on the GHG Protocol (see for example Global 800 Carbon Ranking, where the company is past the ranking number 400), the company managed to get awards for reduction efforts: they were winner of the 2010 New Economy Carbon Leadership Award in the category Best Carbon Reduction for France and were nominated in the Gigaton Award 2011[66].

[66] "The Gigaton Awards aim to provide inspiration for business to progress to the billion ton carbon reduction per sector needed to help stabilize the climate - and show cutting edge initiatives across the

Realizing the benefits of keeping both legitimacies, internal and external, and therefore how both accountings completed each other, the nature team now supports externally the convergence of carbon accounting standards:

> *"Our company has its own carbon accounting rules. This is public and we are strongly engaged, especially with the promotion of the topic [with ERP], and also because we believe this measure, and the convergence of standards, is the future of regulations that should come very soon on the market (all initiatives are backing our choice, and we are the most advanced in this regard)." (2012 internal email)*

The company has a possibility, through their own knowledge of carbon accounting to influence the further construction of carbon accounting systems. Through the participation in the European Union initiative[67], the PCF World Forum conferences, the nature CFO is also supporting their own accounting through the convergence of standards.

6 Discussion

6.1 A case of "reverse" decoupling

Decoupling is defined as the coupling of a new practice with the institutional field, but the decoupling of it from existing organizational practices. In this case study, "reverse decoupling" shows a practice that is decoupled from the field, but coupled with internally existing practices. Contrary to the cases described in the literature, it is not a case of an externally legitimated accounting tool being faced with resistance from internal constituents, but a case of an internally legitimated tool being face with external constituents' requests.

The organization exercised strategic agency that violated existing institutional rules that specify that you must account for carbon using the GHG Protocol Corporate Standard, as they saw more than the enabling qualities of the standard (putting a number on organizational GHG emissions that satisfies investors), but also the constraining qualities of it, that it did not allow to account for the total value chain emissions (Beckert, 1999). The GHG Protocol Corporate Standard had reduced uncertainty by institutionalizing the rule for organizational carbon accounting, but at the same time this

global corporate community", http://www.gigaton-awards.com/nominees/, accessed November 25th 2011

[67] The Directorate General (DG) Environment has worked together with the European Commission's Joint Research Centre and other European Commission services towards the development of a technical guide for the calculation of the environmental footprint of organisations, and the environmental footprint of products since beginning of 2011. The company has been testing both methodologies and pushed for links to be made between the two. Policy from EU is expected in 2013.

allowed for deliberate challenging of the existing rule when more adequate alternatives exist (Beckert, 1999).

6.2 Decoupling and the importance of internal legitimacy to sustain organizational legitimacy

Literature shows that underestimating the importance of internal legitimacy can lead to negative consequences such as loss of motivation in employees, but also loss of external organizational legitimacy (MacLean & Behnam, 2010), thereby losing organizational integrity (Dacin et al., 2002). Boulding (1967) states "a loss of internal legitimacy leads to disorganization of behaviour and an inability to perform an assigned role". Therefore this paper contributes to the literature by stating that organizational legitimacy can also be sustained by addressing both internal and external stakeholders (Human & Provan, 2000). I suggest that external and internal legitimacies are not opposite but two facets of the same manifestation, organizational legitimacy.

6.3 External versus internal legitimacy

This story contributes to the emergent literature on responding to multiple legitimacy requests (O'Dwyer et al., 2011; Kostova et al., 2008) and how to make them co-exist, without choosing one over the other. Admittedly, no organization can completely satisfy all audiences, and it is often said that one legitimacy prevails over others (Suchman, 1995).

Indeed, this case study emphasizes that internal legitimacy makes the foundation of organizational legitimacy, confirming that "a strong and early inside-out emphasis is more likely to achieve overall organizational legitimacy, than an early outside-in focus (Human & Provan, 2000). No manager can completely step outside of the belief system that renders the organization plausible to himself or herself, meaning that to function, insiders need a legitimating institution to be coherent with the organisation's belief system (Suchman, 1995). Both internal and external legitimacies cohabit to form organizational legitimacy. In time of organizational change, internal legitimacy can help not to lose external legitimacy (Whetten, 2006).

6.4 Definition of internal legitimacy

The case analysis revealed key characteristics of internal legitimacy that had been emphasized by previous literature, such as cognitive and pragmatic legitimacies, and

adds another facet to it by emphasizing the relational dimension of internal legitimacy. Internal legitimacy is connected to organizational identity (MacLean & Behnam, 2010), stating that a new accounting practice becomes legitimate when it is congruent with the central and enduring attributes of an organization. This ensures that the organization does not act out of character (Whetten, 2006).

The case study emphasizes an additional component of internal legitimacy, relational legitimacy, which is acquired by an organization when it shows its internal constituents that they are accorded respect, status and dignity in the working environment (Tost, 2011). The relational component of internal legitimacy had already been described in the case study of Moilanen (2008) where face-to-face interaction was considered more "human" than the headquarters "sanctions, penalties and faceless dictates". Another example of threatened relational legitimacy can be found in the case study of Omega (Scapens & Roberts, 1993), where the project of improving the quality of management accounting data posed a worry about job security, particularly amongst the employees who were asked to co-operate with the project team.

Finally, Boxenbaum and Jonsson (2008) state "individuals refuse to see themselves simply as ceremonial props". Relational legitimacy seems to be a distinctive feature of internal organizational legitimacy, since on the contrary, external stakeholders are willing to grant legitimacy on the basis of symbolic gestures in the form of window dressing (MacLean & Behnam, 2010), therefore relational legitimacy does not seem to be a component of external organizational legitimacy.

6.5 To conform and to be distinctive

The organization, in their attempt to respond to both internal and external legitimacy, demonstrated that legitimacy can involve both conformity (to the GHG Protocol) but also distinctiveness (in their own accounting system). The distinctive dimension enables the organization to claim that they are adding value and that they do not merely replicate activities of others (Voronov et al., 2013). It is interesting to see that through the convergence project, the organization emphasized common traits to the global legitimate carbon accounting standard, while downplaying local deviations to the international norm (Voronov et al., 2013). At the same time, keeping both their own locally built system (versus scrapping it all together) and the global standard indicates that legitimacy can rest on both distinctiveness and conformity (Voronov et al., 2013).

6.6 Internal legitimacy and adoption of accounting innovations

Active adoption (Kostova & Roth, 2002) or entrenchment (Zeitz et al., 1999) is not a given outcome from adoption of institutionalized innovations, as the numerous decoupling stories illustrate. Entrenchment is defined so that the abandonment of a practice is unlikely, even under external pressure (Zeitz et al., 1999). It is the gateway between the decision to adopt, and the routinization and infusion of practices in an organization. Zeitz et al. (1999), posit that distinguishing adoption from entrenchment is vital for institutional theory. Entrenchment requires a depth of embeddedness in cognitive structure and coherence with the system (Zeitz et al., 1999), meaning the new practice needs to acquire cognitive internal legitimacy.

In this case of non-adoption, internal cognitive legitimacy embodied in the frames constituting organizational identity "functioned as a filter for interpreting and responding to strategic issues and environmental changes" (Glynn, 2008). The discrepancies between the cultural frames behind the carbon accounting innovation (GHG Protocol Corporate Standard) and the organizational identity were too important to allow for an active adoption of the tool. Instead of resorting to decoupling, which would have been a strategic choice to avoid losing external organizational legitimacy, the organization avoided acting "out-of-character" (Whetten, 2006) by building their own internally legitimated tool. Therefore organizational identity, as the basis for cognitive internal legitimacy, provides "a guide for what an organization's members should do" when faced with contradicting legitimacy claims (Gioia et al., 2013).

7 Conclusion

The aim of this paper was to illustrate empirically and understand theoretically the link between accounting and legitimacy through a longitudinal case study that illustrated the building of internal legitimacy, the conflict with external legitimacy and the interplay between the two. It builds on a rich literature that has explored the strategic use of accounting as a legitimating institution (Abernethy & Chua, 1996; Collier, 2001; Modell, 2001; Tsamenyi et al., 2006) by exploring the consequences of adopting an externally requested accounting practice. The paper further expands the studies of Moll and Hoque (2011) and O'Dwyer et al. (2011) on the growing importance of legitimacy granted by internal constituents to new accounting practices. The analysis focuses on the importance of internal legitimacy requests and explores the conflict of internal

legitimacy and external legitimacy. Furthermore, it illustrates how internal legitimacy remained the driver for action in the case organization and how external legitimacy requests were subordinated to the internally legitimated accounting tool.

The paper offered several contributions. First, this research, by showing an example of reverse decoupling, continues to emphasize the importance of legitimacy accorded by internal constituents (MacLean & Behnam, 2010; Moll & Hoque, 2011; O'Dwyer et al., 2011) and indirectly the important risks an organization takes by not considering it (Tsamenyi et al., 2006; MacLean & Behnam, 2010; Whetten, 2006). Second, the paper contributes to the literature on conflicting legitimacies by showing how external legitimacy can be subordinated to the internally legitimated and constructed tool (Human & Provan, 2000). Third, it further elaborates on the definition of internal legitimacy through adding the concept of "relational legitimacy" (Tost, 2011) as a core component of internally legitimate practices.

Although this case study uncovers a case of non-adoption and the consequences on organizational legitimacy, the empirical setting did not allow researching further the institutional strategy developed by the organization to influence back the development of the field of carbon accounting after seeing its internal legitimacy compromised. Another limitation is having had to resort to interviews for the period from 2007 to 2010 in the case study. Indeed, interviews are subject to potential social reconstruction of the topic by interviewees, for example, as they can use interview sessions as a way to strengthen or defend a favoured self-identity (Alvesson, 2003). This limitation was partially overcome by the use of multiple accounts related to that period and the gathering of secondary data including strategic presentations related to carbon accounting from 2007 to 2010.

The literature on adoption of accounting innovations has explored numerous cases of minimal adoption in decoupling case studies, thereby uncovering the risks and consequences organizations take by ignoring internal constituents' legitimacy claims. On the other hand research could further explore the potential outcomes of responding to insiders' legitimacy claims and outsiders' legitimacy claims together without resorting to ceremonial practices to address one over the other. Multiple stakeholders' demands and growing institutional complexity makes the management of multiple legitimacies a strategic topic for managers today. Further research could explore how organizations engage in a political process of interaction, communication, and exchange to create a

perception about the organization without necessarily resorting to decoupling practices (Kostova et al., 2008). Furthermore, research could be conducted on how organizations search for ways to influence the nature of external standards in the environment when internal legitimacy is compromised (Bromley & Powell, 2012).

Appendix

Date	Event
2006	Interaction with Big 4 consultant, conceptualisation of excel tool « to be »
June 2007	Construction of first excel tool by external consultant
July 2007	Presentation of the excel tool to water division environmental managers
August/September 2007	Test of the tool for four countries
January 2008	Calculation of footprints for all water divisions for 2007
January to December 2008	Carbon Trust certification on UK products
January to June 2008	Workshops to adapt excel tool to dairy division
July 2008	Presentation of the excel tool to dairy division environmental managers
September 2008	Announcement of the -30% target
2009	Medical and Baby division: expansion of the tool
2009	New team arrives: Nature manager and Nature CFO
First semester 2010	Interaction with global environment consultants on the certification of the tool: 2 reports issued on standard comparisons
2010	ERP System is in test in Spain and Belgium business units
End of 2010	Decision is taken to implement « patch » GHG Protocol Convergence project is decided
2011	ERP system is rolled out
2011	GHG Protocol patch system is « tested » on four business units but roll out is postponed to 2012
2012	GHG Protocol is rolled out Convergence project is tested with the company ERP and on one business unit (US)
2012	ERP System is rolled out further and consolidated

Appendix 2.1 Case study timeline

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ARTICLE 3–EPISTEMIC ACCOUNTING PRACTICES AND THE EMERGENCE OF A CLIMATE CHANGE STRATEGY

SUMMARY

EPISTEMIC ACCOUNTING PRACTICES AND THE EMERGENCE OF A CLIMATE CHANGE STRATEGY

Keywords: Practice – emergent strategy – carbon accounting – epistemic practice – epistemic community – epistemic object

Aim: This article seeks to understand how accounting and strategy can be coproduced in an emergence process. Its empirical focus is on the role played by the emerging accounting practices in the everyday practical-coping activities that create the emergent strategy for climate change, and vice versa, how strategy plays a role in the continuous emergence of carbon accounting.

Design: This article uses participation observation and semi-structured interviews, as well as secondary data from the case company such as emails, powerpoints and meeting minutes.

Theoretical background: This article is based on the "as-practice" approach, more particularly focusing on emergent practices and epistemic practices.

Findings: This article demonstrates that the relationship between accounting and strategy in a process of co-emergence goes both ways. In the process of emergence of new practices, accounting and strategy intermingle in the same tool and are both mission of the same function, the "carbon master". Moreover, this case study contradicts the findings that knowledge emerges only in the periphery, and demonstrates that emergence processes can be both local and in the centre, and mutually reinforce each other.

Value:This paper further the analysis of how accounting and strategizing intersect in an emergence process, showing how both can intermingle in the process of rendering a new space not only calculable, but also manageable. This case study further shows how an emergent practices can be mutually reinforced from the local and the periphery, contributing to defining further the dynamic of practices.

Epistemic accounting practices and the emergence of a climate change strategy

Abstract

This paper seeks to understand how new accounting and strategizing practices emerge and how new knowledge is created from local and centre. Through the analysis of emergent epistemic practices, this paper analyses how accounting and strategy intermingle in a single epistemic device and through a new role, the "carbon master". Accounting and strategy are co-produced and render a new calculable space not also quantifiable but also manageable. Moreover, the processes of emergence are analysed and the creation of new knowledge is redefined as an association of both the centre and the periphery.

Keywords: Practice – emergent strategy – carbon accounting – epistemic practice – epistemic community – epistemic object

1 Introduction

More and more new areas of knowledge such as carbon, water, biodiversity, security or quality need to be incorporated into a corporation's strategy and quantified. New strategies are being elaborated and new modes of accounting need to be created for these new calculable spaces (Miller & O'Leary, 1994a) in a very short period of time. New calculative practices are constantly being added to the repertoire of accounting (Miller, 1998). New calculable spaces play a central part in the changes that companies are undergoing (Vaivio, 1999). Until now, new accounting practices have been investigated by looking at their diffusion (Alcouffe et al., 2003; Ax & Bjørnenak, 2005; Firth, 1996; Marimon et al., 2012; Mellett et al., 2009; Nassar et al., 2011), as management fashions (Bjørnenak, 1997; Lapsley & Wright, 2004; Malmi, 1999), and in terms of how they gain legitimacy and get institutionalized within corporations (O'Dwyer et al., 2011; Free et al., 2009; Sharma et al., 2010) . However, there has been little inquiry into how practices emerge and "become" what they are within corporations confronted with the multiplicity of new calculable entities to manage (Bjorkeng et al., 2009). Nonetheless, the accounting and strategizing of a new calculable space such as carbon entails fundamental organizational issues such as the construction of new strategizing area, the connection of the new space with existing ones, the creation of new roles and the modification of existing ones, and the possible hybridization of the new area with more traditional pre-existing ones. This is a story of organisational experimenting with novel accounting (Modell, 2009a; Andon et al., 2007) and the emergent strategy associated with it.

Processes of accounting are centrally bound up with these activities of strategy making and translation (Chapman & Chua, 2007) and accounting is involved in the making of strategic ideas (Whittle & Mueller, 2010). Accounting is not subordinate to strategy and can play an active role in shaping and framing a new strategy and shaping strategic options (Kornberger & Carter, 2010; Skærbæk & Tryggestad, 2010). However, Hopwood (1987) explains that "little consideration has been given to the ways in which accounting has become implicated in, and in turn, shaped by the emergence of processes of organizational governance and management". Little is known about a possible co-production process in the phase of emergence of novel accounting and emergent strategizing, meaning that not only does accounting enable and shapes the strategy, but

the strategy also shapes and enables further developments in the novel accounting for carbon.

Moreover, the literature on new accountings has allowed us to understand how they compete with existing forms of knowledge and can engender resistance and reshape traditional segmentation of responsibility (Vaivio, 1999). However, the potential of association of a novel accounting with an emerging strategy remains, to my knowledge relatively unexplored. Finally, processes of emergence have been said to be the preserve of the periphery, and that new knowledge creation happens "away from the centre" (Regnér, 2003; McNamara et al., 2004; Morris & Empson, 1998; Quattrone & Hopper, 2001). Although emergence processes have been said to occur in a decentralized manner, to my knowledge, it has not been explored as to if the emergence processes can be inductive in both the centre and the periphery, and if both processes can mutually reinforce themselves in the emergence process.

Organizational carbon accounting can be said to be an emergent new practice of accounting. Although several standards of organizational carbon accounting exist (European Commission, 2010), claiming to have already black-boxed this practice, and the practice of carbon accounting is said to be widely spread within MNEs (Ranganathan, 2011), the underlying science behind this practice is still riddled with controversies related to its imprecision, uncertainty, complexity (Bowen & Wittneben, 2011). Moreover, practices of carbon accounting can be defined as epistemic, as they are creative and constructive, as well as knowledge-centered (Knorr Cetina, 2001). Additionally, little is known about how carbon accounting is actually practiced in multinationals (Burritt et al., 2011). Therefore, I contend that carbon accounting is a good example of an emergent epistemic practice, allowing the exploration of a novel accounting methodology through the analysis of micro-practices within an organization.

Climate change has been a hot topic on the desk of multinationals for over ten years now, and MNEs have started to draft, diffuse and implement new climate change strategies (Hoffman, 2007) to mitigate their impact, especially in sectors that have been impacted early by regulations such as the EU Emissions Trading Scheme (ETS) or the reduction of emissions for the car sector (EU). However, some sectors have not yet been impacted by regulation and are only starting to draft and announce climate change strategies. The food sector for example has only been looking at climate change since the

middle of the 2000s[68]. The context of strategy building for that sector is highly uncertain and complex, with the spectre of regulation on consumer labelling, emergent accounting standards for product categories and high NGOs pressure[69]. In cases where outer contexts are dominated by complexity, strategy content tends to be vague (Regnér, 2003). In this particular context where both the accounting and the strategies are characterized by complexity and uncertainty, we follow through the case study of micro-practices, the parallel emergence of a new accounting practice and the emergence of a climate change strategy both at central corporate and local levels.

I seek to contribute to the practice literature in accounting and strategy in three ways. First, I examine further how accounting practices contribute to the process of crafting strategies (Jørgensen & Messner, 2010; Skærbæk & Tryggestad, 2010; Fauré & Rouleau, 2011), and how accounting and strategizing intersect. In this regard, this paper analyses the intermingling of two sets of practices in emergence, accounting and strategizing, where accounting both contributed to the crafting of a strategy, and was consolidated and amended by the strategy in return. Therefore, this paper contributes to examining ways in which accounting relates to, and intersects with strategizing (Jørgensen & Messner, 2010). In this case study, accounting is not preceding strategy, nor is strategy mediating the usefulness of accounting information, but accounting and strategy rely on each other to emerge over time and continuously create both accounting and strategizing practices.

Second, I address the dynamic interactions between accounting and strategy practices in time and space. The case study questions the fact that strategy cannot emerge from the centre (Regnér, 2003). Further, it puts into question the fact that strategy making can be only inductive and from the periphery, and that new organizational knowledge may only be created and sustained in the peripheries of an organisation, away from "the centre" (Morris & Empson, 1998; Quattrone & Hopper, 2001). This case study demonstrates that strategy making can be inductive in both the centre and the periphery, and that both processes can mutually reinforce themselves in the emergence process. The constitution of new accounting knowledge was both locally and centrally created, through the combination of local knowledge and expert knowledge at the centre. The strategy also emerged from both a combination of projects lead by headquarters and "labs" from the

[68] *Unilever's Sustainable* Living *Plan in 2010, Nestlé, Creating Shared Value 2006*

[69] Greenpeace and Nestlé in 2010 on palm oil and rain forests destruction, Oxfam Ethical Ranking for food and drink companies, February 2013

periphery.

Finally I further the analysis of emerging practices (Bjorkeng et al., 2009; Ciborra, 2000; Regnér, 2003; Chia & Holt, 2009), by demonstrating how practices co-emerge in a context of epistemic culture, developing a concept where, in a situation of radical change, practices of accounting and strategizing rely on each other and are associated in becoming the climate change practices of the organization.

In our case study, we develop a field study where both accounting is a practice "in becoming" and the strategy is emergent, and how the two intermingle. This case study is developed through the enquiry of the emergence of accounting and strategy at both headquarter and local level. My research question is as follow: how does an emergent accounting practice intersect and intermingle with an emergent strategy in daily practical coping praxis?

2 Literature review: interactions between accounting and strategy in emergence processes

Processes of accounting are centrally bound up with the activities of strategy making and translation (Chapman & Chua, 2007) and accounting is involved in the making of strategic ideas (Whittle & Mueller, 2010). Here, I adopt a broad view of strategy, stating that "activity is considered strategic to the extent that it is consequential for the strategic outcomes, directions, survival and competitive advantage of the firm (Johnson et al., 2003), even where these consequences are not part of an intended and formally articulated strategy" (Jarzabkowski et al., 2007). Strategizing refers to the doing of strategy, the construction of the flow of activity through the actions and interactions of multiple actors and practices (Jarzabkowski et al., 2007).

Knowledge produced by accounting influence organizational objectives and therefore they are interdependent (Swieringa & Weick, 1987; Ahrens & Chapman, 2007). The practice perspective sees management control systems and strategy as mutually constitutive and embedded in a broader organizing process (Fauré & Rouleau, 2011; Denis et al., 2006; Lowe & Jones, 2004). Kornberger and Carter (2010) illustrate a case where accounting preceded strategy in the form of a league table, and where calculative practices rendered visible and knowable what strategy took as objective (competition between cities). Accounting information can also be mobilized in the strategizing process for uncertainty reduction and goal congruence in a bottom-up contribution to

the strategizing process (Jørgensen & Messner, 2010). Accounting can enable strategy, and allows strategy to permeate the organization, but accounting is not the declination of strategy, it contributes to it and enables it. Strategy is continuously reformulated, the accounting-strategy relationship is multidirectional, and accounting devices can play an active strategic role (Skærbæk & Tryggestad, 2010). However little is known about this co-production process in the phase of emergence of novel accounting and emergent strategizing, whereby not only does accounting shape and enable a novel strategy, but accounting is also shaped and enacted through the emergent strategy.

Management accounting practice is about understanding specifically used accounting solutions, how they come to be, how their use might change accounting, and give rise to new solutions (Ahrens & Chapman, 2007). Accounting changes in both content and form over time; it is neither solid nor immutable. New techniques are invented, or transferred from one domain to another, as accounting intersects with other bodies of expertise (Miller, Napier, 1993; Miller, 1998). Research shows that management accounting tools are knowledge objects (Andon et al., 2007) which "reflects partial and changing 'ontologies', (re)shaped by the variegated and shifting collectives of elements tied to it". Their flexibility drives reciprocal transformation between them and other organizational practices.

Consequently, they also introduce new calculative spaces (Vaivio, 1999; Ogden, 1997) that can mobilise strategic change to facilitate new forms of organisational vision. The birth of an accounting methodology might change the map of organizational reality (Chua, 1995). Accounting numbers create new managerial problematics such as productivity, quality, that are constitutive of new forms of organisation and worker identity (McKinlay et al., 2010). The use of accounting can also be seen as the constitutive of organizational learning, learning that happens through the use of the emerging accounting practices.

Moreover, in processes of emergence, management control practices can be central to organizing because they help to bring about connections between the diverse activities of organisational members (Ahrens & Chapman, 2007). Additionally, accounting tools can contribute greatly to "structuring and harmonizing" by allowing information to become more coherent and understandable (Tillmann & Goddard, 2008). Calculative

practices create and shape our interpretations of new spaces of inquiry and delineate the space in which "true" statements about them are made (Kornberger & Carter, 2010). Accountings' unsettledness and changing ontologies, as well as the making of new calculable spaces have allowed us to understand how new accounting methodologies compete with existing forms of knowledge and can engender resistance and reshape traditional segmentation of responsibility (Vaivio, 1999). However, the potential of association of a novel accounting with an emerging strategy remains, to my knowledge relatively unexplored.

In the context of the experimenting with a novel accounting, in our case carbon accounting, it is often a new strategic area that is targeted for quantification. While the accounting is novel, strategy related to the new area is also emergent and in flux (Mintzberg & Waters, 1985; Boedker, 2010), or emerging "as a consequence of spontaneous human actions rather than of human designs" (Chia & Holt, 2006). Therefore, actions that are non-deliberate can also ultimately be consistently strategic (Chia & Holt, 2006). Strategizing here takes place in a dwelling mode, "in which agent identities and their strategies are simultaneously co-constructed relationally" (Chia & Holt, 2006). Therefore, strategy does not always presuppose deliberate prior planning or intention, and can be immanent (Chia & Holt, 2006). Emerging strategy is based on everyday practical coping actions. A competitive advantage may emerge from a stream of practical-coping activities, "after they have been retrospectively made sense of by practitioners" (Tsoukas, 2010). Ciborra (1997) also argues that there is no such thing as strategy alignment and that "managers are busy muddling through, betting and tinkering". In strategy creation, the specifics of managerial activities and actors are particularly vaguely defined and traditional planning and analysis practices, as well as top management, might play a less significant role (Regnér, 2003). Inductive strategy from the peripheries is explorative in character, externally directed and includes using experiments and procedural methods (Regnér, 2003). Organisational knowledge form, re-form and are mobilised as a result of the trajectories of local activities (McNamara et al., 2004). Quattrone and Hopper (2001), Morris and Empson (1998), Birkinshaw and Mol (2006) have also argued that new organizational practices are created away from the core, in the peripheries of organizations, stating that emergence of novel accounting methodologies also occur in "decentring" mode, as (Regnér, 2003) also argues for the creation of new strategies. Although emergence processes have been said to occur in a

decentralized manner, to my knowledge, it has not been explored if the emergence processes can be inductive in both the centre and the periphery, and if both processes can mutually reinforce themselves in the emergence process. This research explores the constitution of new accounting knowledge and strategizing both locally and centrally, through the combination of local knowledge and expert knowledge at the centre. Here the core, or the centre is not geographically defined but relates to the headquarter services that sustain the decentralized MNE. The periphery refers to independent business units in specific countries.

This paper contributes to the literature on the emergence of new organizational practices of accounting and strategizing by elaborating on the co-production and association modes of two new practices that intermingle in the co-creation process, and further elaborates on the spaces of creation by showing that emergence processes can happen in collaboration and in inductive mode both at the centre and in periphery.

3 The "as-practice" approach

Hager et al. (2012) define practice as consisting "of the relations among the everyday interactions, routines, and material arrangements (…) and forms generated from these". Practice is viewed as socially and collectively constituted (Keevers et al., 2011) Practice involves human and non-human actors in space and time (Keevers et al., 2011; Whittington, 2011). Practice theory emphasizes "the primacy of the actor and individual action in the building blocks of social phenomena" (Gherardi, 2006) and the "improvisional struggles of everyday life" (Whittington, 2011). Moreover, practice is embodied and relational (Hager et al., 2012).

Practices are both neither stable, homogeneous nor a-historical. Practices are emergent, and process oriented, in the making, emerging, becoming. Practice here is not conceived as regularities of behaviours and beliefs or habitual, embodied skills, and rule-governed features of practice (Giddens, 1984; Schatzki, 1996). Practices, here are different from the "recurrent processes governed by specifiable schemata of preference and prescriptions" (Knorr Cetina, 2001).

Of specific interest here is how new practices emerge. Emergence has been defined as "the arising of novel and coherent structures, patterns or properties during the process of self-organization in complex systems" (Goldstein, 1999). Emergent features both preserve some likeness and have irreducible differences in relation to their parent

system (Lancaster, 2012). New practice creation is the enquiry into how practices become what they are (Bjorkeng et al., 2009). New practice emergence can be said to be "experimental" in nature (Andon et al., 2007). For example, Olsen (2009) describes how a practical knowledge of how "microfluidics technology can be used for biological experiments is being developed in the course of everyday practice". Knowledge is practiced-based, within structures, processes and environments (Lowe, 2004). It is tacit, person and location specific and intricated into networks of linkages among human and object where it resides (Lowe, 2004). Those that engage in routine work practices in their jobs (Gherardi, 2012) produce knowledge and innovation on a daily basis. Ciborra (2000) insists on the importance of everyday practices in the emergence of accounting "in the making". Ciborra describes three types of experimental practice: bricolage (make do), hacking and improvisation. Hacking is "an ingenious activity that through iterations, reuse, and reinterpretations of the existing (…) environment leads to the implementation of new solutions" (Zuboff, 2005). Bricolage relates to the "small adjustments and subtle interventions" and improvisation is coping with "emerging circumstances and unexpected consequences through extemporaneous action" (Andon et al., 2007).

This research is concerned by the emergence of practices in knowledge settings, which are called "epistemic cultures" (Knorr Cetina, 1999). Epistemic culture is the type of society that runs on knowledge and expertise (Knorr Cetina, 1999). Accountants produce knowledge of the organization through their day-to-day practice and the inscriptions they fabricate; therefore there is a need to understand the interactions that lead to this "fabrication" (Lowe & Koh, 2007). Research on the production of new accounting knowledge, the experiments and the laboratories linked to the emergence of new practices, will contribute to a better understanding of epistemic cultures (Gendron et al., 2007).

Epistemic practices focus expressly on the production of new knowledge (Gherardi, 2012). An epistemic practice is a creative and constructive practice. This kind of practice is encountered in knowledge-centred and knowledge-based activities. Epistemic practices take place in "laboratories" (Knorr Cetina, 1999) inhabited by physicists and chemists, but the factory can be also considered as a laboratory, a site for invention and intervention (Miller, 2001; Miller & O'Leary, 1994b). It is important to describe the localized and context specific aspects of the culture of knowledge workers to understand

the effects of practice within these communities (Lowe, 2004). Epistemic practices question the circumstances, events, artefacts, etc. that are taken for granted in everyday life. At the same time epistemic practices are framed by technical devices, procedures, other actors, and negotiations, and become themselves routine practices (Kalthoff, 2005). Moreover, Lowe (2001) suggests that accounting practice is dependent on the objects of knowledge it constructs; therefore it is importance to understand the relationships of accountants with "knowledge objects". An epistemic object, which is "always in the process of being materially defined" (Knorr Cetina, 2001) and acquire new properties and change the ones they already have. Epistemic objects have an unfolding ontology. Unfolding ontology is based on a structure of lack and wantings (Knorr Cetina, 2001). These objects embody what one does not yet know (Miettinen & Virkkunen, 2005). The signifying force of epistemic objects lies in the fact that they are meaning-producing and practice-generating (Knorr Cetina, 2001). Epistemic objects are "generators of new conceptions and solutions and can be regarded as a central source of innovation and reorientation in societal practices" (Miettinen & Virkkunen, 2005). An epistemic object is characterized by its "irreducible vagueness, which is inevitable since it translates the fact that one does not exactly know what one is looking for" (Rheinberger, 1992).

A group of practitioners developing knowledge and claims to expertise can develop around an epistemic object and is referred to as an epistemic community (Gendron et al., 2007; Knorr Cetina, 1999). The mobilization of passion for the object of one's own practice contributes to the emergence of a distinctive epistemic community (Gherardi, 2009). An epistemic community deliberately engaged in the production of new knowledge (Gherardi, 2012). One of the most important features of an epistemic community is its creativity to envisage new opportunities (Gherardi, 2012). An epistemic community can be defined as "a group of scientists who share a common practice, develop a common set of concepts, work in a distributed way on different tasks, and who commit themselves to the making of objects of knowledge" (Landri, 2007).

4 Research design

This research is based on a case study in a single organization that inquires into the accounting and strategizing practices related to carbon. It has been conducted through participant observation (Spradley, 1980; Jorgensen, 1989; Kawulich, 2005). Participant

observation is a method that allows one to both uncover the inside of the process and the organizational texture, as practice always needs to be brought to the fore and be made visible (Nicolini, 2012). Schensul et al (1999) define participant observation as "the process of learning through exposure to or involvement in the day-to-day or routine activities of participants in the researcher setting". Therefore, it fits practice research, as practice-based research is said to uncover the activity "inside" the process (Brown & Duguid, 2001). Investigating practices requires proximal research methods, which allow getting close enough to the activity at hand (Nicolini, 2012). The researcher must put himself in the place of the weaver of organization texture, to follow how the threads are woven together (Gherardi, 2012). Moreover, "to identify practice-arrangement bundles requires considerable participant observation such as watching participants' activities, interacting with them and at least ideally, attempting to learn their practices" (Schatzki, 2005).

My dataset is comprised of the following. First, participant observation was conducted during twelve months, in two different periods of three and nine months. The two periods were spaced by a period outside the field, which allowed for first reflections, iterations and going back and forth with theory. During the two periods, I was in charge of carbon accounting standards, the implementation of the accounting tools related to carbon, the reporting related to carbon, as well as the convergence project of two accounting methodologies. I interacted daily with carbon masters around the world in relation to carbon accounting topics. Moreover, I interacted with the consultant who created the excel carbon accounting tool. I also participated in the life of the nature team at headquarters, including team meetings, lunches and informal conversations. During the time when I was part of the nature team, I also participated in "green days" in November 2010, aimed at reflecting on the past strategy on climate change and nature in general, and at developing the future strategy. I also participated in further meetings related to the future of climate change strategy in 2011. Moreover, I witnessed a stakeholder meeting in November 2012 related to the future strategy. To allow the gaining of deeper knowledge in the baby division, I participated in a one-day meeting on carbon accounting and strategy in February 2012. In total 149 meetings were attended during the twelve months.

	Observation	Participation
Carbon accounting	5	12
General	*2*	*5*
Audit		*1*
Certification	*1*	
Convergence project		*6*
CO2 workshop (baby)	*1*	
dairy carbon master webex	*1*	
Headquarter meetings	11	
Dairy Nature Committee	*2*	
Environment Committee	*1*	
Internal nature communication	*1*	
Stakeholder/Lobbying meeting	*2*	
Nature Claims	*1*	
Env. Acctg Standards	*1*	
Stakeholder meeting	*1*	
External meeting on CO2	*1*	
CEO address to employees	*1*	
Strategy		3
GHG Protocol	2	14
Integrated Reporting	2	24
ERP Carbon	2	34
ERP Carbon reporting		14
Team meetings		23
Other (feedback meeting)		1
CDP	1	1
Total	23	126

Table 3.1: Meetings attended

Moreover semi-structured interviews were conducted to gain knowledge of the early moments of the projects in 2007 to 2009, when participant observation was not conducted. A total number of 30 interviews were conducted, in addition to four exploratory interviews with the nature team at the end of 2010.

Division	Number of interviews	Minutes
Headquarters	7	449
Dairy managers	4	133
Dairy carbon masters	8	415
Water managers	7	257
Water carbon masters	4	162
Total	30	1416

Table 3.2: Interviews

Additionally, meetings were recorded to allow the gaining of insights in to the information discussions linked to accounting and strategy making.

Meetings	Date	Minutes
Green Days	November 2010	967 (not transcribed)
Stream CO2 strategy meeting	December 2010	112 (transcribed)
Nature team meeting related to 2011 objectives	December 2010	122 (not transcribed)
Vision 2020 CO2 with external consultant	January 2011	61 (not transcribed)
Nature team meeting related to 2011 objectives	January 2011	54 (not transcribed)
Nature Finance Planning meeting	September 2011	104 (not transcribed)
Baby workshop	February 2012	270 (transcribed)
Feedback meeting	July 2012	110 (transcribed)
Total		1800 (492 transcribed)

Table 3.3: Recorded meetings

Finally, secondary documents were collected and emails were kept to add to the knowledge of the organizational practices.

4.1 Analysis of data

Interviews were transcribed, as well as four meetings that were recorded, to allow coding. They were analysed using a qualitative data analysis programme called Dedoose[70], which allows interview transcriptions and other qualitative sources to be coded line by line. Codes can be drawn up from three obvious sources: existing research questions, theory, data, but also and more importantly the interaction of these three elements during the conduct of the research (Anderson-Gough et al., 2005). A total of 546 excerpts from the transcriptions were coded around key themes. Themes were inductively coded at first from the field data, then exposed to theory related to emerging practices, strategizing and accounting as practice. The final list paid particular attention to the local versus headquarters strategy making and use of accounting, the hybridization in practice, the differences of strategizing and using accounting in the different divisions. A feedback meeting was also organized in July 2012 to allow for remarks on the initial analysis.

The case study starts at the inception of the carbon accounting and the carbon accounting tool in 2007, and finishes in 2012.

[70] Dedoose, formerly called EthnoNotes, is a qualitative data analysis online software, designed by experienced social science researchers using psychological and anthropological research methods. It has been in existence for the last 13 years.

4.2 Case study

The company that I contacted to undertake my research has a history of being innovative in corporate social responsibility topics. The company is a medium size multinational in the food sector. This company is a typical example of hybridity, a transitional form of organization that is an example of blending, where "the possibility of new alternative accounts of management accounting practice which are no longer bounded by organizations and society, but accommodate their fusion and permeability" (Baxter & Chua, 2003). It represents a transitional organization form that is an example of private organization "grappling with their increasing community and environmental responsibilities" (Baxter & Chua, 2003).

The founder of the company in 1972 made a speech in Marseille that became the foundation of what has been called the dual economic and social project of the company:

> *"[The founder] opened a large part of management of economic activity where he said: 'stop looking at yourself, your inputs, your outputs and take care of your people and take care of your environment'. That's the starting point." (Interview 13, headquarters)*

However, the environment has been the most neglected topic of all three sustainability topics. Only two emblematic actions were taken in 1972 and 1992, called "vacances propres" and "eco-emballages". Both programmes represented the idea behind the discourse of Marseille that the responsibility of an organization does not stop at the gates of a factory. They both also embody the proactive behaviour with which the company acts upon issues they think should be dealt with, without waiting for public authorities to take over.

First environmental targets were set from 2000 to 2010 related to water, thermal energy, global energy, and waste. Quickly, the organization realized that the targets would be achieved earlier than expected. The executive committee set out to look for a single indicator that would be able to represent the health of the company in terms of nature. This indicator had to be certifiable, auditable, measurable and synthetic. Carbon was chosen in 2006. In 2007, the environmental director mandated an external consultant in life cycle analysis (LCA) to build a first draft of the carbon accounting in excel. It was first tested in the water division, on a few country business units.

5 Findings

5.1 Dealing with the environment: first strategic choice is to account for carbon

The context, in which the environmental and carbon strategy was to be framed in 2006 and 2007 for the food industry, was highly ambiguous in terms of markets, legal frameworks and technologies (Regnér, 2003). Legally, the company was not constrained like some others by the European Union's Emissions Trading Scheme (EU ETS), however, legal and political pressure was starting to emerge:

> *"Wait, it may be necessary to take that carbon anyway, because one, there is a carbon tax that revolves around us; there is environmental labelling that revolves around us." (Interview 32, environmental manager)*

The water division of the company had also come under a lot of pressure related to the environment:

> *"What happened is that in 2006 and 2007, especially in 2007, there was a wakeup call in the mineral waters, because this is a time when there was a lot of communications against bottled water, around the same time, I would say, in different countries. This was the case in England very much, this was the case in the United States and it started to come to France. And there was inflation all of a sudden of attacks generally and generically targeted towards bottled water." (Interview 22, supply chain manager)*

Strategic issues related to the environment were very imprecise and undefined. Nearly incidentally, the organization realized that they needed to take the environment "more seriously":

> *"And then gradually, both for internal reasons and then for reasons such as the media, stakeholders, we realized that to guide the company towards health, and not to mention the environment, in the future we would have a problem" (Interview 32, environmental manager)*

In 2007, the company decided that carbon would become the indicator of the "nature" health of the organization. The first strategic step that was taken was to account for carbon. Strategy was thus first conflated with accounting for climate change. The foundation of carbon strategy was accounting for carbon as the backbone for the whole strategy. The mere existence of the topic on the strategic agenda was conditioned by its quantification and accounting possibility:

> *"Um, it's fundamental, that is, what isn't measured doesn't exist. And when you are in constrained systems, in business systems where you have to manage lots of paradoxes, lots of contradictions, you have to achieve growth or you also have to be profitable, but you also have to achieve market share… A thing that is new, a bit*

unusual in the beginning and that isn't measured, that doesn't exist. So the measurement, is no doubt an absolutely essential base for us to achieve our ambition."(Interview 30, general manager)

"Setting targets is the only way that you can measure if something is achievable or not. So, maybe we can say, okay, I am green oriented, or I am CO2 reduction oriented. But if you don't measure, really, you don't know if you are doing something right or not. So, yes, the answer to your question is: yes, we are people [that are] facts oriented. So, we need to measure our actions. It is not like wishes. It is not like dreams. We need to measure our dreams." (Interview 7, general manager country business unit)

Although in terms of measurement of carbon, the outer environment was also in constant movement, the company started the construction of a carbon accounting tool in 2007.

"It was on the stability of the methodology. Because a number of points were still being worked on, regulations began to develop, we were talking about Grenelle." (Interview 32, environmental manager)

In 2008 and 2009, external communication related to climate change strategy was still limited to the quantification strategy. Under SUPP EN18 "Initiatives to reduce the emissions of greenhouse gas and reductions achieved" of the Global Reporting Initiative (GRI), in 2008 the company wrote:

"The measure of carbon footprint and of water consumption is carried out using a tool developed for all the (…) subsidiaries, jointly certified by three organisms."

Objectives	Methods/tools	Indicators
Goal for 2009-2011: reduce carbon footprint by 30%	"Carbon Master" Network Establishment of a third party certified worldwide measuring tool	kgCO2/kg product

Table 3.4: Extract from 2008 sustainability report

In 2009, reports still officially defined the climate change strategy only in terms of measurement, giving no indication on how reductions were going to be achieved:

"The new (…) strategic thrusts, for example, with regard to Nature: establishment of tools for measuring carbon, CO2 impact and with the objectives of reducing CO2 emissions and water use."

5.1.1 The accounting tool at the centre of the strategy

In 2007, the group started the construction of a carbon accounting tool:

> *"In 2007,Group (…) and the Water division constructed the Carbon & Water footprint tool. It is positioned around one of the major challenges of our time: global warming. It aims to estimate the effects of greenhouse gases (GG) and the consumption of water linked to the lifecycle of a unit of packaged product and to obtain a global image of the footprint of each subsidiary and to simulate the solutions of exchange in an eco-design initiative." (Annual report 2007)*

The tool was first imagined at corporate level with the help of external life cycle analysis consultants. In June 2007, an independent consultant that had been closely connected to the tool up to 2012 took over from the consultancy. She built the first calculations and emission factor databases by country to allow for a first run over the summer, and a first presentation to users:

> *"So they sent me, there was a project, it was just the, a little bit the inputs, if you'd like, and a table of outputs. And so then, he had called me directly and told me: OK, we have this project to develop a tool, we already have a mockup, so it has to get done very quickly because in July there was a meeting of all the environmental correspondents from different countries. They met every year, and so he wanted to present a first draft of the tool. So as a result, if you like, from this first table of defined inputs and outputs, I built calculations behind it with, I think it was then, I designed, you know, the database thing by country." (Interview 31, external consultant)*

In 2007, the accounting tool only concerned the first division, "water". The first database was tailored for four countries to be tested. Right after Summer 2007, the emission factor database was extended to more countries for further testing within the country business units. The first tests allowed for further elaboration of the model, such as for example on the logistic side:

> *"You see, before, there was one, I think there was an electric diesel modification. Um, maybe it came after, when, for example there was, they could choose between truck and train, but after they realized that they also wanted to be able to make models for different types of trains. So that came about after the fact. So that necessarily there were small adjustments like that, but finally, I think that didn't amount for too much." (Interview 31, external consultant)*

There were two training levels. The first one was the July conference, with first general information given out to the country business units, and the distribution of the tool and training material to the identified future "carbon master". The identified carbon accountants were given a fixed period of time to complete their first 10 measures by product, and a hotline at corporate level was incorporated to support local units.

In 2008, the United Kingdom division asked for certification of several products' footprint and had the Carbon Trust review the calculations that allowed for further refinement of the tool:

> *"Yeah, there, it was the Carbon Trust review, realizing that at that point, there were a lot of comments made. After, we also restructured the tool because in the beginning, you see, I, I had all the… it wasn't as good, that is, all the… I had pieces of calculations that were, I mean, in the, like that, hidden. So we had everything and it was much better, we put everything in a separate sheet, so it was neat and clean." (Interview 31, external consultant)*

> *"For example, initially there was also, we had only one end of life, whether the packaging went into stores or into the consumer's home, there was only one series of statistics, so we separated that." (Interview 31, external consultant)*

In parallel to the review in 2008, the accounting tool was further tailored to the dairy division. Working groups worked on the milk tool, the calculation of fruits emissions and the manufacturing of the different categories of dairy products. Even the logistics was further refined:

> *"And we defined a logistics model, with the understanding that there, finally, it was more precise because in the tool for the water division, I don't know whether you noticed it, but it's very open in fact. We did not predetermine the steps, whereas in the dairy division carbon accounting tool, we have a diagram where all the possibilities are defined." (Interview 31, external consultant)*

The definition of accounting for carbon at the dairy division triggered the first reflections on the consolidation of results at corporate level. The number products in the water division allowed for 80 percent of products to be accounted for each year, but the dairy division was unable to achieve such a number. New rules were established on the basis of representativity of turnover, plants and family of products. In the summer of 2008, the dairy version of the carbon accounting tool was presented to the carbon masters:

> *"We had two days of training in Paris, with all the carbon masters, to get to know each other first of all, who were the chosen few. So there, the first observation was that there were really, I'd say, people from all over. I saw people from supply chain, from R&D, there was everything. During those days, we were made aware of the carbon problem for the group. They showed us the goals for a reduction in the carbon footprint of at least 30 percent over three years, and for future projects for carbon offset compensation. So they brought us up to speed to explain the perception and the context to us, that's good. Then after, we learned about the tool." (Interview 11, carbon master)*

The reduction target for carbon emissions at the group level was announced publically in autumn 2008. Finally, the tool was further elaborated to tailor to the specificities of the two remaining divisions, baby and medical:

> *"And I think the environmental director really had a lot of trouble getting them into the boat… and besides, it has stayed that way somewhat, because today you really feel that it's not their priority and that they just do the minimum, the strict minimum." (Interview 31, external consultant)*

> *"So we gradually showed the tools, like one of those Russian dolls [en poupées gigognes]. That is, the tool [for the water division] was used as a reference tool and finally as a base tool to demonstrate the tool [for the dairy division]. Of course, it became the dairy carbon accounting tool, but what I made sure of each time, that is, with the dairy tool, if we disengage from a certain number of functionalities that are specific to dairy, we have to be able to measure a water product." (Interview 32, environmental manager)*

The carbon accounting for dairy and water products was peer reviewed in 2009 and 2010.

The accounting tool and information on quantification of the climate change strategy was perceived as reassuring:

> *"And on this point overall, information came from headquarters on how we would measure the emission level, because that was a problem. Initially, we had no point of reference on CO2 emissions." (Interview 25, general manager country business unit)*

Indeed, the notion of carbon was difficult to understand and to 'make real' for everyone:

> *"We did not know what a CO2 equivalent was. For us, it was the jungle." (Interview 12, carbon master)*

The tool was built on excel, and although it was considered complex, it was also a tool "for everyone", accessible and democratic.

> *"And, well, yet in the beginning it was too complicated, looking at this Excel file... Excel file... I don't know how to handle it... and that was a reason for me take a lot of time to understand the tools. [Laughs]. So, that was the difficulty I had in the beginning." (Interview 20, carbon master)*

The excel carbon accounting tool allowed one to connect operational reality with carbon numbers. It acted as a translator of the company's activities into carbon emissions:

> *"We had to in a way put ourselves into the logic of the measure. So the first point, was, I would say to understand the measurement tool, which is imperfect like any tool, but made it possible to somewhat reverse engineer our processes, measures and gradually refine the famous quantification" (Interview 18, operations manager)*

Moreover, it was perceived as a transformation tool for the strategy to operate within the company:

> *"So, for me it's a very important tool. The company gives me the tool to change a little bit of the minds of everyone, to show them that at least one company is concerned about sustainability and environment and good practices." (Interview 17, carbon master)*

Already however, the limits of the tool were acknowledged as being time consuming and error-bound:

> *"It's an extremely heavy exercise, and until now we are indeed capturing all the data in the excel file, which is a horrible job, with a lot of risk for errors." (Interview 23, general manager country business unit)*

> *"Finally, I don't know whether I reached that point, but what is important is to be able to measure trends precisely. Therefore, to identify all the levers that come into play for carbon and to be able to relate them to a variation in carbon." (Interview 28, operations manager)*

After the construction of the accounting tool over the period of 2007 to 2009, the announcement of the target of carbon emissions reduction began of the operationalization of the climate change strategy.

5.2 Setting the pace with an official target

As for what would happen beyond measuring and accounting for climate change; the 2007 report only stated:

> *"The 2009-2011 reduction targets will be defined, along with the ways of achieving them."*

In a second step, the company announced the -30% target and the integration of the target in the bonuses, showing a burgeoning climate change strategy:

> *"Reducing the CO2 footprint by 30% (in kg CO2/kg product) on all activities (industrial sites, packaging, transportation, product- and packaging end-of life-cycle)."*
> *"The effective reduction of the carbon footprint has been integrated into the calculation of bonuses for the Group's executives."*

In the local business units, it was hard to grasp what it meant, and what kind of actions could lead to that objective:

> *"What I heard about it was that it did not make so sense for them in that moment, so they didn't understand very well what we should do, or what could be done in*

> *terms of a strategy. But they received it as a... more as a challenge..." (Interview 16, carbon master)*
>
> *"I took this responsibility because everybody was scared. Nobody knew what it was all about." (Interview 3, research and development manager)*
>
> *"I think, at the time the announcement was for me something I did not really feel related to. It sounded very abstract, very far from what we were used to do in running a country business unit." (Interview 23, general manager country business unit)*
>
> *"In my opinion, on the one hand there was a strategy that everyone embraced. And on the other hand, implementation where everyone implemented, but without necessarily being perfectly aware that that contributed to reducing CO2." (Interview 25, general manager country business unit)*

In the 2009 annual report, the objective for reduction was even defined as "inaccessible":

> *"The challenge of this ambition inaccessible a priori is to require the company to question and reconsider its practices so as to reinvent itself."*

At the announcement in the 2008 directors' meeting, top managers were also sceptical about what strategy was behind this target:

> *"Ok, guys, you announce we are going to reduce by 30%, but it is a big responsibility to commit externally and on such an aggressive figure! You have concrete plans to achieve this?" (Internal documents: meeting powerpoint)*

Although strategy has become an obligatory point of passage connecting organisations with the world outside (Carter et al., 2010), the company struggled with defining one related to climate change. For about two years, the nature team used the term "NIC" that stood for non-identified carbon (in relation with the term NIP, non-identified productivity, used in the organization) to describe the impossibility to achieve the -30%. The managers of the company were incentivized on carbon accounting the first year, and on carbon reduction achievements there onwards. The bonus played a crucial role in defining the importance of the target for the company, from the top:

> *"The bonus has played a key role, because it is a sign. This has led to everyone getting engaged. That's right, it's a weapon, it is a way to motivate people that should be used wisely, I think it was used wisely. Maybe a little early, but it was a small risk taking and finally, it went well, the measure was not completely reliable at the beginning so setting a bonus linked to something not completely reliable, it is a little difficult." (Interview 28, operations manager)*

5.2.1 A new mission: carbon master

In 2008, a carbon expert was appointed in each subsidiary, to be responsible for measuring CO2 emissions and to prepare a suitable action plan for their reduction. There were no guidelines given on how the "carbon master" should be chosen, and also no indication that a new function should be created. Most of the time, first carbon masters were actually quality managers, research and development managers, and supply chain managers or else, who added this topic to their job. General managers chose their carbon master looking for project leaders, not afraid of numbers:

> *"I was chosen by my general manager on the criteria, I think, of synergy as it was a measurement tool. So he thought of a quality controller that is accustomed to, and who is used to managing both technical projects and also organizational projects." (Interview 11, carbon master)*

Along with knowledge of organizational projects, an affinity with numbers, a personal affinity with the environment was also a criterion to become "carbon master":

> *"Because of a personal affinity to environmental topics, sustainable development." (Interview 2, carbon master)*

There was a sense for carbon masters of doing pioneering work and being proud of being part of a new emergent accounting and strategy:

> *"So it's motivating to participate in and see that nothing is written down. Finally, you're there also to help define and manage." (Interview 2, carbon master)*

The first task of a carbon master was education and training on the carbon topic. Carbon needed to be rendered accessible:

> *"So, to understand the numbers, to establish a new process, influencing new committees, start discussing the carbon footprint in new committees... so, it was a given that we needed to influence a lot of people, to educate them, to understand the carbon footprint and how important it is, and how the carbon footprint can contribute in the process, or in the savings or in the concepts and how I can sell it to the consumers." (Interview 16, carbon master)*

> *"So there is also a phase of making things accessible to the teams, because a lot of project managers don't necessarily master the concept of CO2 or understand it, or the challenges related to reducing CO2, and so there's that, too." (Interview 2, carbon master)*

Moreover, the carbon master acted also as a translator from carbon to daily life topics:

> *"Carbon number doesn't speak to anyone. You have a carbon footprint and you tell them: your product is 1.3 kg. If in the beginning, because it was more than 1 kg/kg. They said: Ah, so 1.5kg of CO2 for 1kg of yogurt. Oh my God, but that's enormous.*

> *Then they would ask me: But what is 1.5 kg? What does that represent? So then the need to look closely and make comparisons with things a little more down to earth in everyday life, etc." (Interview 13, carbon master)*

However, the topic was seen as relatively positive, since there were no dollars signs involved. There was also a genuine curiosity related to a new topic:

> *"Receptiveness is very good because it's a subject people are interested in, that people talk about. People, whoever they are, whatever their job is or their position, when it comes down to it, they're interested. And in general when you show up, it's to share. And the fact that you're not displaying a euro sign, that puts them at ease." (Interview 2, carbon master)*

5.2.2 Letting the strategy emerge locally: the laboratory mode

As there was strategic vision for how to reduce carbon emissions, the local teams defined the working mode as "practical coping":

> "*Because today, there isn't much vision [on the future]. We're more in a mode of putting out fires than being proactive in terms of defining a deadline, that is, this is where we're going, etc." (Interview 2, carbon master)*

In the first phase, local teams looked for easily quantifiable areas, where reduction and success would be easily measurable.

> "*During the first year, what we did precisely was to take a number of drivers, which would lower carbon for the item: One which is energy consumption, the CO2 footprint, focus on that because it is very easily measurable. Second, packaging, because it is also very easily measurable. Then during the first year, we focused less on the others that are more difficult, like distribution or like what can happen in stores, or on the entire chain below or even what happens with our suppliers." (Interview 28, operations manager)*

> *"I think that it was iterative, going from simpler to more complicated. It has to do with carbon accounting. Finally, it is human but not necessarily the best solution, insofar as often, when something is complicated there are more potentials." (Interview 28, operations manager)*

In the dairy and baby divisions, carbon accounting allowed to first translate existing projects into CO2. Accounting served as a photographic developer on them, revealing the CO2 nature of all productivity projects, but also projects related to new product launches. This period was labelled the "carbon honeymoon".

> *"In all honesty, in the beginning the projects were pure productivity. We took a list of productivity projects. There were some that helped of course, such as reducing the thickness of the cups, a form achieved by injecting small air bubbles, it was that kind of thing; or in the plants, because there were always plans for energy reduction in the plants. So we took things that already existed and the way of working and we*

put it into the Carbon Footprint steering committee and we processed it through the carbon prism, but it was in parallel with the economic prism in any event. So that was the first year." (Interview 13, carbon master)

"Thank you! In fact, what I was telling you (...), it is that today our first tool is really to bounce back on existing projects. And today there are plenty of projects already in the Booster file, Open Way, etc… (The mentioned files are list of future projects) which are not qualified in carbon. And there are also many things we have had in mind for a long time, from (the plant), etc.. So the idea is to say on this whole list of projects that includes both projects that are in the file Booster, in the file open away, both ideas that we could have mentioned at some point, what can we count on or not count on? Potentially, is there carbon in?" (Carbon master in a workshop)

The hybridization of economic purposes and environmental topics also allowed for this new practice to sink in. There was a good correlation between carbon reduction and productivity.

"Well, I might say, in the beginning there were a lot of conflicting decisions between carbon footprint reduction and productivity. It was sometimes difficult. And what we see now, since we are getting more mature, that in most of the cases there is a direct correlation between productivity efforts and carbon footprint reduction. And that means, today we follow the progress of CO2-reduction in our productivity committee, the CoPro. For example, I mean, it's simple, but reducing energy in our factories is of course an objective to save costs. But at the same time obviously you reduce your CO2-emission. So, in this case it's a win-win." (Interview 23, general manager country business unit)

Projects for carbon reduction were associated with local challenges and each country business unit drove their strategy inductively from local situations:

"The majority of this work here was done, I'd say, with the supply chain team, where there was a lot of work, which was done for shipping and merchandise. The supply chain team was the first to really work on the project. And we started to use the train. In our country, the shipping of merchandise has a big impact. In the last three to four months, supply has really changed the way merchandise is shipped. And indeed, I'd say, one of the best practices is that we use the train. So, our limit is wintertime when it snows too often, when the rails are not as reliable. Last year, for the first time, barely 60% of our shipping was by train. So those were the first successes we've had with the supply chain." (Interview 15, quality manager)

"But also we need to deliver our products to very far away markets. So, we decided in 2008 to install mini-plants, micro-plants, very cheap plants to be very close to the market. So at the same time using the returnable packaging we also decided instead of sending our product to primary freight, we decided to install micro plants; right now we are having 16 micro plants installed in Mexico, just to be closer to the consumers. Avoiding the freight from the plants to the market. That's the main reason that we reduced 46 per cent from 2008 to 2011." (Interview 7, general manager country business unit)

5.2.3 Accounting for the emergence of strategy and the emergence of accounting

The new accounting tool requested new data to quantify carbon emissions for the different products that was not always part of traditional data collection circuits. Both the structure of data and the capturing of data was a challenge to the emergence of accounting. Carbon masters had to start on a network of informants that would become the "human" information system for carbon accounting.

> *"Afterwards, the problems are in terms of access to information. That is, that the structure of the data as it is used in the business, it does not at all fit our needs for the carbon accounting tool. So the problem is getting information. And when it exists in the system that makes things easy. And when it is not in the system, well, you have to create a regular flow of information." (Interview 2, carbon master)*

> *"So, usually when I have a deadline I have to push, to push everyone to be on time. Maybe that delays or maybe I ask too many times and they think it's not so important... or maybe it's just my feeling... You know, but that is the main difficulty. Because you have to wait for others, it's like that. You depend on others, on the timing of others to complete your task. That's the main problem. Then you have to work on the arguments to communicate why it's important, why they have to give the information on time and all of that. But mainly that is the... And maybe the.... no.. that will be the... I think." (Interview 17, carbon master)*

Carbon accounting materialized in two excel tools at the local country business unit level. It was therefore malleable for carbon masters. Some managed to automate calculation, and most of them used it not only for reporting but also for simulation of projects. The excel tool became rapidly much more than just an accounting tool, but also a strategic tool for decision making on carbon emissions reduction projects.

> *"The Excel tool really had richness when you thought about it, when you wanted to compare countries, to see the levers. I thought that was really valuable, especially for the logistics part, which is very complex. You can model them quite easily [with the excel tool]." (Interview 18, operations manager)*

> *"It's cumbersome, no doubt. But that said, it's very practical. Especially for me. I use it for things besides reporting, etc. I use it quite a bit for simulations. So I also want to see, oh, I don't know, if I get my strawberries from China rather than from Morocco, what will the impact be, etc.? I use it a lot for that." (Interview 13, carbon master)*

The tool was also adapted to for to allow for more innovative projects to emerge, in particular in the research and development teams. As the tool was a limitation to further exploring potential projects, it was further refined to allow for projects to emerge:

> *"In fact, when we started doing this, we soon realized that with everything we had in the project, we were quickly blocked. Because in fact the carbon accounting tool has been done to evaluate our existing products but not products under development. So we had a number of things that were blocked (…) So in fact, (the consultant) made this famous tool that allows us, on the contrary to separate. So if I want to make a cap in any material I want, I put the cap material, I make the manufacturing process of the cap, etc..." (Interview 27, research & development manager)*

In this extension "pack" (packaging) of the tool, the materials and the processes of fabrication were separated and data from the organization's suppliers and the original database from Plastic Europe were compared. This allowed refining the emission factor used in the calculation (for example a cap takes a lot less energy than other plastic manufacturing processes). The organization contacted the manufacturers to know the energy required for processing, and the distance between their plastic supplier and their plant, and entered the collected data in the "pack" extension of the carbon accounting tool.

Additionally, the tool was also automated for constant monitoring of progress at the local level, some country business units having monthly updates of their performance.

> *"Interviewer: But you have managed to automate the carbon accounting tool on your side? You have managed to change the tool for you to make it easier?*
> *Interviewee: I made some links, you know, reference links, so when I... actually I changed a value in one excel file and when I open the next one I put "actualize" and... It's very simple. You have ten files, and then you have to merge them in one and it saves you some time. And if you link them it's easier. It's not that I am a programmer and I make changes." (Interview 17, carbon master)*

Staying on top of strategic data also required some extensive curiosity from carbon masters. They had to act as "radars" of potential projects that could be translated into carbon reduction, and be integrated into the strategy, as well as the budget for current and subsequent years.

> *"The other problem is about access to information for everything project-related. That is, understanding that a project for new work which will change the production line may also have an impact on the energy console. But, if you will, nobody sends you an e-mail to let you know that, hey, we have that subject. There may be an impact. You have to look into it. So you have to keep your ears open, really open, to understand all that, to know all that, before you can understand whether there will be an impact or not. That's the way it works."(Interview 2, carbon master)*

> *"So, in the action plan activities and in the landing projection estimates, it's a pivotal point. So, to get information about the new products that will be coming out, about the plants, and about logistics when they change the logistics systems. There are direct impacts with CO2. It's difficult to go and get all this information, especially if it is not in the system. That's also time that is devoted to attending meetings and holding regular briefings with various parties." (Interview 2, carbon master)*

5.2.4 Strategy at headquarters level: coordination of laboratories

The headquarter team from 2007 to 2009 was still composed of a single environmental director. In 2009, a "nature" team replaced the single environmental director with a general manager coming from the business (former general manager of a business division) and a nature CFO originating from the finance function. Two sponsors at the executive committee level were also made responsible for the nature strategy.

At headquarters, the team collected best practice and managed the diffusion and rollout to other country business units.

> *"There is a kind of laboratory where they allow people to take initiatives on a given subject, because they think they will provide lots of things, develop lots of things, and, necessarily, best practices, when they will be developed in one country or another, they will take them and make them global. Our strategy is to say: Let's be innovative locally, at our own frontier, and let's gather everything that was well-designed and let's make it general." (Interview 28, operations manager)*

> *"Besides, most of the things we do locally even though we are virtually autonomous, they have to do with interactions and the added value we're able to get from the different sources we have, whether that is the group or the outside world, whether domestically or elsewhere, and all the elements that give us a better perception of what we need to do." (Interview 25, general manager country business unit)*

5.2.5 Headquarter's accounting

In terms of carbon accounting, headquarters acted first as a "hotline" for local carbon masters and started dealing with more and more technical questions such as questions on emission factor choices. Two "headquarter" carbon masters were put as the relay between the local and the global.

> *"After that, once the carbon masters became more familiar with the tool and all that, they have actually started to ask questions and to say ... You have questions such as for the recycled material in jugs, when it enters the factory, should you take the emission factor from your supplier or from the country, stuff like that? There were lots of small questions, many questions of detail that had not yet been solved." (Interview 6, environmental manager)*

> *"I'm in charge of coordination at group level for all the countries and also therefore for data consolidation. So I help them and I'm the support person for the reduction measurement process. Then, I'm also the support person for data consolidation for the group's results." (Interview 8, headquarter carbon master)*

The second task of the nature CFO at headquarters was to drive consolidation of local results into a group number for carbon reduction. This meant driving data collection, data consolidation, data analysis at the group level. Rules had to be put in place for consolidation at country level, division level, but also rules on methodological changes.

> *"Because in the beginning, you say, you count, but in fact you count very imprecisely. So that precise measurement is very difficult. We started with statistical samples, and to some degree we are still there, and that, I would say it's not important from the environmental point of view because it's not fundamental. What is important, is the consistency of the measurement and the trend, which in any case for me is important. Because precision in carbon accounting, when you have 1,000 trucks on the road, to know exactly what their carbon accounting is, is very difficult… But when the method is consistent, if you reduce the number of trucks, if you reduce the number of kilometers, or if you reduce the average consumption of the trucks, finally you're sure that you will reduce the carbon level. So, knowing whether it's 11.5% or 11.8% is not a big deal." (Interview 28, operations manager)*

5.3 Synchronisation of emergent strategy and traditional business strategy

5.3.1 Local emerging strategy

After the first year and the strategy of "translation" of productivity projects into carbon, the local units started to feel the lack of strategic input from global as a handicap to the pursuit of the carbon reduction strategy.

> *"But for us also, being left somewhat in the dark, not knowing exactly when we will be able to communicate or what we're allowed to communicate, what is sure and going there in a sense step by step. Um, that challenges us, because I think we are not prepared well enough to introduce the subject, to introduce it forcefully." (Interview 13, carbon master)*

There was a lack of communication between global and local in terms of performance updates and benchmarking that impaired the future of the strategy at local levels.

> *"But, for example, we don't have regular performance monitoring, I would say not even monthly nor quarterly or every six months. I think that if they want to make that a little more part of everyday life, it's like anything else, it isn't easy to measure and it's hard for it to be a part of everyday life. So we follow the action plans and we define at the beginning and at the end. The group doesn't communicate much after that about the action plans, how they are going. I think there's not enough communication on that… So for me in terms of communication, and I think strategic*

vision is lacking somewhat. There has to be more sharing of strategic vision and concepts." (Interview 25, general manager country business unit)

"What could maybe be interesting to share is more concrete examples of initiatives in countries that led to a dramatic CO2 reduction." (Interview 23, general manager country business unit)

Carbon strategy was beginning to be confronted with business strategy, as well as with tough local conditions. Keeping carbon strategy close to the heart of business on a long term basis was difficult.

"So if you like, it's something that we fuel and that we sustain, but at times it's a bit frustrating, to see that we do work, that we believe in what we're doing, that we try our best to persuade, to make people aware, to get them to embrace all of that. And that after, in the face of all that, we are up against a business strategy that is not necessarily in line with that." (Interview 10, carbon master)

"Mainly it's a battle from the bottom, but when there is a problem and we know that we are not achieving the reduction then the general manager pushes, asks for action. And, I think, all directors ask for that. As every year we manage to achieve, I think, in the last years, I think... the CO2, it is not shown as a problem. We have a lot of other problems here in our country with the inflation and the market fluctuation…that maybe we keep the eye out of the CO2 [consequently, we don't keep an eye on CO2]." (Interview 17, carbon master)

"And a huge difficulty is to be in contact with the business, to be part of it, and to include carbon footprint on the business. It is much more about... the difficulty is to touch the heart of the beast; to be there and to influence the beast to be more conscious about carbon footprint. So, that is the difficulty." (Interview 16, carbon master)

One strategy developed at local level was to start looking for external carbon reduction in combination with suppliers, or getting new ideas from consultants and associations locally.

"The chart from this morning is about the preliminary approach as relates to our suppliers. We already evaluated their maturity and involvement in CO2 in our CO2 accounting and in our emissions with the goal of going to meet them. I did the exercise with supply, too, where I had met with transport and logistics… We also realized that if we really want transparency from them, they need help, because it's a topic where they don't necessarily have expertise. So I would say that we are investing in reducing CO2 emissions, but that are caused by our suppliers, obviously hoping to take advantage of their performance." (Interview 2, carbon master)

"For example I, um, belonged to an association that has sustainable development responsibilities in our country, from a strategic standpoint, I have much more input from interactions within this association. I'm speaking from a strategic standpoint, it's much more than Paris." (Interview 25, general manager country business unit)

5.3.2 Carbon master: at the interface of strategy and accounting

The role of carbon master does not stop at the level of accounting for carbon. They do not simply reflect "carbon accountants" but are really at the intersection of both accounting and strategy.

> *"The interface between the group, the strategy, which is defined as the group level and must come down to the country business unit, so this interface of communication, exchange, sometime as leader and as development of new projects tool." (Interview 10, carbon master)*

> *"The roadmap, you could call it that, was to put the topic of the environment at a strategic level, make it part of the strategy, to define the environmental strategy and the action plans, and develop activities for them." (Interview 13, carbon master)*

> *"A carbon master is someone who, first of all, calculates a company's carbon footprint and reports on it. Second, implement all the action plans to reduce the carbon footprint based on the emission produced." (Interview 12, carbon master)*

Second, he is the connector of the accounting and the strategy with all the different functions:

> *"It remained an important element where we struggled to really get people engaged, it was at the reduction of packaging. (...) But there were many difficulties to create the link with the marketing team, which was led by X. So, it is very difficult to have a transverse engagement of the team." (Interview 15, manager)*

Carbon masters have used processes like mimicking accounting practices such as building budgets to achieve yearly targets, with the notion of risks and opportunities. This allows the new activities to be associated with existing legitimate practices in accounting:

> *"With our partners, we work each year to develop a plan of action. (...). So the group tells us this year, France you need to do at least 7%. We ensure that we have in our pipe of projects enough to reach 7% or more, at least in theory, since we know there will always be a project that will be delayed, another project that will be cancelled, postponed etc. and so that is to say each new year, we make a list of projects." (Interview 10, carbon master)*

> *"So I should have 500 tons that should come out from the [project list] in 2012. So all of that is project X on [project list], therefore less 614 tons from project X. So, concretely, I think there is a real risk about the lid, where the lid was not re incorporated, re incorporating the lid in the calculations here. On the other hand, for 2013 we now have to add that the pack has been discontinued, because that's what's in the plans, right?*

Speaker 3:
What is sure, is that we're launching with the last one. But what is much less sure, is that they will take it away from us afterwards.
Speaker 2:
Really? That's much less sure.
Speaker 3:
Right now, I'll keep it as an opportunity.
Speaker 2:
OK, for 2013?" (Recorded workshop on CO2)

The carbon master is also an orchestra conductor, trying to make all actors perform carbon reduction, where the carbon accounting tool is open, and used in a "networked" fashion by all parties involved in the development of the strategy.

""And from the beginning, that's the way we organized things, a Carbon Footprint steering committee with the parties. And I led the band. The purpose was - and my manager consistently agreed with this - if we wanted to implement carbon in the company, it meant having everyone participate, involving management, and therefore not becoming the carbon expert, the only one who knew the tool." (Interview 13, carbon master)

"Interviewer: So you have a contact in each function that gives you the data every month.
Interviewee: Yes. I had a training session with each department... which are representing each department in terms of the carbon footprint, and after the training... which was more or less a training on how to use the tools, that is the parameters they must input into the tools; after they understood it was not a problem." (Interview 20, carbon master)

Furthermore, carbon masters act as ambassadors of carbon strategy, and have an evangelizing role.

"Ah, what I like is that there is already the aspect of learning and sharing about a subject. Because we realize that we are all there with our filters, with our biases, with the impression that we are doing good about the subject, about recycling. But when you start speaking with people, you realize you don't have the same perception. And so, it also means sharing about those subjects. Then, sharing the business challenges, succeeding in bringing the information to the attention of the management committee to explain that to take one action or another will have one impact or another. So, it really means bringing another argument to decision making." (Interview 2, carbon master)

It is carbon master's mission to allow for everyone to get on board so that every time a new product is developed, the environmental topic emerges at the same time, so that the product is better from the start. Carbon masters have the task to manage internalization of the carbon topic in each and every function.

> *"I think that the challenges are just mostly in relation to this point, which is that I need to be the bridge builder and build confidence and interest in all those parts, and the job is challenging and exciting at the same time; when I have some functional teams, where there is less knowledge, or less interest, or less understanding on how it will drive value or could drive value." (Interview 14, carbon master)*

> *"So in the beginning normally, somewhat like a militant in an NGO, and a bit like someone with their head in the clouds, etc. Let's say naive, but that's good. Ultimately, you have to be unconventional, and at the same time prepared to say: no I'm not completely out of touch. Look, there's an external benchmark that demonstrates that some went into the niche and it works, and that they made out fine. So that's the way I was pigeonholed. But otherwise I'm very nice. And that's also what they expected in the beginning, a fresh look at different topics, because when you're dealing with fine details, you can't be lofty. So I was really up there, so that afterwards it was important to find a good middle ground between the two. But I think you have to keep that loftiness, some of that innocence where we all make stupid mistakes, because otherwise nothing ambitious will get done." (Interview 13, carbon master)*

Finally, they also manage diffusion of best practice at local level, and are at the intersection of carbon strategy in the local business units.

> *"Now, we expanded activities a bit in last two years. It was also about developing sharing between plants, because we realized that it wasn't necessarily about challenges related to energy consumption, for example. There are best practices in both plants, problems in common in terms of replacing equipment, etc." (Interview 2, carbon master)*

5.3.3 Emergent epistemic community of carbon masters

Although at the beginning, carbon masters had to cope with little information on what their "mission" would be and merely had training on the accounting tool, gradually a community started to emerge from practice.

> *"But I think one... one... and also when I had to learn about the tool in my first months I started searching from here in files for some good presentation to see, but they weren't any, and I think that this is something to improve. I didn't have like a welcome training, you know? I searched for our presentations and so on, but there is no like a welcome training kit for the new Carbon Master." (Interview 17, carbon master)*

Several tools served as knowledge transmitters and allowed for a sense of mission to emerge, contributing also to the construction of the carbon master identity. Every month and a half, the divisions organized conference calls. Those conference calls contained information on the results at global and business unit levels, but also expected changes

and enhancements to the accounting tool, best practice in terms of strategy and explanations on the process of budgeting and accounting.

> *"Each of us is responsible for being part of the joint Global Carbon Master Call... Meeting. So, we have those monthly... and it is a very important time when we can connect back with the group and colleagues who play similar roles, partly with different responsibilities, but at least sharing the carbon responsibility, and we learn about goals from [the group], from the parent company. We learn about best practices about the carbon management. We share those; we share questions, have discussion, and any new aspects of tool integration and management. And then, we are able to build up the relationship with other colleagues with a similar role, so that we can share practices and challenges for the role, working together and how we are managing our carbon." (Interview 14, carbon master)*

> *"After, it is also used as a benchmark, that means that if we implement solutions, we communicate them up through that system and share them with other carbon masters." (Interview 11, carbon master)*

A second tool was more particularly aimed at best practice exchanges related to manufacturing, called "campus nature". Those training days allowed for both global and local experts to train colleagues and exchange knowledge on carbon reduction projects.

> *"We hold campuses, that is, that's the method we chose to dispense know-how, so we held nature campuses. We did nature and losses at the same time, that is, we called it nature. It is also a sign of what we wanted to develop and we dispensed it, finally, to everyone. So there are central experts and local experts who come to train our colleagues. So we do two or three a year, and it works pretty well." (Interview 28, operations manager)*

The exchange of practice, the building of case studies was key for the building of carbon strategy, in the sense that there were no "experts" on carbon in the company, but the diffusion of knowledge to the greastest number was the key to enactement of the carbon strategy. The group wanted the teams to understand the link between actions, decisions and emissions of carbon. The sharing of practices helped knowledge to diffuse.

Finally in 2011, the global team organized nature days in the different regions worldwide to share the company vision for the future.

> *"I think, they were very useful, the Nature Days that we shared last July. Because we had the vision directly from the Nature General Manager, and that was very important because we spent a lot of time talking with her and getting to know the company vision and then when we came here we had more tools, more ideas, we had a clearer vision to develop it. And also I think that... um..." (Interview 17, carbon master)*

The connection of carbon masters with each other also happened through the web page created as a recipient of best practice, guides for accounting and strategic presentations related to carbon.

> *"We are always in contact with the people of the group, and we are always in contact through the web page for the nature... we download information from the website; we... yeah, yeah, yeah, we receive a lot of information; every month we have a conf call." (Interview 7, general manager country business unit)*

> *"Maybe we have to improve the communication tools, because we have the Nature Quick Place. But when you upload something in the Nature Quick Place here... for example here in our country I don't have the advice... do you know... the heads-up. Maybe we can have an e-mail with news, that tells us: "A new project has been uploaded to Nature Quick Place[71]. Go and see it." You know? Sometimes we have a lot of information, which is in the Nature Quick Place, maybe it's not so easy to find, or we don't know it is there and maybe we have to work on that to be more connected with the technology." (Interview 17, carbon master)*

Despite the efforts made to build a community around carbon masters, it did not prevent from having knowledge gaps being created in several countries where the carbon master left the job. Interfaces between old and new carbon masters were not well managed at the beginning which was harmful to the development of the carbon strategy since most of the knowledge developed since 2007 is still oral and embodied in current carbon masters.

> *"I don't think the carbon master network gets enough support, so the carbon master doesn't get enough yet. There are conference calls and all that, but, for example, you see they would never hold a convention. They had one last year, they have one once a year, etc. But I think that maybe we could have a more elaborate event." (Interview 12, carbon master)*

> *"So carbon master, that was good, but there were anomalies, too. After the failures we had, we had, quote-unquote, a very good training session at the start of the project, and just when carbon masters moved to a new role and were replaced, the interface between the new one and the old one, it didn't work. In fact, before, we had training that explained in detail how the tool worked and we said: We had that, how it works and all that. And that didn't work well in our organization on the handover between the carbon masters. On the other hand, the carbon master who wants to put a lot of effort into that, necessarily has to go and get information and necessarily has to try and understand." (Interview 6, environmental manager)*

> *"So there is really in my opinion a problem about the expertise of carbon masters who have to - even if they don't do the work - know enough about the tool to be able to detect those kinds of blatant errors." (Interview 11, carbon master)*

[71] The software "QuickPlace" is a Lotus's Web-based shared workspace software for real time collaboration among geographically dispersed participants

5.3.4 Accounting for more

The rules for accounting were gradually overtaken and carbon masters developed locally the accounting requested and needed for the strategy. Instead of accounting for several products only, some divisions developed accounting for products by brand to allow for each and every manager to grasp the carbon impact of their products.

> *"They told us: Yeah, OK, but we don't see what we can do. You have to tell us more, we have to know what to work on, etc. And to know what to work on, I needed visibility for each brand. So we made a sample per brand with about 6 to 10 products, which gave us a sampling of one hundred references, one hundred products. So that obviously we have an enormous amount of work." (Interview 13, carbon master)*

> *"All of that to say that we also do that work which is not necessarily recognized as typical carbon master work, but that allows us to fuel the strategy to bring awareness to our teams in-house as well." (Interview 10, carbon master)*

Others developed tools to allow for carbon accounting of packaging impact on the strategy.

> *"We tried to demonstrate the impact of our packaging by making a record of all our packs and by demonstrating that if you put a pickup on a product, it contributes to so much. Because it is very abstract as a numerical figure. And the other thing we did is that we conducted a training for the pack committee on eco-design and LCA. So we started like that." (Interview 15, quality manager)*

> *"They have a packaging dashboard where they monitor all the new packagings or all the packagings they have, and packaging projects, and that they also use to calculate all the eco-packaging taxes. It's based on the weight and the type of materials. So they call that a dashboard. And there, they also wanted the CO2 figure, if you like. So for that, in the final analysis, I developed the project in a rather short period of time. But I redid a calculation with the same data. I can show you if you want, but it's just, you see… I just added lines at the end. So in these lines, you have the calculation directly, and on the other hand I added a part to the databases. As a result, when they have a new project, that lets them have the CO2 view right away." (Interview 31, external consultant)*

To allow for more regular feedback on the performance of the strategy locally, other carbon masters automated calculations to develop monthly dashboards.

> *"We make the calculations every month, so, every month I actualize and receive the information to make the following of the footprint, and then when we have the results every month we communicate what we have... the savings we achieved or how we are doing in the quality." (Interview 17, carbon master)*

Finally, carbon accounting also allowed for innovations to be translated into potential emissions, to give visibility to future potential impacts and allow for conscious decisions at the earliest level of business strategy.

> *"And at each innovation committee meeting, we have to calculate the carbon footprint for the products developed that will go forward on a priority basis. Therefore the ones that have an 80 percent chance of making it to the market on the shelf. Precisely, in some way we help with this decision-making, because we alert when there are projects that are very poor in terms of carbon footprint. Which sometimes causes teams to rework the project, to challenge suppliers to get a different packaging material, etc. Why not go from standard plastic to recycled PET or things like that in order to really challenge the teams again to work the project." (Interview 10, carbon master)*

> *"The format means that the work in relationship with this tool is rather tedious and time-consuming, that sometimes, indeed, the tool does not evolve as quickly as we do and as our innovations do. That is, we will use new materials that are not necessarily incorporated in the tool. For example, we're working on the project to develop a line of vegetal milk-based products." (Interview 10, carbon master)*

5.3.5 Headquarters: innovation

In a second step, headquarters started to impact on strategy to allow for innovative solutions to emerge that did not always go in the same direction as business strategy. They signalled that strategy had to become more than the "incremental" of the earlier "carbon honeymoon":

> *"And sometimes also the activities to reduce the impact of the nature sustainability is conflicting with the business direction. For instance, if we want to introduce green electricity or green energy, we need other additional investments, and the recovery of this investment is not really easy." (Interview 20, carbon master)*

> *"In 2011, we are, I'd say, because we used that approach a lot, in 2011, we got a little bit more into subjects that were dilemmas, where we are at the frontier between economic interest and ecological interest. Let me give you an example. In logistics, there is what is called, you can use what is called multimodal, I don't know if that says anything to you." (Interview 22, supply chain manager)*

The headquarter nature team managed the launch of single high-impact projects in terms of reduction, such as the launch of the green HDPE bottle, or the carbon pact deployment both in the dairy division:

> *"If I take, for example, new materials or materials of the future, we will not let each business unit work on its own with research and development teams on the materials of the future whether it is the material of yoghurt pots or the material of bottles. So there, there will be a more central dimension with fundamental research*

> *teams far upstream and applied teams on: how we are going to be able to integrate these new materials in the future." (Interview 18, operations manager)*

> *"And, that's true, about the pack, we have a pack central team that has a whole set of projects about packs, to reduce the impact of carbon on our packagings. Because today, we've reached, I think, a point everywhere to reduce the carbon footprint, broadly speaking.... (…) there has to be breaks. I think that indeed today, central R&D departments for the pack are doing a good job on that. So I think that today, eco-design is mainly managed centrally. Then, you have to find country units to implement it. So very naturally, our country volunteered for Green HDPE, but it is not the country as such that promoted it." (Interview 11, carbon master)*

In 2011, the strategy for climate change was finally codified in three categories: "productivity", "green capex" and "competitive edge". At headquarter, the role was to consolidate the first one, and run the other two categories in terms of investments and innovations. In that sense, both the deployment of local actions ("labs") and centrally driven actions were complementary in achieving the target given by the organization.

Finally, the headquarter nature team lead the green capex initiative. To add to the carbon accounting tool, another new practice was enacted. Criteria for "green" capex projects were modified to allow projects to be considered that would not fit in the traditional financial criteria. Tonnes of CO2 saved per million of euros of investment was added as a criteria to consider the project under the green capex scheme. The payback period was calculated using a monetarization of CO2 at about 15 euros per tonne saved. The criterion for a decision was still made on payback, but included the CO2 saving monetized.

> *"And I managed to convince the group to say that we will select an investment portfolio, part of our annual investment portfolio, and we're going to say: We are on it, we are capable of accepting the project which will have a payback in five years. Provided that lots of carbon is saved. We slipped in a carbon ratio to achieve." (Interview 28, operations manager)*

This has allowed different prioritization of projects:

> *"So it's a few projects that have passed, yes, projects to reduce our pick-up, finally reducing the width of our pick-up. There are the energy recovery projects in our factories. I do not have the amounts specifically in mind. But yes, there are a few projects that have gone into this category. So I think that if this category had not been done perhaps, or you would not have done it, or we would have more time to do them. So it can enhance a number of actions and prioritize a number of projects." (Interview 26, finance manager)*

> *"That [green capex] had a much bigger impact in terms of action and orientation of the company's choices compared with what we were able to do elsewhere." (Interview 26, finance manager)*

5.3.6 Carbon accounting at headquarters: growing expertise and diffusion of savoir-faire

In 2009, a nature CFO was appointed in the nature team. Her role was to enable for certification of the carbon measure, and to introduce rigor in the accounting processes for carbon.

> *"Carbon masters are not necessarily champions at measurement, generally speaking. They are motivated, they're passionate, but they are not great finance folks. (…) So I think discipline had to be added as a way, moreover, to be sure about what we say, to be sure of our work. And then, especially, once they used that as a component of compensation, because it is also a bonus, that you have to be published abroad because it's a result you committed to and you want to obtain results, you look for certification, it's very important that the measurement be very reliable. Because otherwise, it gets challenged, if it is challenged, even if you made progress, everyone can have a doubt." (Interview 28, operations manager)*

The questions coming from local carbon masters became more complex in terms of accounting, accompanying the development of local and global strategies of carbon reduction on new plastics, energy solutions and green electricity for example.

> *"There, you see, I got an e-mail from the carbon master in the U.S., the incorporation of green electricity. She wondered about green electricity. As far as PLA goes, um, I don't know. I think she compared it, because they did an LCA study, and maybe they didn't find exactly the same number. After, my question was about filling the milk part, which they had to. Because you know, they have to report the milk footprint. For that I had a thing from Turkey for cogeneration, because you see, they had a cogeneration project. So they wondered how they could model it. I had stuff, intermodal logistics, and biogas. For complex packs, maybe they had a new complex pack, to be sure to get information. End of life for products, losses on finished goods, you see. Understanding that globally, I think that I have fewer and fewer of these questions, at least I think so." (Interview 31, external consultant)*

> *"When you have questions about the tool, about the new techniques that are part of the tool, or about points to have the group confirm. For example, everything that involves the so-called green energy problem, therefore to get certificates approved by the group." (Interview 11, carbon master)*

A specific carbon data quality committee was created in 2010 to respond to the technical questions posed by emerging strategic options. This committee looked at emission factors sources, questions on quality of data sources, and the evolution of external carbon accounting standards

> *"I think that 2009 and 2010 were somewhat complicated years. But, at the same time you see, I don't remember when it was, in 2010, we set up the Carbon Data Quality Committee, things like, bodies that mean that emission factors are also reviewed. There was also the fact that [the nature CFO] prepared her guideline about reporting. That also helped, it helped calculate things. Also the fact that the tools and the know-how at the same time about what had to be reported, how to understand, you know, all these stories about the evolution of technology, whether it is in scope or not in scope. Also the concept of scope which became increasingly more specific." (Interview 6, environmental manager)*

Accounting at corporate level consisted in further refining the consolidation methodology of all the business units' annual numbers, while also becoming carbon accounting experts and anticipating future emission factor topics and methodological issues that would arise from their future carbon strategy as well as external developing carbon accounting standards.

5.4 Routinization and the future of strategy

Carbon has managed to sink into official announcements of yearly financial results and exposes publically the synchronisation of carbon strategy and business strategy. However tension is still tangible internally as the translation of carbon into the profit and loss statement is still impossible.

> *"But what I notice is that our company communicates about carbon in a public way, especially when reporting results, that is the second year in a row. So that is, you can say, a visible display of a certain kind of synchronization between traditional finance work and carbon." (Interview 21, finance manager)*

> *"And the reasons, they are also related to the fact that there is still no concrete translation in the P&L of these elements there. That is to say, if we do not do a productivity project, we run the risk of adversely affecting profitability. If we do not do the project to reduce CO2, we run the risk of undermining the CO2 part [only]. But it does not directly have any consequences on the P&L and the bottom line of the company." (Interview 26, finance manager)*

Carbon has become invasive. It has become something that is kept a constant eye on, that has become part of daily business and your natural surroundings.

> *"But that's the task we also give ourselves. It means being close to what is happening in the company to input the CO2 indicator. So, I'm not saying that it has become a decision-making criterion, but in any case it's another argument... Because after the euro checkbox, we often put the CO2 checkbox." (Interview 2, carbon master)*

> *"And therefore, as long as we can in our major projects, we show how the environment is concerned. Therefore, there is an awareness of the environment and*

> *which is incorporated into the decision process. After, again, it is rarely the manager who makes the decision alone. Most often, I've seen the pair semi economic and semi-CO2 make the decision." (Interview 22, supply chain manager)*

> *"But because now, when I see an R&D project, there is the carbon impact from the project, because I learned to look, because I learned to interpret. When I see one packaging, I can see whether it's rich in material, and another packaging, whether it will be expensive in terms of carbon". (Interview 30, general manager)*

Connection to the marketing strategy was not achieved at the end of the five years of work and stood as the future challenge.

> *"Now, we have to reform our processes, our products, our materials. That will take even more time. So it has to be a firm policy for continuous improvement." (Interview 28, operations manager)*

> *"I'm not saying there's nothing more to go and get, I think there are lots of things to go and get. On the other hand, that requires very intense changes. A very drastic change in the company also, that's for sure. And then, you can't tire people out about a subject. You also have to make it new in a different way. And in other ways we will reduce carbon, I'm sure, but with other levers, etc." (Interview 13, carbon master)*

> *"So that was up until last year. This year, we planned to separate the industrial challenges and the business challenges. What we're saying today is that we need to create value vis-à-vis the consumer. We need growth in volume and in sales." (Interview 2, carbon master)*

Carbon masters will need to re-inspire people for the next phase of the strategy – it seems as if the intensity of the "blitz" between 2007 and 2012 had left no space for future efforts.

> *"So my aim is also to stop calculating and, walking stick in hand, to go out and bring the teams back on board, as I was telling you, with other subjects. Because with carbon, they had basically had enough, they are no longer motivated. And when a subject no longer sparks enthusiasm, it necessarily advances more slowly. So of course we continue with carbon. That's for sure. But I think we have to start moving on other things." (Interview 13, carbon master)*

5.4.1 Unintended consequences of emerging practices

Some roles have become more important since the inception of the climate change strategy:

> *"I think the person responsible for energy in a plant has become somebody more important since we started looking at CO2 than before, more sharp." (Interview 18, operations manager)*

It has also led other functions to challenge themselves:

> *"I think this is another managerial aspect, it has opened up interesting challenges for engineers. That is to say that sometimes it led us to open doors that had not really been considered before." (Interview 18, operations manager)*

> *"When they started working with carbon on logistics in dairy [division], they were not able to measure the carbon the way it was supposed to be measured. They realized that there were big scopes, it didn't stop in the same spot, at times in the warehouse. They had to develop a new model that was both cost and carbon. That is, it completely changed their way of managing." (Recorded meeting, nature manager)*

5.4.2 From carbon master to nature master

Carbon masters are progressively turning their role into a more strategic role related to nature and not just focused on carbon any longer.

> *"But precisely that requires… I think that your scope of awareness, your scope of investigation has to be broader and that there has to be interest in other subjects other than carbon. Other things have to be looked at: management of water resources, implications with communities, things like that. When you think about a subject like nature, it's something that is necessarily… you have to think broadly." (Interview 6, environmental manager)*

The role is taking a more strategic stance compared to the accounting focus of the beginning.

> *"So that today in the carbon business, if I focus only on carbon, unfortunately, there's 70% carbon reporting and 30% action plan activities. It's totally crazy, because by focusing on reporting, oh well, it's OK. But to do reporting for reporting's sake serves no purpose. You waste time." (Interview 13, carbon master)*

To accompany the evolution of the carbon master role, business units have hired younger employees to help with the accounting job:

> *"I take care of the relation with Paris, what is global. He helps me daily. He is my right hand, that is to say, for all the calculation and executions of action plans." (Interview 12, carbon master)*

5.4.3 Continuous improvement of the accounting and the tool

Tensions emerged between the precarious state of the accounting methodologies and the willingness to communicate achieved results.

> *"Yes, our global CO2 approach triggered a change, really challenged our products, and that's something that can be communicated. And if you like, even if the methodology has some weaknesses, and I think so, it's still what nevertheless motivated many of the actions in the country business units. So for me, it's something that needs to be used." (Recorded meeting on the future of strategy)*

Current accounting was considered insufficient to support the future strategy of carbon emission reduction, and constantly refining the accounting wasone key to the future of the strategy.

> *"By 2015, I think it's unavoidable if we want to achieve a more precise measurement of our emissions. And when I say a more precise measurement, clearly behind that is the notion of reduction potential, because if we are clear about the data, we will get an immediate performance benefit from our suppliers. If you like, I think it's really a strategic focus." (Interview 2, carbon master)*

> *"If tomorrow there is total scope, for me on the other hand there's a big job to do on the ingredients factors and all of that. Because there are times when it's really not very precise. And after, the problem, when there's a supplier who takes a measurement, who makes progress, how you reflect it in your footprint, realizing that it may be, that it is a database value. But, finally, it's very difficult. Once you're in total scope, ideally, you should have everybody's actual footprints, and with a more or less common methodology. Then, follow the progress of all the suppliers and see… And in that case, it would be a real reduction, except that there are lots of places where we don't have the supplier's value, therefore we try to extrapolate using a value from a database, but that's not necessarily the reality." (Interview 31, external consultant)*

Moreover, the strategy needed to be backed up by certified accounting results - the future of accounting lay in participation in standardization of carbon accounting.

> *"We absolutely need to have systems of standards and systems of control. The best guarantee for companies with respect to these problems, is to have standards and controls. And it's important, because generally, a company tries to move in a complex society with rules, with standards, with regulations. It is all very complex and it all changes dramatically. The worst thing for companies is not having rules, not having standards." (Interview 30, general manager)*

> *"So in any case, having figures is completely necessary. You have to have proof, certificates... So that's it, you have to have figures, proof that provides credibility because you are announcing." (Interview 4, marketing manager)*

The state of emergence and the "practical coping" in which accounting had taken place along the five years between 2008 and 2012 started to show its limits. Traceability of data was precarious, and some of the earlier methodological choices such as accounting by consumption sites were put in question.

> *"Another shortcoming of the current system still, is the traceability of data. Because if you want to be certified, it will be necessary to justify the origin of our data." (Interview 11, carbon master)*

> *"So it was, in my opinion, one of the big points if you want to have visibility especially on country business units that import and export, it's really that accuracy*

> *- in French, I do not know how to say - relevance, updating of action plans that we send to customer country business units. This is really one of the problems, to have the visibility on that." (Interview 11, carbon master)*

The evolutive nature of accounting was also starting to put pressure on the validity of the whole carbon strategy.

> *"Um, in fact, I think the problem today is, it's the methodology risk, that is, that a general manager, an executive, they like things that are nicely squared off. When you have a methodology, which evolves, that after all we want to base the company's management strategy on, even if in the background the strategy is a little operational, it is nonetheless essential. If ever you have a methodology that has some weaknesses, um, it doesn't make third parties confident, it doesn't make executives confident. And you, as carbon master, you're not able to say: I feel great and all of that, so you're a bit on the defensive, and gradually - that's what I was saying before - you notice stuff that doesn't exactly work well. So something that was nicely squared off in the beginning starts to have six sides or takes on another shape, it changed the idea the executives had by saying: your thing there, sometimes it's a little far-fetched and everything" (Interview 6, environmental manager)*

> *"The only one tool that we have, I mean the only one big calculation that we have is at the end of the year, and it is a big surprise at the end of the year, whether or not we have achieved something. Now, we obviously have a good sense of what the deliveries would be, but given the tool, it is extremely difficult to do an accurate reading in between. We can do an accurate reading at the end, but not throughout the year." (Interview 14, public affairs manager)*

6 Discussion

6.1 Coproduction of accounting and strategy

This paper demonstrates how accounting and strategy can be co-produced. Strategy was first constituted and enabled by carbon accounting. The processes in place were both creating new spaces of calculability (Vaivio, 1999) and processes of translation of actual projects into carbon reduction possibilities. By creating what can be seen, accounting conditions and enables action (Robson, 1992). Indeed, accounting played the role of a photographic developer on existing productivity projects, giving visibility to potential carbon emission sinks. Through laboratories (labs) and productivity projects, climate change strategy emerged at the pace that projects were translated into carbon. Accounting enabled the carbon reduction strategy. Furthermore, in a second step, potential carbon emission reductions and innovation projects drove the further refinement of the accounting through, for example, looking for more precise supplier

data. Therefore, strategy was also the driver for the emergence of both a more precise and rigorous accounting.

6.2 Intermingling of accounting and strategy

An epistemic object can be conceptualized as a new knowledge space (Miettinen & Virkkunen, 2005), where multiple knowledges are recombined from different sources. It's also a tool for dialogue between different functions that previously did not talk or act together. Carbon accounting "juxtaposes diverse constitutions of organisational knowledges" (McNamara et al., 2004). Heterogeneous knowledges about the environment, strategy, accounting and operations intermingle in the epistemic object and practices created around carbon management (McNamara et al., 2004). Beyond just "accounting for" carbon, the accounting device performed strategic work (Skærbæk & Tryggestad, 2010), by participating in the shaping of what is "quantifiable", what is possible to simulate (such as innovative projects). This research shows a gradual convergence of accounting and strategy, thus as carbon became not only just "measurable but also "manageable" (Millo & MacKenzie, 2009).

Moreover, the intermingling of accounting and strategy has been stated in the creation of a hybrid role in the shape of the "carbon master" who acted both as an accountant and a strategist for carbon.

6.3 Processes of emergence of new practices

This research contributes to the literature on the processes of emergence of new practices. One key process of the emergence of new practices in this case study is the creation of the identity of an accountant-strategist, the carbon master. Strategizing here takes place in a dwelling mode, "in which agent identities and their strategies are simultaneously co-constructed relationally" (Chia & Holt, 2006). The carbon master took the face of an evangelizer of the rest of his co-workers, acted as the orchestra conductor of the strategy and accounting mechanisms during the emergence process. I observed the practices of "authoring boundaries" (Bjorkeng et al., 2009) where the carbon master has to legitimate his actions, and "evangelizing", where he has to constantly train, explain and motivate on a topic on which no one had prior knowledge or frames.

The role of carbon master was crucial in the internalization and routinization of the emergent practices, where he tirelessly embedded carbon numbers and performance

indicators in each department (e.g. supply) and each processes (e.g. innovation, research and development). Organization members moved from being spectators at an external phenomenon to managers of an increasingly internal institutional resource. (Millo & MacKenzie, 2009).

Secondly, this paper emphasizes the mechanisms of knowledge creation and knowledge sustainment through the premises of an epistemic community of carbon masters. The second mechanism emphasized in the learning processes was the exchanges between the local knowledge of what was possible and the technical expertise of headquarters in multiple instances such as conference calls, email "hotline" and the nature website.

6.4 Combined local and central emergence

Previous literature has emphasized the key decentralization in the creation of new strategy and new knowledge. This case study contributes to this literature by demonstrating that local knowledge and local strategy is not sufficient in the process of emergence and that headquarter coordination and expertise reinforces the local creation.

7 Conclusion

This paper describes the emerging practices in carbon accounting and the emergent strategy in climate change in a French multinational company over a period from 2007 to 2012. The first period describes how accounting was first conflated with carbon strategy, and then developed as the "photographic developer" of carbon strategy. In that period, local knowledge and practice was the driver of the emergence process, with headquarters trying to "coordinate" local efforts. The second period narrates how innovation strategy driven from headquarters also pushed carbon accounting beyond its current limits. In the second period, both the accounting tool and the carbon master were the merger of both accounting and strategy for carbon in their identity and role they played in reinforcing each other.

First, this research contributes to the literature on the relationship between accounting and strategy. Prior literature had established causal relationships between strategy and accounting, where accounting had to adapt to strategy, and vice versa, where accounting was conducive to the elaboration of strategy. In this paper, accounting and strategy

intermingle in their mutual constitution, in sharing the same device and the same emerging "role" of carbon master.

Second I contribute by describing further how new accounting practices emerge through the use of a carbon accounting device, and the emergence of a new practitioner, the "carbon master". He can be described as the "orchestra conductor" of both the new accounting and the emergent strategy.

Lastly, this case study emphasizes how an emergent strategy and accounting can be mutually reinforced from the local and the periphery, contradicting the findings of (Regnér, 2003; Quattrone & Hopper, 2001; McNamara et al., 2004), who had questioned that new knowledge could indeed emerge from the centre. In the case of the emerging climate change strategy, it was enacted both by local projects, as well as centrally driven projects that mutually reinforced each other, as the centre also served as diffusion channel of successful local laboratories. The accounting was also both enacted locally through carbon master knowledge of local conditions and projects, and from headquarter's expertise and standardization.

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Conclusion

To gain a better understanding of the institutionalization processes at play in environmental management accounting innovations from ideas to practice, the dissertation aimed at answering the following research questions:

- How can environmental management accounting tools be created, by whom and with what strategies?
- What is the process of adoption and the consequences on the adopting organization? How can an accounting innovation become the centre of a conflict of legitimacies at the time of adoption?
- How do EMA tools translate into organisations' practices?

The research questions were answered through three articles. The first paper focused on the innovation "life cycle assessment" (LCA) and its creation phase. It mobilized the concept of elite as actors of innovation, and institutional work to describe the purposive and intentional set of actions performed in the creation of a new accounting tool. The second article looked at carbon accounting in the specific moment of adoption, and from the point of view of a corporation adopting the innovation. It elaborated further on the concept of internal legitimacy as being a key asset on which to base organizational legitimacy. The last paper engaged with the practice of the innovation "carbon accounting". It focused on the emerging practices in accounting and strategy related to the management of carbon. It contributed to better understanding how innovation emerges in practice through the links that an innovation makes in both time and space.

This conclusive chapter comments on the contributions and limitations of this research. Sections one and two discuss the contributions and the limitations of the dissertation. Section three suggests further research avenues.

1 Contributions

1.1 Theoretical contributions

This dissertation makes three main theoretical contributions on the specific institutional work developed by elite, the role of internal legitimacy in organizational legitimacy, and on the processes of emergence of new practices.

Elite institutional work, because of their inherent embeddedness, has been defined in previous literature (Greenwood & Suddaby, 2006; Boxenbaum & Battilana, 2005) as

being able to reach out, bridge, and connect with the external world to "break" the embeddedness and be drivers of change. However, to the contrary, this dissertation demonstrates that the elite conducts creative work in a way to connect everything back to their own elite status, without making any efforts to connect with others. Instead of reaching out, the work was conducted to strongly identify the new tool with elite identity, and to construct strong locking mechanisms that would avoid any non-elite interference with the making of and using of the tool. For example, allies that were mobilized were also exclusively from the elite group and mimicry work was based on other elite groups.

This dissertation also contributes to the emergent literature on responding to multiple legitimacy requests (O'Dwyer et al., 2011; Kostova et al., 2008) and how to make them co-exist, without choosing one over the other. Admittedly, no organization can completely satisfy all audiences, and it is often said that one legitimacy prevails on others (Suchman, 1995). Indeed, the second article emphasizes that internal legitimacy can be the foundation of organizational legitimacy, confirming that "a strong and early inside-out emphasis is more likely to achieve overall organizational legitimacy, than an early outside-in focus (Human & Provan, 2000). No manager can completely step outside of the belief system that renders the organization plausible to himself or herself, meaning that to function, insiders need a legitimating institution to be coherent with the organisation's belief system (Suchman 1995). Both internal and external legitimacies cohabitate to form organizational legitimacy. In time of organizational change, internal legitimacy can help not loose external legitimacy (Whetten, 2006).

Moreover, this dissertation contributes to a better understanding of the phenomenon of decoupling. Literature on decoupling shows that underestimating the importance of internal legitimacy can lead to negative consequences such as loss of motivation of employees, but also loss of external organizational legitimacy (MacLean & Behnam, 2010), thereby loosing organizational integrity (Dacin et al., 2002). Boulding (1967) states "a loss of internal legitimacy leads to disorganization of behaviour and an inability to perform an assigned role". Therefore this dissertation contributes to the literature by stating that organizational legitimacy can also be sustained by addressing both internal and external stakeholders (Human & Provan, 2000). This research suggests that external and internal legitimacies are not opposite but two facets of the same manifestation, organizational legitimacy.

Finally, this dissertation contributes to the understanding of the emergence of innovations in practice through space and time. The article three demonstrates how accounting and strategy can be co-produced in the emerging process. Strategy is first constituted and enabled by carbon accounting. New spaces of calculability were created (Vaivio, 1999) and actual projects of productivity were translated into carbon reduction possibilities. By creating what can be seen, accounting conditioned and enabled action (Robson, 1992). Indeed, accounting played the role of a photographic developer on existing productivity projects, giving visibility to potential carbon emission sinks. Through laboratories (labs) and productivity projects, climate change strategy emerged at the pace that projects were translated into carbon. Accounting enabled the carbon reduction strategy. Furthermore, in a second step, potential carbon emission reductions and innovation projects drove the further refinement of the accounting through, for example, looking for more precise supplier data. Therefore, strategy was also the driver for the emergence of both a more precise and rigorous accounting.

Innovations are also created through space in collaboration from the centre and the periphery. Previous literature had emphasized the key decentralization in the creation of new strategy and new knowledge (Regnér, 2003; Morris & Empson, 1998; Quattrone & Hopper, 2001; Birkinshaw & Mol, 2006). This dissertation contradicts this literature by demonstrating that local knowledge and local strategy is not sufficient in the process of emergence and that headquarter coordination and expertise reinforces local creation.

1.2 Contributions to studies of management accounting innovations

This dissertation makes several contributions to the studies of management accounting innovations. First, it looks at the creative work of institutional agents for making innovations, to understand the strategic and purposive actions that render an innovation possible. Secondly the research contradicts the view that within a constitutive network of support in the creation of a new accounting, all actors have the same importance in determining the future of the tool (Alcouffe et al., 2008). The first paper relates how a small group of elite engineers from the Ecobilan team lead the creation process for five years, before other members of the elite took control of the tool, demonstrating also that actors have varying importance in the development of the tool.

Second, this dissertation introduces elites as institutional agents in the creation of EMA innovations. Studies of the conception of innovations have emphasized the role of

several different agents in the inception of management accounting innovations. Innovations in management accounting have originally been viewed as principally the preserve of practitioners, as arising from attempts to address the problems actually faced by managers of enterprises (Miller, 1991). However, recently, external change agents have been given a much more significant role. These individuals are a mix of academics, consultants, management gurus and ex-employees (Jones & Dugdale, 2002; Berland, 1997; Miller, 1991). In the environmental management accounting literature, the role of government and governmental agencies has been emphasized (Kokubu et al., 2003; Mia, 2005; Lee et al., 2005). Although elites are traditionally seen as unlikely to be the locus of change (Savage & Williams, 2008; Greenwood & Suddaby, 2006), elites actors can respond to an external threat to their power, through institutional work as a creative act (Currie et al., 2012). In the case of life cycle assessment, the French elite considered creating a tool to measure the environmental impact so as to master the way the environment would be measured, and not let it be decided by "ecologists" or other countries such as Germany or North European countries that were pushing for other definitions of environmental performance in the 90s.

Third, this dissertation introduces a new object of research in management accounting innovations: environmental management accounting. First, the status of degradation of the environment around us is visible, important in magnitude, and many scientists state the urgency of action to remediate to it (Costanza et al., 2013). Second, as Medley (1997) stated, the way that the accounting profession will tackle the environmental question will indicate its capacity to evolve- or not, with the rest of society. Certain characteristics of EMA innovations make them interesting objects of inquiries for the study of both the process of innovations and institutional change in accounting. First EMA constitutes an interesting field of innovations since some are still in the making (water accounting for example), others are emerging practices in organizations (carbon accounting) and finally, others have a short but constituted span of life that allows for genealogies to be unfolded (LCA). The field of EMA is also interesting because it allows observing the interaction, competition, and association of different innovations in the making. Furthermore, EMA stands at the crossroad of several streams of sciences, in the name of natural sciences, ecological economics, management accounting and traditional financial accounting. This particular node of knowledge is an interesting feature of innovations, as it brings together numerous institutional actors, ideas and has an impact on the

"networks" that need to be built around innovations, on the actors that will decide upon adoption and on the practice of those innovations. This is particularly true of carbon accounting that is "disputed" between engineers, politicians and accountants (this is particularly visible in France). Finally, EMA has several interesting features as they make new spaces calculable (Vaivio, 1999; Miller, 1998; Antheaume, 2013). Then, they extended the temporal dimension of management accounting, for example when taking into account the damages to the environment, spanning from a few years to thousands of years (Antheaume, 2013). Finally, EMA increases the number of actors and non-human actors that are taken into account into the management accounting realm. For example, when accounting for an LCA, the river and its pollution is integrated in the realm of accounting, as are the neighbours (their health) of a polluting plant (Antheaume, 2013). I believe looking at EMA through the less of innovations hence point to interesting avenues for research on how innovations are created, adopted, diffused, practiced, destroyed and "re-created".

Fourth, the papers in this dissertation contribute to analysing the constitutive role of accounting (Napier, 2006). The story of the creation of life cycle assessment demonstrates how accounting can be constitutive of how policy makers' views are shaped by accounting. Indeed LCA was used in political debates over recycling for the 1994 European directive. The use of LCA results changed the policy for recycling in the EU completely, proving that a 100% recycling policy would not be entirely beneficial to the environment. LCA was further used in eco-labelling debates in France and in the European Union. Today, LCA is the backbone of the experimentation for environmental labelling in France. LCA is thus constitutive of what is considered "good" or "bad" for the environment in many environmental regulations today. Similarly, the GHG Protocol is constitutive of how investors read organizational GHG emissions performance results.

Finally, there have been numerous attempts at trying to decipher the process or life cycle of innovations (chapter 1 and 3). These analytical categories that allow splitting origination from diffusion, adoption and implementation tend to deemphasize the links that exists between those steps and how much more interlinked the different phases are. "Despite the undisputable merits of such models, a linear sequence of stages does not go unchallenged" (Höllerer, 2013). Rather, the research conducted in this dissertation points at various simultaneous, circular, and interrelated processes (Höllerer, 2013). The adoption phase (or non-adoption in article 2) has consequences on

both the implementation phase, with the potential risks associated with decoupling phenomenon, and back on the origination phase, as for example "imported" MAIs often fail to get institutionalized because of the societal and organizational contexts there were created in (Bell & Hoque, 2012). Similarly, the creation phase has consequences on the diffusion rate, the potential "weak" or "active" adoption of the innovation, and process of implementation within organizations. For example, life cycle assessment is still very much conducted by consultants externally to the organizations, as LCA experts are rare, and costly, while LCA are often conducted only on an adhoc basis because of the cost and complexity of realization, that was embedded in its construction phase originally. Finally, the practice phase influence back future versions of the innovation, and how it is reconceptualised in time. The practice of an innovation impacts the ongoing building of the organizational field around it, such as the potential for standardization, regulation and education to develop.

1.3 Contribution to social and environmental accounting research

Given the central role of accounting in the management and accountability of organizations, new forms of accountings will affect our ability to pursue sustainable development (Unerman et al., 2007). This research on EMA innovations therefore contributes to further understanding how sustainable development can be pursued through accounting in organizations.

Furthermore this dissertation contributed to understand the potential supporting, or lack of support from infrastructure, regulations or user demand (skills to used) (Brown & Dillard, 2013) for EMA innovations. Indeed, it explored the institutional field of life cycle assessment in France, and the links to government, regulations and the economic elites, and the lack of links with university research and the educational field.

Studying EMA as innovation should allow understanding how some innovations are more "incremental" in nature, understanding the lock-ins and tight links between some innovations and the current "regime", and how they could be "unlocked" (Brown & Dillard, 2013). The study of carbon accounting, and more particularly of the non-adoption of the GHG Protocol Corporate Standard, explores the lock-ins and tight links of this particular standard with the financial culture and American business culture. The case study offers one way of unlocking the "incremental" nature by adopting the more "engaged" approach of accounting for scope 3 as well. The second article also points to

the inertia existing in the current carbon accounting structure (2012) and the difficulty to challenge the status quo, since the GHG Protocol occupies the main space of carbon accounting methodologies today, having locked in relationships with governments (US EPA, Brazil, Mexico…), the ISO and the investors (CDP). The recent developments around life cycle assessment also demonstrate how support networks of EMA tools must continuously rebuilt links to defend the tool against competition, such as when the French government overturned the decision of the European Commission to develop a one-criteria tool (based on carbon accounting) to move back to a multi-criteria methodology (today the PEF and OEF methodologies that will be tested starting 2014).

This research also contributes to analysing the role of managers in promoting enhanced corporate social performance (Norris & O'Dwyer, 2004), with the decision of the case study company not to adopt the legitimate outside carbon accounting standard that, according to them, did not correspond to their view of their corporate social responsibility. The focus on the decision of adopting or not an EMA tool is in line with the view that companies are not "some abstract organizational actor; they are met by individual human actors who constantly make decisions and choices, some big and some small, some minor and others of great consequence" (Wood, 1991).

Although participant observation is not a new technique (Spradley, 1980), this dissertation is one of the first researches in environmental management accounting to use this technique. Contrary to some critical accounting researchers which research environmental accounting from the "outside", I believe, like Adams and Larrinaga-Gonzalez (2007), that engaged research is a better methodological approach to studying EMA. To obtain better understandings of how EMA functions in practice, more field studies must bring "the messy world of organizations closer to the reader" (Ahrens & Dent, 1998).

1.4 Managerial and practical contributions

Scapens (2006) argued that management accounting researchers need to give more attention to exploring the practical relevance of their theoretical work. I argue that bringing the importance of internal legitimacy of newly adopted accounting tools to the forefront has practical implications for managers who make decisions in the adoption of innovations. Instead of merely adopting tools proposed by the field to keep or acquire external legitimacy, this dissertation suggests that there is "a need for more reflective

and proactive responses to external pressures" (Bromley & Powell, 2012). More particularly, the focus on internal legitimacy encourage managers "to focus thoughtfully on shaping tools, such as systems of reporting, monitoring, and evaluation, in ways that are more directly linked to their organization's core activities" (Bromley & Powell, 2012). Finally, this research suggests that organizations should proactively respond, but also engage with standard setters in ways that influence the nature of standards that will be made available to them to avoid dissonances in organizational legitimacy post-adoption (Bromley & Powell, 2012). This, in turn, as implication for standard makers and innovators to consider more in depth the future internal legitimacy of their standards and innovations.

The third paper's analysis of a new accounting emerging in practice shades some light on a topic that is linked to our current knowledge society (Knorr Cetina, 1999), that is how new spaces are increasingly rapidly rendered calculable, obliging managers to quickly grasp new accounting knowledge and tools. Similarly to quality or security in the 90s, the environment and carbon have been rendered calculable and are now integrated in organizational management systems. However, contrary to quality and security, environmental accountings are at the crossroads of multiple topics related to natural sciences, ecological economics, politics and accounting- both financial and managerial. These new accountings also relate to long term planning and a wide range of externalities that were both long outside of the organizational realm. Managers are faced with organizing challenges (new roles, resistance, uncertainty) and learning challenges (no education system exists). They need to build new skills and new connections with outside members of a growing organizational field, at the same time that accountings continue to evolve. The third paper brings the challenges of incorporating emergent epistemic practices into organizations to the forefront. The third paper also has implications for the education sector, which needs to bridge the gap for educating the new generation of business managers to new accountings, as well as contribute to training existing managers to the challenges that environmental accountings bring to their organization.

From the point of view of practice, the research conducted into the process of management accounting innovations aroused interests from the practitioners involved in the study. This was visible in the July 2012 meeting organized at the case study

organization, but also in numerous conversations where people expressed their interests in the results of the research.

Through the participant observer status in the organization, I contributed to building bridges between the academic world and the practice world. This was indeed one of the prerequisite of the company to accept the research in the first place. One of the tasks during the participating period was to bring academic knowledge to the company about carbon accounting and to do strategic watch about environmental accounting topics, as well as educating the members of the nature team on the field of environmental accounting (including standards, associations, literature…). Secondly, the knowledge gathered during the case study research was put into an academic paper (on the "convergence project"), which is addressed also at an audience of practitioners and managers. In addition, a book chapter on the entire case study, to the attention of practitioners, will be written and published. Finally, the knowledge on carbon accounting was used to develop a carbon accounting course for business students and a case study of the GHG Protocol implementation is being developed for this course too.

2 Limitations

2.1 Theoretical limitations

The dissertation can be criticized on four main points. First, the dissertation aims at contributing to our understanding of the institutionalization process of EMA innovations. However, it was not able to study back to back the creation, adoption and practice of the same object of research. Therefore, although we assume the feedback loop of each of the three "steps" of the process (figure 0.6.1), the three articles do not have the common field that would have allowed theorizing it entirely. Secondly, the consequences of non-adoption and of the realization of an internal tool on the field of carbon accounting was not understood in full due to time constraints. The impact of the company choice on the future of carbon accounting remains unknown, if any. Thirdly, the field is limited to the French context only, while "ignoring" that the field in which EMA is being worked on is international in nature (LCA has roots in the US and many European countries have acted upon its shaping recently, carbon accounting has American roots, but another 30 methodologies exist). Lastly, the dissertation seeks to contribute to our understanding of the institutionalization process primarily, and

therefore the contributions to the dynamics of emergent practices are not as strong, as to the ones made to institutional theory.

2.2 Methodological limitations

The dissertation suffers from three methodological limitations. First, the perception of a participant observer is influenced by the closeness to the team the participant belongs to while doing the research. A participant observer tries to insulate from the daily realities of fieldwork, but it is unrealistic to think that you can be unaffected (Jorgensen, 1989). This is especially the case in lengthy participations, which are also intense when you perform a membership role. In the case study, the length of participation was twelve months and thus the results are also affected by the realities linked to this lengthy participation. Secondly, the genealogy was conducted as a longitudinal study, which main limit is that it is retrospective (Thiétart, 2007) and appealed to secondary data (archives) and interviews data might suffer from the bias of past reconstruction. The collection of secondary data allowed for "triangulation" of data, to show that the interpretation of the collected interview data and archives go in the same direction, or at least do not contradict our results (Miles & Huberman, 2003). Thirdly, the participant observation method is said to have strong internal validity (Schensul et al., 1999). However, external validity can be threatened by the creation of a researcher-informant relationship that would seriously affect the setting or results (Schensul et al., 1999). The research was conducted under a CIFRE contract that presupposes a working relationship between the researcher and the company. This entails that the researcher developed close and trusting relationships with the informants within the company, and had to develop the relevant tactics to avoid threatening the difficult balance between the participation and the observation as a researcher.

Finally, the structure of the dissertation, which follows the institutionalization process of innovations made me make choices, and some interesting aspects of the field data gathered have been put away for future research, such as the observed transformation of the excel accounting tool into an ERP system, or the interaction between LCA and bilan carbone, for which interviews were started in 2011/2012.

3 Future research

Following the research in this dissertation, several axes for future research will be described. The first paper describes how one tool was made by elite for the elite, it does not give hints and how this tool could be made available to SMEs, or be made simpler without loosing the quality of the analysis, a problem still faced today by the French experiment on environmental labelling. In short the question is, how can a tool made by the elite be democratized, as per how SEA innovations "should" be (Hopwood, 1977)? Furthermore, the complexity built into life cycle assessment as an "expert system" (Giddens, 1990) raises questions of trust placed in those systems, especially related to environmental topics. Furthermore, more and more environmental areas become calculable (water will be next), organizations will be confronted to an increasing number of epistemic objects and practices. Understanding how organizations can deal with constantly emerging practices of which the knowledge is constantly put into question requires further rich case studies.

The second paper raises the question on how and when to participate in standard setting processes. An organization has limited means to participate to external private standard setting processes; however this non-adoption case study raises the question of whether the company should have participated to secure a standard closer to its organizational identity that would have secured both internal and external legitimacy. Further research could study how organizations search for ways to influence the nature of external standards in the environment when internal legitimacy is compromised (Bromley & Powell, 2012).

The third paper raises questions on organizational learning and the evolution of the role of management accounting to encompass new spaces (the environment), and how this new accountings bring the management accountant closer the business partner role that the profession has been longing to achieve.

This dissertation was based principally on a twelve-month participant observation, and therefore I believe that "the cooperation between researchers and practitioners is of primary importance for generating innovative knowledge" (Arjalies, 2010; Adams &

Larrinaga-Gonzalez, 2007). Engaged research in the area of SEA should be encouraged and will allow for richer understanding of current practices in organizations.

Finally, EMA innovations are practiced differently in SMEs, family owned companies, state owned companies, and further contextually different case studies should be conducted to further our understanding of how EMA innovations are adopted and practiced. More genealogies should be conducted to understand competition between different tools (Alcouffe et al., 2008), as for example between carbon accounting and LCA, or LCA and MFCA. Lastly, new organizational fields are being created around EMA innovations with new regulations and professions emerging that could warrant further study.

4 Concluding remarks

As evidence accumulate that capitalism is not ecologically sustainable (Gray & Bebbington, 1998) and that financial accounting as it is today continues to report biased and unfaithful information of the impact of our organizations on our environment (Birkin, 1996), this research aimed at making a contribution with an engaged approach, to advance our knowledge of how accounting – in its broad encompassing meaning - should evolve, through innovations, towards reconsidering the modalities of management of organizations (Brown & Dillard, 2013). Through the study of two EMA innovations – in its political meaning as a "shock against the order" (Monzani, 1985), this dissertation aimed at furthering our understanding of how the creation of new forms of accountings will affect our ability to pursue sustainable development (Unerman et al. 2007).

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Appendices

Appendix 6.1: Historical development of the concept sustainable development

IUCN General Assembly 1950	"If the unbridled devastation of natural resources, which is permitted in the 20th century throughout the world were curbed, certainly by consolidating the basis of world economy a greater contribution would be made towards averting the risks of war than that resulting from political meetings and military coalitions"
Stockholm Conference 1972	Ecodevelopment: "An approach designed to support the efforts of these people (living in villages and other rural settlements) to better understand and utilize in their own development the basic natural resources and human skills available in their own environment" (Maurice Strong, archives from 1973)[72]
Cocyoc Declaration 1974[73]	"Environmental degradation and the rising pressure on resources raise the question whether the "outer limits" of the planet's physical integrity may not be at risk" "The crisis can also be a moment of truth from which the nations learn to acknowledge the bankruptcy of the old system and to seek the framework of a new economic order" "To elaborate and start implementing, as soon as possible, programmes aimed at satisfying the basic needs of the poorest peoples all over the world, including: wherever appropriate, the distribution of goods in kind. These programmes should be designed in such a way as to ensure adequate conservation of resources and protection of the environment"
Maurice Strong (Director of UNEP) 1974	"Ecodevelopment is an approach to development of a given eco-system or locality which harmonizes economic and ecological factors to assure best use of both the human and natural resources of the region to best meet the needs and aspirations of the people on a sustainable basis. It denotes a creative and planned community effort to develop patterns of life, institutions, and techniques which give fullest possible expression to its distinctive cultural and social values and goals and enhance the quality of life of individual people and the community as a whole" (Archives)[74]
World Conservation Strategy (IUCN, 1980)	"Development and conservation operate in the same global context and the underlying problems that must be overcome if either is to be successful are identical"
Bruntland Report (United Nations, 1987)	"Development which meets the needs of the present without compromising the ability of future generations to meet their own needs"

[72] http://eganhistory.com/2012/05/22/before-sustainable-development/ accessed September 23rd 2013
[73] http://www.mauricestrong.net/index.php/cocoyoc-declaration accessed September 23rd 2013
[74] http://eganhistory.com/2012/05/22/before-sustainable-development/ accessed September 23rd 2013

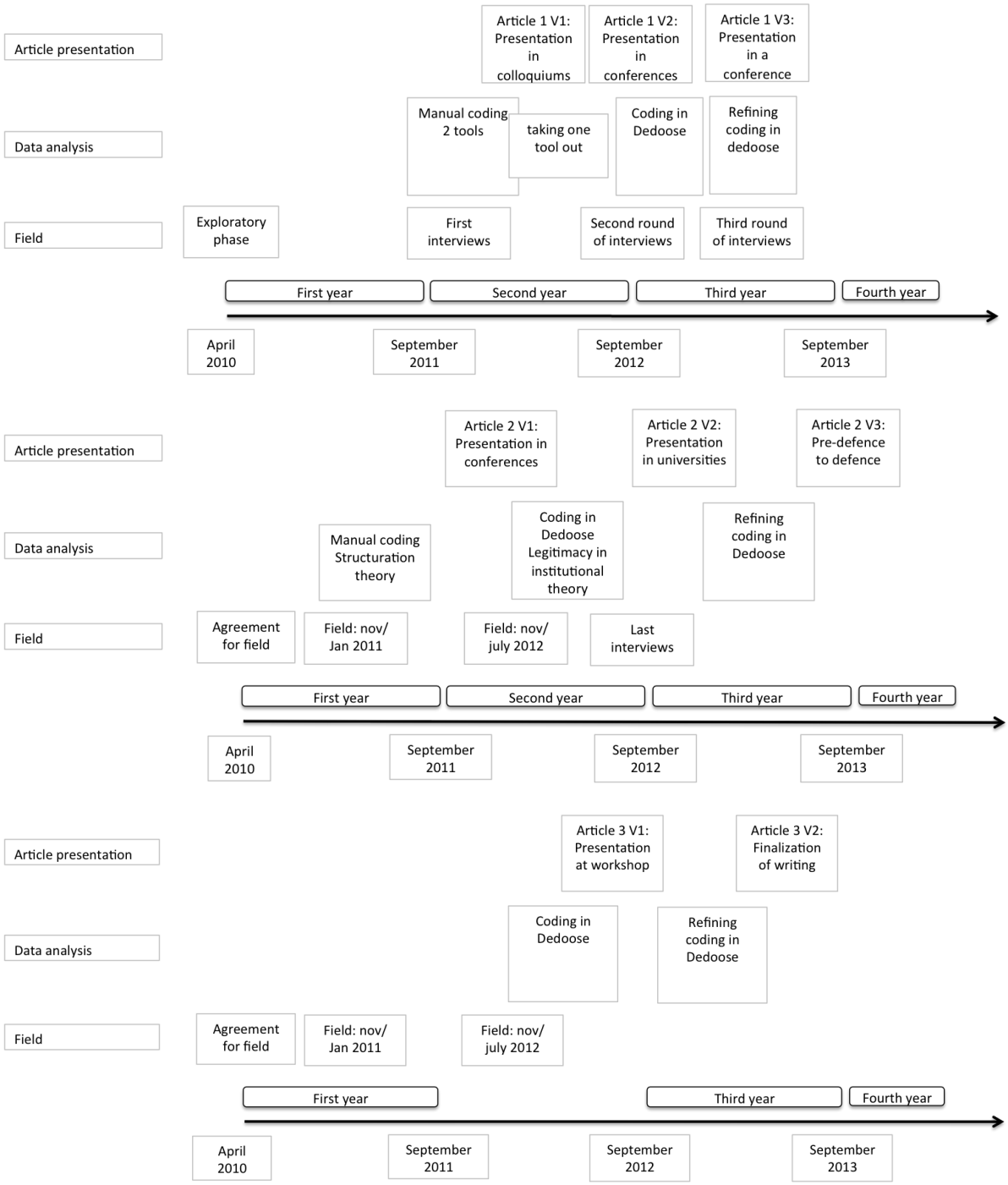
Appendix 6.2: Integration of the concept sustainable development in the French and European policy realm

Treaty of Amsterdam, European Union, 1997	"Determined to promote economic and social progress for their peoples, taking into account the principle of sustainable development and within the context of the accomplishment of the internal market and of reinforced cohesion and environmental protection, and to implement policies ensuring that advances in economic integration are accompanied by parallel progress in other fields"
Environmental Code in France L 110-1	"(Spaces, natural resources and environment, sites and landscapes, air quality, animal and plant species diversity and biological balance's) protection, enhancement, restoration, rehabilitation and their management are of general interest and contribute to the goal of sustainable development which aims to meet the needs of development and the health of present generations without compromising the ability of future generations to meet their own needs"
Gothenburg, European Commission, 2001	"Sustainable development offers the European Union a positive long-term vision of a society that is more prosperous and more just, and which promises a cleaner, safer, healthier environment - a society which delivers a better quality of life for us, for our children, and for our grandchildren. Achieving this in practice requires that economic growth supports social progress and respects the environment, that social policy underpins economic performance, and that environmental policy is cost-effective"
French Environmental Charter 2005	"In order to ensure sustainable development, the choices designed to meet the needs of today must not compromise the ability of future generations and other people to meet their own needs"

Appendix 6.3: Evolution of the definition of CSR, partially based on Carroll (1999)

Bowen (1953)	"It refers to the obligations of businessmen to pursue those policies, to make those decision, or to follow those lines of action which are desirable in terms of the objectives and values of our society"
Frederick (1960)	"Social responsibility in the final analysis implies a public posture toward society's economic and human resources and a willingness to see that those resources are used for broad social ends and not simply for the narrowly circumscribed interests of private persons and firms"
McGuire (1963)	"The idea of social responsibilities supposes that the corporation has not only economic and legal obligations but also certain responsibilities to society which extend beyond these obligations"
Carroll (1979)	"The social responsibility of business encompasses the economic, legal, ethical and discretionary expectations that society has of organizations at a given point in time"
Carroll (1983)	"CSR involves the conduct of a business so that it is economically profitable, law abiding, ethical and socially supportive"
Drucker (1984)	"The proper social responsibility of business is to tame the dragon, that is to turn a social problem into economic opportunity and economic benefit, into productive capacity, into human competence, into well-paid jobs, and into wealth"
WBCSD (1998)	"Corporate Social Responsibility is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large"
European Commission (2001)	"Being socially responsible means not only fulfilling legal expectations, but also going beyond compliance and investing "more" into human capital, the environment and the relations with stakeholders"

Appendix 6.4: Research process for the three articles



Appendix 6.5: Exploratory interviews for the first phase of the research (genealogy)

Interviewee	**Duration**	**Time of interview**
Academic (France)	50 minutes	June 2010
Parliamentarian (France)	29 minutes	March 2010
Academic (France)	42 minutes	June 2010
Consultant (France)	62 minutes	May 2010
Consultants (France)	52 minutes	
Academic (France)	30 minutes (15 minutes recorded)	July 2010
Industry (France)	76 minutes	May 2010
Ademe (France)	57 minutes	June 2010
Manager US EPA (US)	23 minutes	June 2010
Manager US EPA (US)	32 minutes	June 2010
Former consultant (US)	99 minutes	May 2010
Researcher/consultant (Austria)	47 minutes	May 2010
UN EMA project leader (US)	22 minutes	June 2010
Total	606 minutes recorded	

Appendix 6.6: Interviews for the second phase of the research (genealogy)

Interviewee	**Duration**	**Time of interview**
Academic	16 minutes	End of 2011
Consultant	85 minutes	October 2011
Government/governmental body	30 minutes (not recorded)	November 2011
Consultant	74 minutes	December 2011
Academic	24 minutes	January 2012
Consultant	66 minutes	January 2012
Government/governmental body	29 minutes	March 2012
Consultant	59 minutes	April 2012
Consultant	42 minutes	April 2012
Consultant	46 minutes	August 2012
Consultant	34 minutes	September 2012
Consultant	63 minutes	September 2012
Industry	66 minutes	September 2012
Other	25 minutes	September 2012
Government/governmental body	79 minutes	October 2012
Consultant	59 minutes	November 2012
Government/governmental body	48 minutes	December 2012
Industry	29 minutes	January 2013
Industry	83 minutes	January 2013
Industry	49 minutes	March 2013
Total	1006 minutes	

Appendix 6.7: Secondary data (genealogy)

Afite recorded conference	2 hours
Books	878 pages (4 books)
Press articles (Lexis Nexis)	1192 pages (557 articles)
Press articles (other)	97 pages (25 articles)
Other sources (archive, congress presentations etc.)	551 pages (22 documents)
Standards	3 standards (the French standard from 1994, and the international ISO standards)

Codes for lexis nexis research	Number of articles	Number of pages
Analyse de cycle de vie	172	336
Ecobilan	232	425
5 former director and associates	21	52
Biointelligence services	131	379
Total	557	1192

Title of the book	Pages
L'écobilan d'Antoine Blouet et Emmanuel Rivoire, Dunod, 1995	210
L'analyse de cycle de vie par Philippe Osset et Laurent Grisel, Afnor, 2004	347
Adoption by Industry of Life Cycle Approaches, European Commission, 1998, Kogan Page	139
La qualité écologique des produits, des écobilans aux écolabels, Afnor/Sang de la terre, Jean-Paul Ventere, 1995	182

Archives from the French Environmental Agency	Pages
Rapport Final, Etude n° 95-1001/1A (RECORD), ACV, Outils d'aide à la decision industrielle?, septembre 1996, J. de Greave, E. Labouze, P.Rousseaux	33
ACV-Infos, numéro 3, juin-juillet 1998	4
ACV-Infos, numéro 1, décembre 1997- janvier 1998	8

Appendix 6.8: Exploratory interviews and interviews related to the context of research (case study company)

Interviewee	Duration	Time of interview
Sustainable development manager	22 minutes	November 2010
Environmental reporting manager	46 minutes	November 2010
Human Resources Nature manager	28 minutes	November 2010
Environmental manager	34 minutes	December 2010
R&D manager nature	54 minutes	January 2011
Nature external relations manager	45 minutes	January 2011
Information systems nature managers	44 minutes	January 2011

Interviewee	Duration	Time of interview
Consultant for the nature department	70 minutes	January 2011
Former environmental director (90s)	55 minutes	January 2011
Former environmental director (2000s)	29 minutes	January 2012
Sustainable and Responsible Investment Analysis manager	Record lost	January 2012

Interviewee	Duration	Time of interview
GHG Protocol director	29 minutes	October 2011
British Standards Institute managers	44 minutes	November 2011
Carbon Trust manager	32 minutes	December 2011

Appendix 6.9: Interviews at the case study company

Interviewee	Duration	Time of interview	Article 2	Article 3
Former environmental manager	109 minutes	November 2010	X	X
Environmental manager	54 minutes	December 2010	X	
Nature manager	53 minutes	January 2011	X	
Environmental manager	62 minutes	January 2011	X	
External consultant, former employee (in charge of carbon accounting)	35 minutes	October 2011	X	
Former operations manager	48 minutes	April 2012	X	X
Carbon master	39 minutes	May 2012	X	X
Environmental manager	83 minutes	July 2012	X	
CFO	27 minutes	September 2012	X	
Co-COO	43 minutes	September 2012	X	
Former operations manager division (Europe)	44 minutes	September 2012	X	X
Manager division Europe	45 minutes	September 2012	X	X
LCA Consultant	120 minutes	September 2012	X	X
Headquarter carbon master	34 minutes	December 2010		X
Carbon master	71 minutes	December 2010		X
Carbon master	83 minutes	January 2011		X
Carbon master	43 minutes	January 2012		X
Carbon master	28 minutes	February 2012		X
Industrial manager	27 minutes	March 2012		X
Finance manager	38 minutes	March 2012		X
Finance manager	17 minutes	March 2012		X
Carbon master	38 minutes	March 2012		X
Carbon master	26 minutes	March 2012		X
R&D manager	55 minutes	March 2012		X
Public affairs manager and carbon master	60 minutes	March 2012		X
Carbon master	53 minutes	March 2012		X
Quality manager	34 minutes	April 2012		X
Country general manager	35 minutes	April 2012		X
Carbon master	41 minutes	April 2012		X

Country general manager	25 minutes	April 2012		X
Carbon master	40 minutes	May 2012		X
Marketing manager	37 minutes	June 2012		X
Country general manager	34 minutes	June 2012		X
Marketing manager	54 minutes	July 2012		X
Environmental manager	49 minutes	July 2012		X
Carbon master	55 minutes	July 2012		X
R&D manager	34 minutes	July 2012		X

Appendix 6.10: Meetings attended at the case study company

Date	Theme	Role	Title of the meeting
03/11/10	GHG Protocol	Participation	Presentation of the toolproposed by the consultancy
03/11/10	Carbon accounting	Participation	Kickoff of the project: guidelines for the update of emission factors and measurement parameters
03/11/10	Carbon accounting	Observation	Consolidation of carbon accounting data 2007-2010
04/11/10	Team meeting	Participation	Team meeting
09/11/10	Carbon accounting	Observation	Consolidation of carbon accounting data 2007-2010
10/11/10	GHG Protocol	Observation	Presentation of CDP 2010 results at a bank
15/11/10	Team meeting	Participation	Team meeting
15/11/10	Dairy Nature Committee	Observation	Committee where nature topics including carbon are discussed at WBU level
16/11/10	ERP Carbon	Participation	Presentation of project
16/11/10	Team meeting	Participation	Meeting with manager on work
16/11/10	Lobbying Committee	Observation	Committee where stakeholder topics are discussed
17/11/10	Nature Claims	Observation	Meeting to present process for nature claims by intern in charge of project
18/11/10	GHG Protocol	Participation	With external consultants
25/11/10	Carbon accounting	Participation	Meeting with external consultant on comments by other external consultants on the gap between the excel tool methodology and standard PAS 2050
26/11/10	Carbon accounting	Participation	Presentation of the carbon accounting tool with external consultant
29-30/11/10	Nature Strategy	Participation	2 days on definition of new 2020 strategy
01/12/10	GHG Protocol	Participation	Meeting with external consultants on GHG Protocol tool and finding pilot CBUs
03/12/10	Carbon accounting	Participation	Meeting with dairy logistic manager on how to deploy logistic tool to other CBUs
03/12/10	GHG Protocol	Participation	Kickoff of project with external consultants
10/12/10	Nature Strategy	Participation	Stream C02 for strategy 2020
22/12/10	Team meeting	Participation	2011 priorities
22/12/10	Internal communicatio n	Observation	Meeting on internal communication strategy for Nature
04/01/11	GHG Protocol	Participation	Security of web based tool
10/01/11	KOL meeting	Observation	Meeting on external communication

			topics, stakeholders
11/01/11	Nature strategy	Participation	Vision 2020
12/01/11	Team meeting	Participation	2011 priorities
20/01/11	ERP Carbon	Observation	Status on ERP Carbon roll out
13/09/11	Team meeting	Participation	Finance nature team meeting
03/11/11	Team meeting	Participation	Regular nature team meeting
03/11/11	ERP Carbon	Observation	Status on ERP Carbon roll out
04/11/11	Dairy Nature Committee	Observation	CO2 strategy for 2012
09/11/11	GHG Protocol	Observation	Key learnings from pilot
10/11/11	Stakeholder meeting	Observation	Presentation of vision 2020 (second meeting) to external stakeholders to get feedback
16/11/11	Carbon accounting	Participation	How to calculate emission factors effect year on year
18/11/11	Team meeting	Participation	Regular nature team meeting
02/12/11	Team meeting	Participation	Regular nature team meeting
13/12/11	GHG Protocol	Participation	Presentation of project
16/12/11	GHG Protocol	Participation	Presentation of project
16/12/11	Team meeting	Participation	Regular nature team meeting
16/12/11	Certification	Observation	Certification PAS 2050 on brand meeting
10/01/12	Environment Committee	Observation	Meeting of environmental director every three months
11/01/12	ERP Carbon	Participation	Steering Committee IS Nature Projects
12/01/12	GHG Protocol	Participation	Call with baby and medical division to present project
17/01/12	Internal meeting	Observation	CEO address to employees
17/01/12	ERP Carbon	Participation	Half day Training on ERP Carbon
19/01/12	ERP Carbon	Participation	Half day Training on ERP Carbon
19/01/12	Standards	Observation	Presentation of results on European Product Environment Footprint
20/01/12	ERP Carbon reporting	Participation	Kickoff meeting of project
20/01/12	Integrated reporting	Participation	Presentation of project to nature team members
25/01/12	ERP Carbon	Participation	All day meeting on quality projects with consultant
26/01/12	Team meeting	Participation	All day green day, 2012 objectives meeting
27/01/12	ERP Carbon	Participation	All day meeting on quality projects with consultant
30/01/12	External meeting	Observation	Carbone 4 – CAC 40 companies meeting on carbon topics
30/01/12	Team meeting	Participation	Finance nature team meeting
31/01/12	GHG Protocol	Participation	Meeting on operational control

01/02/12	GHG Protocol	Participation	Meeting on operational control
06/02/12	Team meeting	Participation	Regular nature team meeting
06/02/12	ERP Carbon	Participation	Steering Committee IS Nature Projects
07/02/12	CDP	Observation	CDP Working Group meeting
07/02/12	ERP Carbon reporting	Participation	Half Day Design workshop
08/02/12	ERP Carbon reporting	Participation	Half Day Design workshop
09/02/12	Integrated reporting	Participation	Meeting with nature manager
10/02/12	CO2 workshop	Observation	Baby division workshop on CO2
13/02/12	Integrated reporting	Participation	Meeting with nature manager
13/02/12	ERP Carbon reporting	Participation	Status of project
17/02/12	Team meeting	Participation	Regular nature team meeting
20/02/12	Team meeting	Participation	Nature finance team meeting
20/02/12	ERP Carbon reporting	Participation	Design workshop
21/02/12	Integrated reporting	Observation	IIRC webex
23/02/12	ERP Carbon	Participation	All day with consultant on quality projects
24/02/12	ERP Carbon	Participation	All day with consultant on quality projects
27/02/12	ERP Carbon	Participation	Workshop on simulation project on ERP
29/02/12	ERP Carbon	Participation	Quality projects and convergence
05/03/12	Team meeting	Participation	Regular nature team meeting
05/03/12	ERP Carbon	Participation	Steering Committee IS Nature Projects
06/03/12	Integrated reporting	Observation	IIRC webex
08/03/12	ERP Carbon reporting	Participation	Status of project
12/03/12	ERP Carbon	Participation	All day with consultant on quality projects
13/03/12	ERP Carbon	Participation	All day with consultant on quality projects
14/03/12	Integrated reporting	Participation	Presentation of project to Nature manager
14/03/12	ERP Carbon reporting	Participation	Presentation of project
20/03/12	Dairy carbon master webex	Observation	Carbon master online meeting every two months
21/03/12	Team meeting	Participation	Finance nature team meeting
22/03/12	Team meeting	Participation	Regular nature team meeting
22/03/12	ERP Carbon	Participation	Quality projects and convergence

23/03/12	ERP Carbon reporting	Participation	Status of project
27/03/12	Audit	Participation	Meeting for Preparation of audit with auditors
27/03/12	GHG Protocol	Participation	2 trainings on GHG Protocol for finance team
03/04/12	ERP Carbon reporting	Participation	Status of project
04/04/12	Team meeting	Participation	Regular nature team meeting
06/04/12	ERP Carbon	Participation	Review of US Dairy carbon user alert process
10/04/12	ERP Carbon	Participation	Steering Committee IS Nature Projects
11/04/12	GHG Protocol	Participation	1 training on data collection and operational boundaries
11/04/12	ERP Carbon	Participation	Next steps for Italy Dairy on ERP Carbon
13/04/12	GHG Protocol	Participation	2 trainings on data collection and operational boundaries
16/04/12	ERP Carbon reporting	Participation	Detailed design validation
16/04/12	ERP Carbon	Participation	ERP User conference (half day)
17/04/12	ERP Carbon	Participation	Half day with consultant on quality projects
18/04/12	ERP Carbon	Participation	Half day with consultant on quality projects
19/04/12	Convergence project	Participation	All day meeting with ERP, consultant, IS on convergence project
20/04/12	Convergence project	Participation	All day meeting with ERP, consultant, IS on convergence project
23/04/12	ERP Carbon reporting	Participation	Detailed design validation
24/04/12	Team meeting	Participation	Regular nature team meeting
14/05/12	ERP Carbon	Participation	All day visit of a dairy plant
15/05/12	Convergence project	Participation	All day meeting with ERP, consultant, IS on convergence project
16/05/12	Team meeting	Participation	Regular nature team meeting
16/05/12	Integrated reporting	Participation	Launch with team internally
16/05/12	Integrated reporting	Participation	Launch with consultants
24/05/12	ERP Carbon reporting	Participation	Status meeting with IS
25/05/12	ERP Carbon	Participation	Half day meeting with IS on quality projects
29/05/12	ERP Carbon	Participation	Canada user alerts and open points meeting
31/05/12	Integrated reporting	Participation	All day meeting with consultants

01/06/12	Integrated reporting	Participation	Workshop on design outline paper versus web
01/06/12	GHG Protocol	Participation	Presentation of second phase to finance team particpants (2 meetings)
04/06/12	ERP Carbon	Participation	Steering Committee IS Nature Projects
04/06/12	Integrated reporting	Participation	Preparation meeting with consultants on workshops
05/06/12	Integrated reporting	Participation	Website/Online content workshop
06/06/12	ERP Carbon	Participation	Day meeting with consultant on quality projects
07/06/12	ERP Carbon	Participation	Day meeting with consultant on quality projects
08/06/12	Integrated reporting	Participation	Workshop on content of IR (1)
08/06/12	Integrated reporting	Participation	Workshop on content of IR (2)
11/06/12	Team meeting	Participation	Finance nature projects
11/06/12	Integrated reporting	Participation	Meeting with consultants in preparation of workshops
11/06/12	Convergence project	Participation	Meeting with ERP
12/06/12	Convergence project	Participation	Meeting with dairy business controller on scope 3
12/06/12	Team meeting	Participation	Regular team meeting
12/06/12	CDP	Participation	Finalizing CDP with environmental director
14/06/12	Convergence project	Participation	ERP and organization final meeting on convergence project, next steps
15/06/12	ERP Carbon reporting	Participation	Test reporting questions with IT
15/06/12	Integrated reporting	Participation	Meeting with investor relation analyst
15/06/12	ERP Carbon	Participation	Training new member of dairy heaquarter team
18/06/12	Integrated reporting	Participation	Workshop on KPIs
18/06/12	Integrated reporting	Participation	Workshop on materiality
21/06/12	ERP Carbon	Participation	Presentation of ERP Carbon quality projects results to Nature General Manager
02/07/12	Integrated Reporting	Participation	Short meeting on next steps with consultants
02-03/07/2012	ERP Carbon	Participation	2 days meeting with LCA consultant on quality project
03/07/12	ERP Carbon	Participation	Presentation of ERP Carbon quality project results

04/07/12	Integrated reporting	Participation	Workshop to prepare presentation for July 20th with consultants
06/07/12	ERP Carbon reporting	Participation	Phone meeting with IT team on cancelling the training for the 18th
06/07/12	Integrated reporting	Participation	Phone meeting on Health part for integrated reporting with consultants (recorded)
12/07/12	Integrated reporting	Participation	Workshop to prepare presentation for July 20th with consultants
16/07/12	ERP Carbon	Participation	Transitioning project and training on tool for replacement
17/07/12	Integrated reporting	Participation	Finalization of presentation for July 20th with consultants
19/07/12	Thesis	Participation	Presentation of thesis results
19/07/12	ERP Carbon	Participation	Workshop for designing new interco rules
20/07/12	Integrated Reporting	Participation	Presentation of first results and decision for next steps
23/07/12	ERP Carbon	Participation	Presentation of « quality project » and next steps
26/07/12	Integrated Reporting	Participation	Presentation by PWC of their methodology for eP&L at Puma
26/07/12	Integrated Reporting	Participation	Presentation by ERP of the integrated reporting project

Appendix 6.11: Recorded meetings at the case study company

Meetings	**Date**	**Minutes**
Green Days	November 2010	967 (not transcribed)
Stream CO2 strategy meeting	December 2010	112 (transcribed)
Nature team meeting related to 2011 objectives	December 2010	122 (not transcribed)
Nature internal communication meeting	December 2010	62 (not transcribed)
Key Opinion Leaders (KOL) Meeting	December 2010	92 (not transcribed)
Vision 2020 CO2 with external consultant	January 2011	61 (not transcribed)
Nature team meeting related to 2011 objectives	January 2011	54 (not transcribed)
Nature Finance Planning meeting	September 2011	104 (not transcribed)
GHG Protocol presentation meeting	December 2011	52 (not transcribed)
Baby division CO2 workshop	February 2012	270 (transcribed)
ERP User conference	April 2012	169 (not transcribed
Feedback meeting	July 2012	110 (transcribed)
ERP Headquarter meeting	July 2012	87 (transcribed)
Handover meeting	July 2012	226 (not transcribed)
Total		**2488 minutes**

Appendix 6.12: Secondary data related to the context of research

Type of documents	Number of documents
Internal documents: responses to Vigéo, DJSI ratings	16 documents
Internal communication	17 documents from headquarters and water division
Externally available documents on sustainability strategy	48 documents
Sustainability reports (or part of annual reports dedicated to the environment)	1997 and from 2000 to 2012
Carbon Disclosure Project Responses	From 2006 to 2011
External documents related to environment and the food industry	11 documents
Press articles	42 articles
Books related to the case company	3 ("le dernier de la classe", memoires de [case company]", "un patron dans la cite")
Other	1 document linked to a "crisis" in 2001

Appendix 6.13: Secondary data of the case study company

Type of documents	Number of documents
2007-2009 carbon accounting	23 documents
Consultancy documents (2010)	10 documents
2007 to beginning of 2010 environmental strategy	10 documents
2010 to 2012 environmental strategy, including crafting of 2020 strategy	32 documents
Documents on work with suppliers	12 documents
Best practices in carbon strategy	57 documents
Dairy division carbon accounting and strategy	98 documents
Accounting Convergence project	16 documents
Carbon accounting methodology guide v4	1 document
Carbon Data Committees	9 documents
Work on ERP Carbon	154 documents
Work on ERP Carbon reporting	38 documents
ERP Carbon strategy	32 documents
ERP Carbon training	28 documents
Emails	153 emails
Total (without emails)	520 documents

Appendix 6.14: Dictionary of themes (Article 1)

Themes	**Sub-themes (first path)**	**Sub-themes (second path)**
Institutional work (creative)	Naming	
	Theorizing/methodology building	Theorizing (locking)
	Advocacy/mobilizing/networking	Mobilizing
	Mimicry	
	Standardization	Defining (locking)
Maintenance work	Packaging directive	
	Ecolabels (France/Europe)	
Institutional agency	Reasons for elite to drive change	
Ecobilan (company)	Recruitment in Ecobilan	
	Vision for the business	
	Team, EIME, database	Connected tools (gatekeeping)
	Positioning, sales pitch	Strategy (gatekeeping)
	Birth of the company: academic, engineer, reasons for launching the company	Origins
Écobilan (tool)	Definitions	
	Reasons to do an écobilan	
	Limits of the tool	
	Strengths of the tool	
Elite relationships	French environmental agency - Industry	
	Industry-Academia (Mines)	
	Ecobilan/government/French environmental agency	
	French environmental agency	
Field	Competitors	
	Research (absence of)	
	Education (absence of)	
	Professional association (absence of)	
	Clients (users of écobilan/LCA)	
	Internalization in companies	
Institutionalization	Institutionalization	
Recent events	Environmental labelling	
	Local expertise	Democratization work
	Massification	Democratization work
	Acrimony towards recent events	Demonizing work

Appendix 6.15: Dictionary of themes (Article 2)

Themes	**Sub-themes**
Measurement characteristics	Credibility
	Reliability
	Preciseness
	Certifiability
	Lever for action
	Able to represent extended responsibility
	Able to embark people (relational legitimacy)
	Able to represent product accounting
Strategy for carbon accounting	Strategy to start "alone"
	Willingness to make it owned at local level
	Willingness to transform the way of doing business
	Willingness to be "the best"
	Willingness to be proactive externally in the standardization processes
	Driving potential of bonus on carbon measurement and strategy
Choice of accounting standard (PAS 2050)	
Company "culture"	Co-innovation
	"Laboratory" culture
	"Dual project" culture (sustainability)
GHG Protocol	Negative statements
	Reasons for doing GHG Protocol accounting
	Misunderstanding between LCA and GHG Protocol
New environmental strategy	Reaction to the strategy
	New nature team
	"Top down" approach
	Importance of the measure
	Choice of CO2
	External environment related to carbon
	Bonus
Stakeholders	
History of environmental strategy	Former team
	Limited scope responsibility

Appendix 6.16: Dictionary of themes (Article 3)

Themes	**Sub-themes (1)**	**Sub-themes (2)**
External context	Water division	
	Dairy division	
Knowledge/learning	Best practices exchange	
	"Laboratory" mode	
Carbon Master	Definition	
	Being chosen as carbon master	
	Pioneer (défricheur)	
	Accountant	Budget
		Reporting
	Strategist	Simulation
		Creation of a network
		"Push people"/ "push marketing"
		Animation of target and strategy at different levels
	Trainer (formateur)	Ownership of topic (CO2)
		Empower all functions to act on carbon
	Ambassador, evangelizer	
	Curious, acting as a "radar"	
	Translator and interpretor of CO2	
	Negative aspects	Lack of resource and time
		Not well recognised
		Not all good "accountants"
	Community of carbon master	
Carbon measurement	Importance of the measure	
	Complexity	
	Pervasive	New KPIs
	Negative vision	Renders other environmental problems invisible
		Not always followed by action (new products launches)
		Credibility issues
	Positive vision	Communicable
		Helped drive carbon reduction
	Impact on role changes	
Carbon accounting tool	"History"	Birth of the tool
		Evolution of the tool
	Reaction to the tool	Reassuring
	Role	Consolidate results
		Budgeting

		Give visibility/renders strategy visible
		Guidance
	Deviation of use	Simulation
		Extension of measurement to more products
Practical coping with new accounting	Import/export issues	
	Traceability	
	Sampling issues	
	Emission factors issues	
	Difficulty to have access to the right information	
Headquarter role for accounting	Help/hotline for carbon masters on accounting	
	Role as "experts" of carbon accounting	
	Role of nature CFO (rigor)	
	Interface with external consultants on accounting	
	Green capex "invention" and monitoring	
	Consolidation of numbers	
Headquarter role on strategy	Communication of strategy to country business units	Little information given
		Help needed from headquarters (more direction)
	Globally driven strategy (such as with new materials)	
	Role of bonus	
	Reaction to the target of -30%	Negative
		Inspirational
Local (country led) strategy	Practical coping/emergent strategy	
	Taking the "easily measurable" projects	
	Carbon honeymoon (link to productivity projects)	
	Local brand strategies	
	Working with suppliers	
	Taking to key opinion leaders (KOL) or consultants	
	Local benchmarking	
	Difficulty to transpose in marketing/sales	
Routinization	Stickiness of new practices	
	Hybridization (with "normal"	

	business strategy)	
Future of strategy		

Appendix 6.17: Interview topics for genealogy: ecobilan consultants

Can you describe your professional career?

Interest of the environment

TOPICS RELATED TO ECOBILAN

Birth of Ecobilan

Customers, contracts

Work with the the French environmental agency

Employees/colleagues, what was your particular role in the company

How did you sell ecobilans at the time?

Development of a particular methodology (compared to what was existing in US/UK consultancies)?

Role of databases/ software development

GENERAL QUESTIONS

On the use of ecobilans by the French industry

Competitors

Work on standardization

Relationship with foreign consultancies

FINAL QUESTIONS

Why and when did you leave the company?

Your view on the development of LCA from then to now

Appendix 6.18: Interview questions for genealogy: users

Your role in the company at the time

How did you hear about LCAs/Ecobilans?

How did you get in contact with the consultancy?

How what ecobilans/LCAs presented to you? What kind of documents.

Did you have difficulty convincing internally in your company about LCAs

What were the arguments in the company to conduct LCAs

How did the consultancy proceed in doing the LCA in your company?

How did you react to the results? What about others in the company?

Did you have a "peer review" conducted?

How did you use the results? Internally? Externally?

Did you internalize the competency for LCA Inside your company? Did you buy a software?

Did you do several or just one LCA?

Did you have contacts with other people doing LCAs at the time?

Appendix 6.19: Interview questions for carbon masters

HISTORY OF CARBON MASTER ROLE

Your "history" at [Group], your training?

How long have you been carbon master for?

How were you chosen to be carbon master? Is there a definition of your role?

What kind of training did you receive to be the carbon master?

Has the carbon master role evolved since 2008?

CURRENT ROLE/ORGANIZATION

Are you full time carbon master? If not how much time do you devote to « carbon master » role? Who do you report to for your role as carbon master?

Can you describe the typical work you do as a carbon master in a day/month/year?

What are the difficulties you have met in your job as carbon master?

What do you like in your job as carbon master?

HISTORY OF CARBON STRATEGY AT [THE COMPANY]

Can you tell me the beginning of carbon accounting in your CBU, what you thought (how you felt about it)

How it was presented to you

Reactions of others around you

RELATIONSHIPS WITHIN YOUR CBU

With which other functions (marketing, logistics, R&D, supply, finance etc) do you work most? Why?

Is the impact on carbon taken into the business decision processes such as the innovation process (R&D)?

How do you do practically to help take carbon into account in the development of new products (carbon thresholds, carbon simulation, carbon KPIs, other)?

STRATEGIES

How would you define the carbon strategy of your CBU? How does it relate to the overall business strategy?

How do carbon actions at your CBU link to overall global [Group] strategy?

What do you think is missing on carbon strategy of your CBU/[Group]?

RELATIONS WITH HEADQUARTER

Do you have support from headquarters in your job as carbon master? Is it enough?

Do you feel associated to the carbon strategy of your own CBU, the WBU and [Group] as a whole?

MEASUREMENT TOOLS

How do you feel about the current excel carbon tool?

When are you going to be on ERP Carbon? How are you involved in the project? What are the difficulties you encountered?

Do you report other carbon measures then the one from the excel tool? (For regulation purposes for example)

REPORTING

What kind of reporting do you do (for Headquarter, manager, CODI, other function such as logistics, packaging etc)?

NATIONAL CONTEXT

How does your local context (your country) impact how you deal with carbon data? (Regulation, consumer readiness to carbon information, national culture, internal culture within your CBU..)

Are you involved in any national institutions dealing with carbon accounting, carbon reduction programmes, labelling etc?

FUTURE

What do you think should be better in the position of "carbon master"? Should the carbon master job change? How?

Appendix 6.20: Interview questions for managers

YOUR HISTORY AT [THE COMPANY]

Can you tell me about you: your role, your history at [the company]

When were you designated as the "carbon contact" in your team?

Why were you chosen?

HISTORY OF CARBON STRATEGY AT [THE COMPANY]

Can you tell me the beginning of carbon accounting in your CBU, what you thought (how you felt about it)

How it was presented to you

Reactions of others around you

ROLE

How would you define your role?

How do you choose the actions on which you are going to work for carbon reduction?

What kind of recurrent meetings did you put around carbon emissions reduction strategy?

Did the inclusion of carbon measure change the way you look at your projects/your work?

Are you using carbon measures for decision-making processes? Which ones?

What would you like to have more in the carbon measure?

INTERACTIONS

How is your carbon master involved in daily business management? (How many times do you have contact with your carbon master per month/year)

Did your team ask for more training/knowledge around carbon related issues?

How and what do you communicate with your hierarchy? And with your team?

Do you feel like you have enough information on the nature strategy of [the company]? On how this links back to business strategy?

STRATEGIES

How would you define the carbon strategy of your CBU? How does it relate to the overall business strategy?

How do carbon actions at your CBU link to overall global [the company] strategy?

What do you think is missing on carbon strategy of your CBU/[the company]?

EXTERNAL COMMUNICATION

Have you used carbon results in commercial, marketing, business strategies? Do you plan to do so in the future?

Have you communicated externally and if yes how?

Appendix 6.21: Interview questions for top managers

YOUR HISTORY AT [THE COMPANY]

Can you tell me about you: your role, your history at [the company]

HISTORY

Can you tell me the beginning of carbon accounting in your CBU, what you thought (how you felt about it), how you design your "plan" to measure, how you decided who should be your carbon master…

How it was presented to you

Reactions of others around you

STRATEGIES

How would you define the carbon strategy of your CBU? How does it relate to the overall business strategy?

How do carbon actions at your CBU link to overall global [the company] strategy?

What do you think is missing on carbon strategy of your CBU/[the company]?

Do you feel like you have enough information on the Nature strategy of [the company]? On how this links back to business strategy?

ORGANISATION

How did you design your first carbon emissions reduction plan? How has this evolved now?

What kind of recurrent meetings did you put around carbon strategy?

Did you change people's job around carbon strategy topics?

Did you design people's goals around carbon strategy (reduction goals achievement)?

Are you using carbon measures for decision-making processes? Which ones? (Investment, packaging, launching new products)

INTERACTIONS

How is your carbon master involved in daily business management? (how many times do you have contact with your carbon master per month/year)

Did your team ask for more training/knowledge around carbon related issues?

How and what do you communicate with your hierarchy? And with your team?

Do you feel like you have enough information on the Nature strategy of [the company]? On how this links back to business strategy?

EXTERNAL COMMUNICATION

Have you used carbon results in commercial, marketing, business strategies? Do you plan to do so in the future?

Have you communicated externally and if yes how?

MEASURE (how do you understand the carbon measurement tools and strategy)

Do you think carbon measurement on ERP changes the way that you will use carbon measurement?

What do you think of the new measurement GHG Protocol?

Summary of dissertation

1 Introduction

This dissertation seeks to understand the innovation process of environmental management accounting (EMA). EMA is at the crossroads of three worlds.

First, mainstream accounting, based on neo-classical roots, views sustainability issues primarily in terms of externalities, market failures, price signals and economic incentives, it has been slow to recognise sustainability as an accounting issue at all. Financial accounting is even considered to be amongst the most likely causes of the environmental desecration (Gray 2013). If we were to deduct the sustainable cost from convention profit of organizations, Gray (1992) suggests that "the probability is that no Western company has made a sustainable profit for a very long time, if at all".

Second, the object of research "environmental management accounting" is being considered through the lens of innovation studies, more particularly as a management innovation. Although innovation has been a symbol of capitalism since the beginning of the 20th century, the initial meaning of innovation was a "political tool to achieve a shock against the established order". Balancing innovation in its more recent economic vision as a source of competitive advantage and the original political meaning as "subversive", and "a shock against the established order" (Monzani, 1985) allows looking at EMA from "within the system" (Gray, 1992) as well as considering it has a part of the wider social and environmental project (Gray, 2002). Management accounting innovations (MAIs) are understood as "newer" or modern forms of management accounting and control systems (Zawawi & Hoque, 2010). Environmental uncertainties, recent global issues such as climate change, scarcity of natural resources, affect MAIs.

Thirdly, EMA refers to sustainability. Alternative indicators of progress regularly show that the status of environmental degradation and social inequalities reach new heights every year. Today the world has entered the anthropocene era, to denote the new era where humans constitute a geological force capable of acting and changing the ecological system that sustains life on earth (Costanza et al., 2013), and where the "new" limits are now those of natural capital. The main driver of this unsustainable course of action that the alternative indicators are pointing to, is economic growth as the "fundamental cause" of the myriad of social and environmental problems (Johnson, 2012).

As it might appear on the surface to be a stretch from huge sustainability challenges (United Nations, 2005) to the practices of accounting, there is a pressing need to understand the "creation o systems and methodologies by which governance for sustainability can be achieved" (Porritt, 2007). Given the central role of accounting in the management and accountability of organizations, new forms of accountings will affect our ability to pursue sustainable development (Unerman et al., 2007). Studying social and environmental accounting as an accounting innovation could shed some lights on both the institutional context in which it has appeared in the last 40 years and the potential evolutions that it is bringing to traditional accounting.

To gain a better understanding of the institutionalization processes at play in environmental management accounting innovations from ideas to practice, the dissertation aims at answering the following research questions:

- How can environmental management accounting tools be created, by whom and with what strategies?
- What is the process of adoption and the consequences on the adopting organization? How can an accounting innovation become the centre of a conflict of legitimacies at the time of adoption?
- How do EMA tools translate into organisations' practices?

The research questions are answered through three articles. The first paper focuses on the innovation life cycle assessment and its creation phase. It mobilizes the concept of elite as actors of innovation, and institutional work to describe the purposive and intentional set of actions performed in the creation of a new accounting tool. The second article looks at carbon accounting in the specific moment of adoption, and from the point of view of a corporation adopting the innovation. The last paper engages with the practice of the innovation carbon accounting. It focuses on the emerging practices in accounting and strategy related to the management of carbon.

2 Literature Review : Management Accounting Innovation

I believe analyzing EMA through the lens of innovations could be of interest for several reasons. First sustainability innovations, of which EMA is part, are often institutionalized but scarcely diffused and adopted; therefore more investigation is needed into that phenomenon. Indeed, there is a need to understand the potential supporting, or lack of support from infrastructure, regulations or user demand (skills to used) (Brown & Dillard, 2013) for EMA innovations. Furthermore, studying EMA as innovation would allow understanding how some innovations are more "incremental" in nature, understanding the lock-ins and tight links between some innovations and the current "regime", and how they could be "unlocked" (Brown & Dillard, 2013). Additionally, Bell and Hoque (2012) challenge researchers to critically assess the inertia created by existing accounting structures, processes and techniques and mainstream those conversations that provide challenges to the status quo. Looking at EMA as an innovation allows to look at the spaces they are built in, the networks they do or could depend on to develop, and the technologies they must compete with in the current regime (Brown & Dillard, 2013). Analyzing EMA as innovations allows considering for many dimensions (technical, cultural, behavioural, policy, infrastructure) and different levels (institutions/organizational field, the organization and the practices) of these management accountings which contribute to our understanding of how accounting can or might contribute to sustainability transitions. There is a need to understand how certain ways of posing general problems (the environmental crisis) such as those related to accounting for the environment comes to attain the status of self-evidence; or why it doesn't, and reciprocally, how it is that particular calculative technologies come to be seen as the appropriate way to solve these particular problems (Miller, 1991). Moreover, studying EMA as innovations is firmly entrenched in the view that accounting can be changed (and should evolve), and therefore that we cannot mistake "contingent accounting ideas, practices and institutions, local in space and time, as self-evident, universal and necessary" (Gomes et al., 2011).

Innovation is described as a successful meeting, synergistic, between an entity and a social ensemble. It is a chemical reaction (Gaglio, 2011). Callon (1999) defines innovation as:

> *"An emergent phenomenon based on gradually putting into place interactions that link agents, knowledge and goods that were previously unconnected, and that are slowly put in a relationship of interdependence (…). What marks innovation is the alchemy of combining heterogeneous ingredients: it is a process that crosses institutions, forging complex and unusual relations, the market, law, science, and technology".*

Management innovation has, according to Hamel (2006), more than any other kind of innovations, allowed companies to cross new performance thresholds. Today, management innovation represents one of the most important and sustainable sources of competitive advantage for firms (Feigenbaum & Feigenbaum, 2005; Hamel, 2006) because it is context specific (Birkinshaw et al., 2008), and because it is ambiguous and hard to replicate (Volberda et al., 2013). Management innovations are defined as:

> *"New approaches to devise strategy and structure of tasks and units, modify the organization's management processes and administrative systems, motivate and reward organizational members, and enable organizational adaptation and change." (Damanpour & Aravind, 2011)*

Management accounting innovations (MAIs) refer to "newer" or modern forms of management accounting and control systems (Zawawi & Hoque, 2010). Research in MAI allows to understand which one are "true" or "false" innovations, and why they succeed (Bouquin & Nikitin, 2003). Environmental uncertainties, recent global issues such climate change, scarcity of natural resources can affect MAIs (Zawawi & Hoque, 2010). Interaction between those issues and MAIs needs further investigation (Zawawi & Hoque, 2010). EMA is relatively new as a field of research and practice, in which the first uses only date back to the early 1990s; thus EMA can still be characterised as a field of innovation (Rikhardsson et al., 2005).

This dissertation takes a process approach to innovation, in opposition to looking at innovations as outcomes. Therefore, its focus is on the study of the institutionalization process. It is defined as:

> *"The process whereby new norms, values, and structures become incorporated within the framework of existing patterns (…). This process is one that lends stability and predictability to social relationships and enables them to persist." (Kimberly, 1979)*

This dissertation focuses on the three stages that are developed in the three articles: origination, adoption and implementation.

The stories of the creation of MAIs, in particular genealogies, have emphasized the social nature of accounting and its very contextual nature in their emergence processes. These researches on the constitution of innovations emphasize particularly the conditions, events, traces of power and expert discourses that have shaped their existence. They are unofficial histories seeking to explore the many "small" ways in which techniques of knowledge emerged and spread (Loft, 1986).

In the origination phase, the construction of historical agency needs to be further explored (Burchell et al. 1980). Although accounting genealogies and stories of MAIs

development have emphasized different kind of actors involved in the making of innovations, in particular practitioners, consultants and governments, the construction of historical agency needs to be further explored, as not anyone can articulate ideas about accounting that will be heard or believed (Oakes & Miranti, 1996). Indeed, actors are also institutionally constructed and institutional contexts determine what sorts of actors become relevant to the construction of innovations (Hwang & Colyvas, 2011). Furthermore, the first article brings a "work" perspective to the story of accountings in emergence, as the purposive actions aimed at creating institutions. Until now, to the exception of Cooper et al. (2012), where they review work of experimentation, theorization, labelling, and the making of abstract categories, the different work needed to the making of innovations was relatively neglected. However, genealogies of calculation must look at "the strategies advanced for their (techniques) adoption" (Miller & Napier, 1993).

The adoption process covers how an organization becomes aware of new ideas, acquires and adapts them (Damanpour & Aravind, 2011). The perception that organizations are passive receptors of legitimate ideas is now long overdue, and the adoption phase of the innovation cycle has retained more attention as the crucial link between the organizational field, and the inside of organizations.
The second article of the dissertation focuses on the moment of adoption in a particular way. Indeed, it has for empirical site the decision of non-adoption of widely accepted and legitimate management accounting innovation. This empirical focus, as well as the decision to make an internally generated tool, allows understanding notions of "appropriation", "internalization" (Dambrin et al., 2007), and the development of the "bundling" concept forwarded by Modell (2009a). The article also sheds light on the widely described phenomenon of decoupling, where an innovation is adopted and not implemented.

The third article of this dissertation seeks to address the implementation phase of the innovation process. Innovation implementation within an organization can be defined as the process of gaining targeted employees' appropriate and committed use of an innovation (Klein & Sorra, 1996). Implementation is an uncertain exercise and may prove complex and problematic (Rogers, 2003). Indeed accounting innovations are often not successfully implemented or diffused throughout the organization (Abernethy & Bouwens, 2005). What the third article of this dissertation seeks to add to our understanding of implementations is a practice perspective to the emergence of accounting innovations. Indeed, appropriation of an innovation is in the realm of "doing", in the creation of new practices (Gaglio, 2011). By focusing on how practices surrounding the innovation "carbon accounting" are being formed, the research conducted allowed to see how new connections were formed, new spaces were created for the new practices (Sharma et al., 2010), how accounting interacted with existing practices and co-emerged with new strategizing practices. Through this practice-based approach, the article demonstrates how practices are not only created in the periphery but in connection with the centre. The connections for new practices to be created are happening through time (co-emergence of two practices that mutually reinforce each other) and space (local-centre).

The process of innovation is defined as starting from an idea (invention) to the practice of the innovation (Garud et al., 2013). Through the three papers of the dissertation, I will

explore the complexities of innovation processes which are co-evolutionary, as they simultaneously implicate multiple levels of analyses; relational, as they involve a diverse set of social actors and material elements; inter-temporal, as temporal events and sequences are experienced in multiple ways and cultural, as they unfold within contextualized settings (Garud et al., 2013). This implies that one has to take a multi-level, longitudinal perspective, and follow events implicating actors, artifacts, and institutions over time (Garud et al., 2013). Therefore, the three articles follow innovations from idea to practice, following events, actors, accounting innovations, and the institutional environment surrounding those innovations (both LCA and carbon accounting environments).

3 Object of Research : Environmental Management Accounting (EMA)

This researches focuses on the management accounting innovation "EMA" for several reasons. First, the status of degradation of the environment around us is visible, important in magnitude, and many scientists state the urgency of action to remediate to it (Costanza et al., 2013). Second, as Medley (1997) stated, the way that the accounting profession will tackle the environmental question will indicate its capacity to evolve- or not, with the rest of society. Third, it is of importance and relevance to organizations, as according to an Accenture/Global Compact 2010 survey, 96% of CEOs agree that sustainability issues should be integrated in the strategy and operations of companies.

In addition, certain characteristics of EMA innovations make them interesting objects of inquiries for the study of both the process of innovations and institutional change in accounting. First EMA constitutes an interesting field of innovations since some are still in the making (water accounting for example), others are emerging practices in organizations (carbon accounting) and finally, others have a short but constituted span of life that allows for genealogies to be unfolded (LCA). The field of EMA is also interesting because it allows observing the interaction, competition, and association of different innovations in the making (LCA and Life Cycle Costing (LCC), LCA and carbon accounting, material flow cost accounting (MFCA) and LCA). Furthermore, EMA stands at the crossroad of several streams of sciences, in the name of natural sciences, ecological economics, management accounting and traditional financial accounting. This particular node of knowledge is an interesting feature of innovations, as it brings together numerous institutional actors, ideas and has an impact on the "networks" that need to be built around innovations, on the actors that will decide upon adoption and on the practice of those innovations.

Finally, EMA has several interesting features as they make new spaces calculable (Vaivio, 1999; Miller, 1998; Antheaume, 2013). Then, they extended the temporal dimension of management accounting, for example when taking into account the damages to the environment, spanning from a few years to thousands of years (Antheaume, 2013). Finally, EMA increases the number of actors and non-human actors that are taken into account into the management accounting realm. For example, when accounting for an LCA, the river and its pollution is integrated in the realm of accounting, as are the neighbours (their health) of a polluting plant (Antheaume, 2013).

Environmental management accounting (EMA) is a complex notion that relates to a variety of concepts. On the one hand it relates to traditional management accounting, its tools and systems. On the other hand, it is also related to recent concepts such as corporate social responsibility (CSR), the environment, ecology and sustainable development (SD).

For the purpose of this research, we will thus define EMA broadly as:

> *"The identification, collection, estimation, analysis and reporting of physical and monetary information related to environmental issues".*

EMA tools can take the form of traditional management accounting tools (budgeting, balanced scorecard, investment review), as well as newly developed tools such as life cycle assessment, full cost accounting, total cost assessment or material flow cost accounting, as well as new indicators for integrated performance. EMA also is concerned with specialised areas such as water accounting, biodiversity accounting and carbon accounting.

Two examples of EMA innovations are studied in this dissertation: the tools known as "écobilan" (later "life cycle assessment") and "carbon accounting". Life cycle assessment (LCA) is the most widely recognized tool for accounting for the environment and the first to be standardized at ISO level in 1997. Life cycle assessment is defined as:

> *"A quantified assessment of flows of materials and energy entering and leaving at the borders of a representative system of the life cycle of a product or service." (Grisel & Osset, 2004)*

In 2005, ADEME[75] said about LCA "In the domain of global and multicriteria evaluation of environmental impacts, LCA is the most perfect tool. Its current practice and diffusion contribute to make is a successful and recognized tool" (2005). According to ISO standards (2006), LCA is comprehensive (assesses the entire life cycle of a product and all attributes or aspects of natural environment, human health and resources), allowing revealing "the real actual, true or whole picture of environmental impact" of companies' products (Freidberg, 2013).

Over the last ten years, carbon has emerged as the key environmental indicator. Carbon accounting comprises:

> *"The recognition, the non-monetary and monetary evaluation and the monitoring of greenhouse gas emissions on all levels of the value chain and the recognition, evaluation and monitoring of the effects of these emissions on the carbon cycle of ecosystems." (Stechemesser & Guenther, 2012)*

In this research we are only concerned with physical evaluation of GHG emissions. There are carbon accountings at different levels: nations, territories, cities and corporations. Three types of carbon accountings concern corporations: by site, by product and by project. Project carbon accounting is concerned with carbon-offset projects and is out of scope for this research. Carbon accounting by site is usually based on the voluntary framework named "GHG Protocol Corporate Standard" (2004) or similar methodologies. Carbon accounting by product is usually based on the PAS 2050 designed by the British Standard Institute (BSI) in 2008.

LCA has a short but constituted span of life that allows for genealogies to be unfolded, therefore constituting a good field of research to analysis retrospectively the creation of the tool in the French context.

Carbon accounting is a good representation of EMA at the crossroad of several streams of sciences, such as natural sciences, management accounting and traditional financial accounting. This particular node of knowledge is an interesting feature of carbon accounting, as it brings together numerous institutional actors, ideas and has an impact on the "networks" that need to be built around innovations, on the actors that will decide upon adoption and on the practice of those innovations.

[75] French Environment and Energy Management Agency (Agence de l'environnement et de la maîtrise de l'énergie)

4 Theoretical Framework: Institutional Theory and Practice Theory

EMA innovations are studied using the lens of institutional theory and practice theory in the three papers of this dissertation. Hopwood (1977) encouraged considering "the institutional processes that can both facilitate and constrain the development of accounting". Although there is an inherent tension between institutionalization (stabilization) and innovation (newness), I believe institutional theory brings interesting theoretical insights into the process leading to stabilization and from stabilization to "destabilization" and death of institutional innovations (Hopwood, 1978). Embracing the study of institutional change, studies have explored a variety of theoretical puzzles such as the role of agency, more recently the purposive work of actors (Lawrence & Suddaby, 2006), the phenomena of decoupling (linked to adoption of innovations) and processes of deinstitutionalization (Peton, 2012; Hiatt et al., 2009).
Until recently, there were still critics as to the deficit in institutional theory of an approach to practices (Lounsbury & Crumley, 2007). However, recent works have made the connection between the wider social processes and organizational practices (Arjalies, 2010; Labatut et al., 2012). Despite this connection, practice theory has long approached practices more as a routine and a process of stability (Feldman & Pentland, 2003) than as a dynamic process. What I seek here is to introduce an explanation of how innovations emerge through a study of practices as constantly emerging (Ciborra, 2000; Andon et al., 2007; Bjorkeng et al., 2009; Gherardi, 2012).
This dissertation uses the theoretical framework of institutional theory and practice theory together to account for the totality and interdependence of the difference phases in the innovation process (origination on diffusion, adoption and practice, implementation back on to adoption and origination). Indeed, this dissertation seeks to understand the totality of the innovation process, from ideas to practice. The goal of this dissertation thus requires being able to analyze both the field where innovations are being given birth to, the link between this field and the adoptants, and the actual practice of innovations. The combination of these two theoretical frameworks allows doing that by explaining the social and institutional environment that shapes, constrains and in return is shaped back by innovations; the agency of actors and their purposive work; as well as the micro-foundations of institutional innovations in analyzing the emerging practices that constantly shape and reshape innovations in daily praxis.

5 Research Design

The epistemological position of this dissertation is interpretive (Burrell & Morgan, 1979) and this research was conducted in a qualitative manner.
Interpretive studies answer why and how questions, and explanatory questions are more likely to lead to the use of qualitative research methods (Yin, 2009). Innovation processes often implicate multiple levels simultaneously, in a particular cultural setting, requiring rich longitudinal case studies (Garud et al. 2013). Studying institutional contexts and making institutional work visible also require qualitative case studies (Lawrence et al, 2009).
The methodological framework of this dissertation uses a qualitative approach and is based on two different fields, one conducted outside organizations, in the field of life cycle assessment, and the other within an organization. The two fields allowed to cover the life cycle of an EMA innovation, from the creation, to the adoption (non-adoption)

and finally to the implementation phase. This framework allows gaining a better understanding of the institutionalization processes at play in environmental management accounting innovations from ideas to practice.

The first article is a genealogy of the tool "écobilan". I believe studying the genealogy of accounting tools brings about the how and why tools that we commonly use today were incepted and diffused. "Such an unofficial history (genealogies) seeks to explore the many 'small' ways in which this technique of knowledge emerged and spread" (Loft, 1986). At the same time, "the historical perspective allows society to assess the future of accounting and its artefacts and manifestations" (Carnegie & Napier, 2012). Genealogies explore the identification and explication of the factors causing the accounting, whilst being attentive to the changes in meaning that accompanies their emergence (Miller & Napier, 1993). Different calculations are deployed according to different objectives or ideals, and present practices are an outcome of disparate events and processes (Miller & Napier, 1993) that need to be further explored and analysed.

Genealogies often take a "longitudinal approach", therefore I will study the institutionalization processes of life cycle assessment in France over a period of twenty years (Tolbert & Zucker, 1996). This allows seeing different contextual phases and different processes of institutionalization up to now. I will also be able to analyse power relations and networks at play and "locate the processes historically" as stated by Ball and Craig (2010). Longitudinal approaches study a phenomenon across time (Thiétart, 2007). The time is an important feature of the analysis of the process of innovations, since they happen over long period of time (Garud et al., 2013). Longitudinal approaches require to collect data from the different periods considered (here 1990 to 2012), and to gain insights from interviewees that were active over the different periods.

The data collected for Article 1 are mainly interviews (33 in total). Moreover, to study the objectification of the LCA and the discourse surrounding this innovation, I collected important secondary data such as books on methodology, and articles from 1989 to 2012, as well as archives of the French environmental agency. Finally, I was able to attend a seminar on the theme "reinvest analysis life cycle".

Article 2 and 3 are based on a single case study. The case study is preferred in examining contemporary events over which the investigator has little or no control, and to answer "how" and "why" questions (Yin, 2009). Moreover, the case study allows interpreting the social system being studied (Scapens, 1990). A case study is "an exploration of a bounded system over time through detailed, in depth data collection involving multiple sources of information rich in context" (Creswell, 1998).

In the social and environmental accounting literature, it has also been argued, that there is a need for more engaged approaches with organizations that practice sustainability accounting, with the "aim of drawing from the field the rationales that the actors use to construct sustainability accounting and accountability and, directly or indirectly, enhancing practice" (Adams & Larrinaga-Gonzalez, 2007). Therefore we believe case studies with strong participant observation approach responds to the call for more engaged approaches with organizations.

When studying a social situation, it is suggested to select one single social situation to allow for a better understanding of the complexity embedded in it (Spradley, 1980). The careful study of a single case leads researchers to see new theoretical relationships and question old ones (Gibb Dyer & Wilkins, 1991). The aim of single case study is to reveal the "deep structure of social behaviour" (Gibb Dyer & Wilkins, 1991). Theory that is born out of deep insights will be more "accurate" since the researcher will take into

account the "intricacies and qualifications of a particular context" (Gibb Dyer & Wilkins, 1991).
My research questions respond to "how" questions and are explanatory in nature. My object of inquiry (EMA) is relatively new when it comes to being studied at corporate level. Therefore, I believe that the case study company here will be a revelatory case, where the researcher has "an opportunity to observe and analyze a phenomenon inaccessible to social science inquiry" (Yin, 2009). Indeed, practices of EMA from the inside of a company, and the study of the adoption of an innovation from the inside of a company are phenomena that have been rarely studied from within (Burritt et al., 2011; Zawawi & Hoque, 2010). Moreover, I believe the case study dataset represents an "intense case" in the sense of Miles and Huberman (2003) as it is a rich case that expresses the phenomena with intensity, without being of extreme character. Using a single case study to be as close as possible to the phenomenon under investigation is important to reveal the mechanisms at play in innovation studies (Gibb Dyer & Wilkins, 1991; Garud et al., 2013). The richness of single case studies is paramount to contributing to practice-theory and institutional theory as well.
In my case study, the main mode of data collection is participant observation during 12 months (Spradley, 1980). The other sources of evidences used are interviews, documentation from the company and about the company and access and use of physical artifacts, namely accounting tools related to carbon accounting.
The interviews and meeting transcribed were first read as "skim reading", then re-read and notes were taken. First ideas emerged from the reading and annoting of data manually. In a second step, I went back to reading literature on the theory. Coding was done via a software of data quality analysis. The analysis was thematic at first, both inductive and deductive from theoretical reading.

6 Case Study Company Presentation

To study the phases of adoption and implementation of an EMA innovation in the institutionalization process, a single case study in a multinational company has been conducted. Global MNEs represent today an immense part of the global economy, and are accused of being responsible of much of environmental damage, together with their accounting (Gray & Bebbington, 1998). To the contrary, others say that business is the only mechanism powerful enough to produce the change necessary to reverse global environmental and social degradation (Hawken, 1993). MNEs therefore pledge to not be only accused of, but also pledge to be motor in the remediation to environmental damage (Gunningham, 2009). Consequently I wish to concentrate on one MNE to seek to understand its involvement in the environmental debate around sustainability (Gray & Bebbington, 1998) and to contribute to the understanding of this paradox.
The case study company is a medium size multinational in the food sector that is leader in its segments but does not represent a mastodon of the food industry worldwide. This company is a typical example of hybridity, a transitional form of organization that is an example of blending, where "the possibility of new alternative accounts of management accounting practice (…) are no longer bounded by organizations and society, but accommodate their fusion and permeability" (Baxter & Chua, 2003). It represents a transitional organization form that is an example of private organization "grappling with their increasing community and environmental responsibilities" (Baxter & Chua, 2003).
The case study company has a long history of corporate social responsibility action that is anchored in its "dual economic and social project" dating back in the 70s. Despite this

strong identity, environmental topics have only been rarely at the forefront (to the exception of the 1971 and 1992 emblematic actions vacances propres and eco-emballages) until recently.
A new more integrated approach of CSR was developed after 2006 with four pillars including "nature". Based on this new program, a nature team was implemented in 2009 and carbon accounting was designed to be at the forefront of the efforts of the company towards the environment. This was publically visible with the pledged target of reducing the company's GHG emissions by 30% between 2008-2012.
The company is the field for both article 2 and 3 based on the participant observation of twelve months as a carbon accountant in the headquarter nature team.

This dissertation is composed of three articles that together explore the different facets of management accounting innovations. I will now turn to those three articles.

7 Article 1

The first article tackles the question of how innovations get created and on the path to institutionalization. The perspective taken is to focus on the actors and their strategies, the 'who' and 'how' of the institutionalization process. The study follows the tool historically from the 1990s to 2012, looking at the different phases of the institutionalization process. It answers the research questions: What is the role of national elites in the institutionalization of management accounting innovations? How did the French elite contribute to its dissemination into companies? What are the elements and circumstances that contributed or restrained the institutionalization of this tool in the French context? The concept of "institutional work" (Lawrence & Suddaby, 2006) is mobilized to shed light on the strategies of the elite in the conception of an accounting innovation. This article is a genealogy of an environmental management accounting tool overs a period of 22 years, and combines semi-structured interviews and analysis of secondary data, including archives, books and press articles.
The article demonstrates that in the French context, elites were the main actors in the institutionalization process of the tool "écobilan". By explaining the role of particular agents in the making of an environmental management accounting tool, this article furthers our understanding of how environmental issues are shaped and accepted in the French context. Moreover, uncovering the strategies deployed to create the tool gives a particular insight on how environmental accounting tools play a crucial role in power relations, rendering environmental performance visible to some but invisible to others.
The article contributes to institutional theory by defining what institutional work elites use to maintain power, despite the threat exercised by a new phenomenon, here environmental concerns, on their dominant position. Contrary to previous literature which has define elite work as reaching out, bridging to break their embeddedness, the paper demonstrates that the elite has conducted creative work in a way that everything connects back to their own elite status.
It further contributes to the literature on genealogies of management accounting innovations by introducing a perspective on strategies of actors and therefore not only focusing on the cultural, geographical and historical context of the innovation process. The work was conducted to strongly identify the new tool with elite identity, constructing strong locking mechanisms that would avoid any non-elite interference. LCA is an example of a management accounting innovation that was made complex and high end so as not to appeal to a wide audience, contrary to what is expected of an

innovation to spread, or contrary to other tools such as standard costing. It was made with little interpretive flexibility.

8 Article 2

This paper describes the introduction of a new accounting tool in the form of carbon accounting, in a multinational organization. It provides an understanding of the particular moment in the institutionalization process, which connects the innovation created with the potential users, that is the moment of adoption of the innovation. This article answers the following research questions: How does a new accounting practice become the centre of a conflict of legitimacies? How does internal legitimacy interact with external legitimacy and what role does it play in maintaining organizational legitimacy?

The study uses institutional theory, with a particular focus on legitimacy, to understand the introduction of the new accounting tool and its confrontation with the external organizational field of carbon accounting. It explains in a longitudinal study over five years how an internally created carbon accounting tool was confronted with external constituents' requirements, and how the conflict of legitimacies unfolded. Through an in-depth case study of one organization, the article uncovers the process of the non-adoption of a carbon accounting methodology. The paper mobilizes participant observation in a single case study, and interviews.

The article contributes to institutional theory by stating the role played by internal legitimacy in the decision of non-adoption, and how it was recombined with external legitimacy to reinforce organizational legitimacy of the organization. It contributes to the literature on management accounting innovations by introducing the crucial role played by internal legitimacy in the adoption process of innovations, and also by stating that internal legitimacy could also be the foundation of organizational legitimacy and thus a factor of success in the adoption process of innovations. This article suggest that external and internal legitimacies are not opposite but two facets of the same manifestation, organizational legitimacy. Indeed, as loosing external legitimacy can lead indirectly to consequences on the performance of the organization, a loss of internal legitimacy has similar consequences and can disorganize corporate behaviour. Finally, Moreover, this article emphasizes, like Human and Provan (2000), that a strong and early "inside-out" emphasis is more likely to achieve overall organizational legitimacy.

9 Article 3

The third article analyzes the practices surrounding an accounting innovation in a multinational. Through the analysis of practices at local and central levels, the article allows to understand further how accounting practice contributes to strategy emergence. It answers the question: How does an emergent accounting practice intersect and intermingle with an emergent strategy in daily practical coping praxis? The theoretical framework is practice theory with a focus on epistemic practices and epistemic object. This article uses participation observation and semi-structured interviews, as well as secondary data from the case company such as emails, powerpoints and meeting minutes.

Previous literature has emphasized the key decentralization in the creation of new strategy and new knowledge. This case study contributes to this literature by demonstrating that local knowledge and local strategy is not sufficient in the process of

emergence and that headquarter coordination and expertise reinforces the local creation.
The article demonstrates how accounting and strategy can be co-produced. Strategy was first constituted and enabled by carbon accounting. In a second step, potential carbon emission strategies, innovation projects drove the further refinement of the accounting. This paper further the analysis of how accounting and strategizing intersect in an emergence process, showing how both can intermingle in the process of rendering a new space not only calculable, but also manageable.

10 Conclusion

Theoretical contributions

This dissertation makes three main theoretical contributions on the specific institutional work developed by elite, the role of internal legitimacy in organizational legitimacy, and on the processes of emergence of new practices.
Elite institutional work, because of their inherent embeddedness, has been defined in previous literature (Greenwood & Suddaby, 2006; Boxenbaum & Battilana, 2005) as being able to reach out, bridge, and connect with the external world to "break" the embeddedness and be drivers of change. However, to the contrary, this dissertation demonstrates that the elite conducts creative work in a way to connect everything back to their own elite status, without making any efforts to connect with others. Instead of reaching out, the work was conducted to strongly identify the new tool with elite identity, and to construct strong locking mechanisms that would avoid any non-elite interference with the making of and using of the tool. For example, allies that were mobilized were also exclusively from the elite group and mimicry work was based on other elite groups.
This dissertation also contributes to the emergent literature on responding to multiple legitimacy requests (O'Dwyer et al., 2011; Kostova et al., 2008) and how to make them co-exist, without choosing one over the other. Admittedly, no organization can completely satisfy all audiences, and it is often said that one legitimacy prevails on others (Suchman, 1995). Indeed, the second article emphasizes that internal legitimacy can be the foundation of organizational legitimacy, confirming that "a strong and early inside-out emphasis is more likely to achieve overall organizational legitimacy, than an early outside-in focus (Human & Provan, 2000). No manager can completely step outside of the belief system that renders the organization plausible to himself or herself, meaning that to function, insiders need a legitimating institution to be coherent with the organisation's belief system (Suchman 1995). Both internal and external legitimacies cohabitate to form organizational legitimacy. In time of organizational change, internal legitimacy can help not loose external legitimacy (Whetten, 2006).
Moreover, this dissertation contributes to a better understanding of the phenomenon of decoupling. Literature on decoupling shows that underestimating the importance of internal legitimacy can lead to negative consequences such as loss of motivation of employees, but also loss of external organizational legitimacy (MacLean & Behnam, 2010), thereby loosing organizational integrity (Dacin et al., 2002). Boulding (1967) states "a loss of internal legitimacy leads to disorganization of behaviour and an inability to perform an assigned role". Therefore this dissertation contributes to the literature by stating that organizational legitimacy can also be sustained by addressing both internal and external stakeholders (Human & Provan, 2000). This research suggests that

external and internal legitimacies are not opposite but two facets of the same manifestation, organizational legitimacy.
Finally, this dissertation contributes to the understanding of the emergence of innovations in practice through space and time. The article three demonstrates how accounting and strategy can be co-produced in the emerging process. Strategy is first constituted and enabled by carbon accounting. New spaces of calculability were created (Vaivio, 1999) and actual projects of productivity were translated into carbon reduction possibilities. By creating what can be seen, accounting conditioned and enabled action (Robson, 1992). Indeed, accounting played the role of a photographic developer on existing productivity projects, giving visibility to potential carbon emission sinks. Through laboratories (labs) and productivity projects, climate change strategy emerged at the pace that projects were translated into carbon. Accounting enabled the carbon reduction strategy. Furthermore, in a second step, potential carbon emission reductions and innovation projects drove the further refinement of the accounting through, for example, looking for more precise supplier data. Therefore, strategy was also the driver for the emergence of both a more precise and rigorous accounting.
Innovations are also created through space in collaboration from the centre and the periphery. Previous literature had emphasized the key decentralization in the creation of new strategy and new knowledge (Regnér, 2003; Morris & Empson, 1998; Quattrone & Hopper, 2001; Birkinshaw & Mol, 2006). This dissertation contradicts this literature by demonstrating that local knowledge and local strategy is not sufficient in the process of emergence and that headquarter coordination and expertise reinforces local creation.

Contributions to SEA literature

Given the central role of accounting in the management and accountability of organizations, new forms of accountings will affect our ability to pursue sustainable development (Unerman et al., 2007). This research on EMA innovations therefore contributes to further understanding how sustainable development can be pursued through accounting in organizations.
Furthermore this dissertation contributed to understand the potential supporting, or lack of support from infrastructure, regulations or user demand (skills to used) (Brown & Dillard, 2013) for EMA innovations. Indeed, it explored the institutional field of life cycle assessment in France, and the links to government, regulations and the economic elites, and the lack of links with university research and the educational field.
Studying EMA as innovation should allow understanding how some innovations are more “incremental” in nature, understanding the lock-ins and tight links between some innovations and the current “regime”, and how they could be “unlocked” (Brown & Dillard, 2013). The study of carbon accounting, and more particularly of the non-adoption of the GHG Protocol Corporate Standard, explores the lock-ins and tight links of this particular standard with the financial culture and American business culture. The case study offers one way of unlocking the “incremental” nature by adopting the more “engaged” approach of accounting for scope 3 as well. The second article also points to the inertia existing in the current carbon accounting structure (2012) and the difficulty to challenge the status quo, since the GHG Protocol occupies the main space of carbon accounting methodologies today, having locked in relationships with governments (US EPA, Brazil, Mexico…), the ISO and the investors (CDP). The recent developments around life cycle assessment also demonstrate how support networks of EMA tools must continuously rebuilt links to defend the tool against competition, such as when the

French government overturned the decision of the European Commission to develop a one-criteria tool (based on carbon accounting) to move back to a multi-criteria methodology (today the PEF and OEF methodologies that will be tested starting 2014).
This research also contributes to analysing the role of managers in promoting enhanced corporate social performance (Norris & O'Dwyer, 2004), with the decision of the case study company not to adopt the legitimate outside carbon accounting standard that, according to them, did not correspond to their view of their corporate social responsibility. The focus on the decision of adopting or not an EMA tool is in line with the view that companies are not "some abstract organizational actor; they are met by individual human actors who constantly make decisions and choices, some big and some small, some minor and others of great consequence" (Wood, 1991).
Although participant observation is not a new technique (Spradley, 1980), this dissertation is one of the first researches in environmental management accounting to use this technique. Contrary to some critical accounting researchers which research environmental accounting from the "outside", I believe, like Adams and Larrinaga-Gonzalez (2007), that engaged research is a better methodological approach to studying EMA. To obtain better understandings of how EMA functions in practice, more field studies must bring "the messy world of organizations closer to the reader" (Ahrens & Dent, 1998).

Methodological limitations

The perception of a participant observer is influenced by the closeness to the team the participant belongs to while doing the research. A participant observer tries to insulate from the daily realities of fieldwork, but it is unrealistic to think that you can be unaffected (Jorgensen, 1989). This is especially the case in lengthy participations, which are also intense when you perform a membership role. In the case study, the length of participation was twelve months and thus the results are also affected by the realities linked to this lengthy participation. Secondly, the genealogy was conducted as a longitudinal study, which main limit is that it is retrospective (Thiétart, 2007) and appealed to secondary data (archives) and interviews data might suffer from the bias of past reconstruction. The collection of secondary data allowed for "triangulation" of data, to show that the interpretation of the collected interview data and archives go in the same direction, or at least do not contradict our results (Miles & Huberman, 2003).

Theoretical limitations

The dissertation can be criticized on three main points. First, the dissertation aims at contributing to our understanding of the institutionalization process of EMA innovations. However, it was not able to study back to back the creation, adoption and practice of the same object of research. Therefore, although we assume the feedback loop of each of the three "steps" of the process (figure 0.6.1), the three articles do not have the common field that would have allowed theorizing it entirely. Secondly, the consequences of non-adoption and of the realization of an internal tool on the field of carbon accounting was not understood in full due to time constraints. The impact of the company choice on the future of carbon accounting remains unknown, if any. Thirdly, the field is limited to the French context only, while "ignoring" that the field in which EMA is being worked on is international in nature (LCA has roots in the US and many

European countries have acted upon its shaping recently, carbon accounting has American roots, but another 30 methodologies exist).

Further research

Following the research in this dissertation, several axes for future research are described. The first paper describes how one tool was made by elite for the elite, it does not give hints and how this tool could be made available to SMEs, or be made simpler without loosing the quality of the analysis, a problem still faced today by the French experiment on environmental labelling. In short the question is, how can a tool made by the elite be democratized, as per how SEA innovations "should" be (Hopwood, 1977)? Furthermore, the complexity built into life cycle assessment as an "expert system" (Giddens, 1990) raises questions of trust placed in those systems, especially related to environmental topics. Furthermore, more and more environmental areas become calculable (water will be next), organizations will be confronted to an increasing number of epistemic objects and practices. Understanding how organizations can deal with constantly emerging practices of which the knowledge is constantly put into question requires further rich case studies.

The second paper raises the question on how and when to participate in standard setting processes. An organization has limited means to participate to external private standard setting processes; however this non-adoption case study raises the question of whether the company should have participated to secure a standard closer to its organizational identity that would have secured both internal and external legitimacy. Further research could study how organizations search for ways to influence the nature of external standards in the environment when internal legitimacy is compromised (Bromley & Powell, 2012).

The third paper raises questions on organizational learning and the evolution of the role of management accounting to encompass new spaces (the environment), and how this new accountings bring the management accountant closer the business partner role that the profession has been longing to achieve.

This dissertation was based principally on a twelve-month participant observation, and therefore I believe that "the cooperation between researchers and practitioners is of primary importance for generating innovative knowledge" (Arjalies, 2010; Adams & Larrinaga-Gonzalez, 2007). Engaged research in the area of SEA should be encouraged and will allow for richer understanding of current practices in organizations.

As evidence accumulate that capitalism is not ecologically sustainable (Gray & Bebbington, 1998) and that financial accounting as it is today continues to report biased and unfaithful information of the impact of our organizations on our environment (Birkin, 1996), this research aimed at making a contribution with an engaged approach, to advance our knowledge of how accounting – in its broad encompassing meaning - should evolve, through innovations, towards reconsidering the modalities of management of organizations (Brown & Dillard, 2013). Through the study of two EMA innovations, this dissertation aimed at furthering our understanding of how the creation of new forms of accountings will affect our ability to pursue sustainable development (Unerman et al. 2007).

Résumé substantiel en français

1 Introduction

Cette thèse vise à comprendre le processus d'innovation du contrôle de gestion environnemental.

Le contrôle de gestion environnemental est au carrefour de trois mondes. Tout d'abord, la comptabilité traditionnelle, basée sur les racines néo-classiques, considère les questions de développement durable principalement en termes d'externalités, de défaillances du marché, de signaux de prix et d'incitations économiques, elle a tardé à reconnaître le développement durable comme une question de comptabilité. La comptabilité financière est même considérée comme l'une des causes les plus probables de la profanation de l'environnement (Gray 2013). Si nous devions déduire le coût durable du profit conventionnel des organisations, Gray (1992) suggère que « la probabilité est qu'aucune société occidentale n'a réalisé un bénéfice durable depuis très longtemps, voire jamais ».

Deuxièmement, l'objet de la recherche « contrôle de gestion environnemental » est considéré à travers le prisme des études de l'innovation, plus particulièrement comme une innovation de gestion. Bien que l'innovation ait été un symbole du capitalisme depuis le début du 20e siècle, le sens initial de l'innovation était un « outil politique pour parvenir à un choc contre l'ordre établi ». Regarder l'innovation à travers sa vision économique plus récente comme une source d'avantage concurrentiel et à travers son sens politique d'origine comme « subversif », et « un choc contre l'ordre établi » (Monzani, 1985) permet d'étudier le contrôle de gestion environnemental de l'intérieur (Gray, 1992), et de le considérer comme partie intégrante du projet social et environnemental plus large (Gray, 2002). Les innovations en contrôle de gestion sont comprises comme des formes « nouvelles » ou modernes des systèmes comptables et de contrôle de gestion (Zawawi et Hoque, 2010). Les incertitudes environnementales, les enjeux mondiaux récents, tels que le changement climatique, la rareté des ressources naturelles, affectent ces innovations en contrôle de gestion.

Troisièmement, le contrôle de gestion environnemental se réfère au développement durable. Les indicateurs alternatifs de progrès montrent régulièrement que l'état de dégradation de l'environnement et les inégalités sociales atteignent de nouveaux sommets chaque année. Aujourd'hui, le monde est entré dans l'ère anthropocène, pour désigner la nouvelle ère où les humains constituent une force géologique capable d'agir et de changer le système écologique qui soutient la vie sur terre (Costanza et al., 2013), et où les « nouvelles » limites sont maintenant celles du capital naturel. Le principal moteur de cette trajectoire non viable de l'action vers lequel les indicateurs alternatifs pointent, est la croissance économique comme la «cause fondamentale» de la myriade de problèmes sociaux et environnementaux (Johnson, 2012).

En surface, on peut penser que les immenses défis du développement durables (Nations Unies, 2005) et la pratique de la comptabilité sont très éloignés, pourtant, il est urgent de comprendre la « création de systèmes et de méthodes par lesquels la gouvernance du développement durable peuvent être réalisés » (Porritt, 2007). Compte tenu du rôle central du contrôle de gestion dans le management et la responsabilité des

organisations, les nouvelles formes de comptabilités affecteront notre capacité à poursuivre un développement durable (Unerman et al., 2007). Étudier la comptabilité sociale et environnementale comme une innovation comptable pourrait illuminer à la fois le contexte institutionnel dans lequel elle est apparue au cours des 40 dernières années et les évolutions potentielles qu'elle apporte à la comptabilité traditionnelle.

Pour avoir une meilleure compréhension des processus d'institutionnalisation qui entrent en jeu pour les innovations de contrôle de gestion, des idées à la pratique, cette thèse vise à répondre aux questions de recherche suivantes:

- Comment sont créés les outils de contrôle de gestion environnemental, par qui et avec quelles stratégies?
- Quel est le processus d'adoption et les conséquences sur l'organisation qui adopte? Comment une innovation comptable peut devenir le centre d'un conflit de légitimités au moment de l'adoption?
- Comment les outils de contrôle de gestion se traduisent dans les pratiques des organisations?

Les questions de recherche sont traitées à travers trois articles. Le premier article porte sur l'innovation appelée « analyse du cycle de vie » et sa phase de création. Il mobilise le concept d'élite comme acteurs de l'innovation, et le travail institutionnel pour décrire l'ensemble des actions intentionnelles et dirigées, réalisées dans le but de créer un nouvel outil de comptabilité. Le deuxième article porte sur la comptabilisation du carbone au moment précis de son adoption, et du point de vue d'une société adoptant l'innovation. Le dernier article se focalise sur la pratique de l'innovation « comptabilité carbone ». Il se concentre sur les pratiques émergentes en matière de comptabilité et de stratégie relative à la gestion du carbone.

2 Revue de littérature: l'innovation en contrôle de gestion

Nous croyons que l'analyse du contrôle de gestion environnemental à travers le prisme des innovations pourrait avoir un intérêt pour plusieurs raisons. Premièrement, les innovations de développement durable, dont le contrôle de gestion environnemental fait partie, sont souvent institutionnalisés mais à peine diffusées et adoptées; donc il faut continuer à investiguer ce phénomène. En effet, il est nécessaire de comprendre le potentiel de soutien, ou le manque de soutien des infrastructures, de la réglementation ou de la demande des utilisateurs (Brown et Dillard, 2013) pour les innovations en contrôle de gestion environnemental. En outre, l'étude du contrôle de gestion environnemental comme une innovation permettrait de comprendre comment certaines innovations sont plus «incrémentales» par nature, permettant de comprendre les blocages et les liens étroits entre certaines innovations et le « régime » actuel, et comment ils pourraient être « déverrouillés » (Brown et Dillard, 2013). En outre, Bell et Hoque (2012) défient les chercheurs d'évaluer de façon critique l'inertie créée par les structures comptables existantes, les processus et les techniques et de généraliser ces conversations qui challengent le statu quo. Considéré le contrôle de gestion environnemental comme une innovation permet de regarder les espaces dans lesquels il est construit, les réseaux dont il dépend ou pourrait dépendre pour se développer, et les technologies avec lesquelles il est en compétition dans le régime actuel (Brown et Dillard, 2013). Analyser le contrôle de gestion environnemental comme une innovation permet de prendre en considération de nombreuses dimensions (technique, culturel,

comportemental, politique, d'infrastructure) et les différents niveaux (les institutions/le champ organisationnel, l'organisation et les pratiques) de ce contrôle de gestion, ce qui contribue à notre compréhension de la façon dont la comptabilité peut ou pourrait contribuer à la transition vers un développement durable. Il est nécessaire de comprendre comment certaines manières de poser les problèmes généraux (la crise de l'environnement) tels que ceux liés à la comptabilité de l'environnement atteignent un statut d'évidence; ou pourquoi ils ne l'atteignent pas, et réciproquement, comment certaines technologies du calcul viennent à être considérées comme le moyen approprié pour résoudre ces problèmes particuliers (Miller, 1991). En outre, étudier le contrôle de gestion environnemental comme une innovation est une position fermement ancrée dans la vision que la comptabilité peut être changée (et devrait évoluer), et que donc nous ne pouvons pas confondre «des idées comptables contingentes, des pratiques et institutions, locales dans l'espace et le temps, comme allant de soi, universelles et nécessaires » (Gomes et al., 2011).

L'innovation est décrite comme une rencontre réussie, synergique, entre une entité et un ensemble social. Il s'agit d'une réaction chimique (Gaglio, 2011). Callon (1999) définit l'innovation comme:

> *« Un phénomène émergent basé sur la mise en place progressive d'interactions qui lient les agents, les connaissances et les biens qui étaient auparavant sans lien, et qui sont lentement mis dans une relation d'interdépendance (...). Ce qui marque l'innovation est l'alchimie de la combinaison d'ingrédients hétérogènes: il s'agit d'un processus qui traverse les institutions, établissant des relations complexes et inhabituelles, le marché, le droit, la science et la technologie. »*

L'innovation de gestion a, selon Hamel (2006), plus que tout autre type d'innovations, permis aux entreprises de franchir de nouveaux seuils de performance. Aujourd'hui, l'innovation de gestion représente l'une des sources les plus importantes et durables de d'un avantage concurrentiel pour les entreprises (Feigenbaum et Feigenbaum, 2005; Hamel, 2006), car elle est spécifique au contexte (Birkinshaw et al, 2008.), Et parce qu'elle est ambigüe et difficile à reproduire (Volberda et al., 2013). Les innovations de gestion sont définies comme suit:

> *« De nouvelles approches pour concevoir la stratégie et la structure des tâches et des unités, pour modifier les processus de gestion de l'organisation et des systèmes administratifs, pour motiver et récompenser les membres de l'organisation, et pour permettre l'adaptation et le changement organisationnel. » (Damanpour & Aravind, 2011)*

Les innovations en contrôle de gestion se réfèrent à de « nouvelles » formes ou formes modernes de comptabilité et de contrôle de gestion (Zawawi et Hoque, 2010). La recherche sur les innovations en contrôle de gestion permet de comprendre quelles sont les innovations « fausses » ou « vraies », et pourquoi certaines réussissent (Bouquin et Nikitin, 2003). Les incertitudes environnementales, les enjeux mondiaux récents, tels le changement climatique, la rareté des ressources naturelles peuvent affecter les innovations en contrôle de gestion (Zawawi et Hoque, 2010). L'interaction entre ces questions et les innovations en contrôle de gestion doit être approfondie (Zawawi et Hoque, 2010). Le contrôle de gestion environnemental est relativement nouveau comme champ de recherche et dans la pratique, dans laquelle les premières utilisations remontent seulement au début des années 1990; ainsi le contrôle de gestion

environnemental peut encore être considéré comme un domaine de l'innovation (Rikhardsson et al., 2005).

Cette thèse adopte une approche de processus de l'innovation, en opposition avec une recherche qui considérerait l'innovation comme un résultat. Par conséquent, l'accent est mis sur l'étude du processus d'institutionnalisation. Il est défini comme:

> *« Le processus par lequel les nouvelles normes, valeurs et structures s'incorporent dans le cadre de modèles existants (...). Ce processus est celui qui donne de la stabilité et de la prévisibilité aux relations sociales et leur permet de persister. » (Kimberly, 1979)*

Cette thèse porte sur les trois étapes qui sont développées dans les trois articles: création, adoption et implémentation.

Les histoires de la création d'innovations en contrôle de gestion, en particulier dans les généalogies, ont souligné la nature sociale de la comptabilité et son caractère très contextuel dans leurs processus d'émergence. Ces recherches sur la création d'innovations soulignent en particulier les conditions, les événements, les traces de pouvoir et les discours d'experts qui ont façonné leur existence. Elles sont des histoires non officielles qui cherchent à explorer les nombreux « petits » moyens à travers lesquels les technologies de la connaissance ont émergé et se sont propagées (Loft, 1986).

Dans la phase de création, la construction de la capacité d'agir historique doit encore être explorée (Burchell et al., 1980). Bien que les généalogies comptables et les histoires de développement des innovations en contrôle de gestion ont souligné différents types d'acteurs impliqués dans la réalisation d'innovations, en particulier les praticiens, les consultants et les gouvernements, la construction des agents doit encore être explorée, car par ailleurs tout le monde ne peut pas exprimer des idées au sujet de la comptabilité qui seront entendues ou crues (Oakes et Miranti, 1996). En effet, les acteurs sont aussi institutionnellement construits et les contextes institutionnels déterminent quels types d'acteurs deviennent pertinents pour la construction des innovations (Hwang et Colyvas, 2011). En outre, le premier article apporte une perspective sur le travail institutionnel pour l'étude des comptabilités en émergence, comme des actions délibérées visant à la création d'institutions. Jusqu'à présent, à l'exception de Cooper et al. (2012), où ils examinent les travaux d'expérimentation, de théorisation, de dénomination et de fabrication de catégories abstraites, les différents travaux nécessaires à la réalisation d'innovations ont été relativement négligés. Cependant, les généalogies du calcul doivent examiner « les stratégies avancées pour l'adoption de leurs techniques » (Miller & Napier, 1993).

Le processus d'adoption explique comment une organisation prend connaissance de nouvelles idées, les acquiert et les adapte (Damanpour et Aravind, 2011). La perception que les organisations sont des récepteurs passifs d'idées légitimes est maintenant depuis longtemps dépassée, et la phase d'adoption du cycle de l'innovation a retenu plus d'attention en représentant le lien crucial entre le champ organisationnel, et l'intérieur des organisations.

Le deuxième article de la thèse porte sur le moment de l'adoption d'une façon particulière. En effet, il a comme situation empirique celle d'une décision de non-adoption de l'innovation de contrôle de gestion largement acceptée par ailleurs et légitime. Ce focus empirique, ainsi que la décision de fabriquer un outil généré en interne, permet la meilleure compréhension de notions telles que «l'appropriation» et

«l'internalisation» (Dambrin et al., 2007), ainsi que le développement du concept de «groupement» (bundling) transmis par Modell (2009). L'article permet également de continuer à explorer le phénomène déjà largement décrit de découplage, où une innovation est adoptée mais non implémentée.
Le troisième article de cette thèse cherche à aborder la phase de mise en œuvre de l'innovation. La mise en œuvre de l'innovation au sein d'une organisation peut être définie comme le processus d'acquisition de l'utilisation appropriée et engagée d'une innovation par les employés ciblés (Klein et Sorra, 1996). La mise en œuvre est un exercice incertain et peut se révéler complexe et problématique (Rogers, 2003). Les innovations comptables ne sont en effet souvent pas mises en œuvre ou diffusées avec succès dans toute l'organisation (Abernethy et Bouwens, 2005). Ce que le troisième article de cette thèse vise à ajouter à notre compréhension de la mise en œuvre d'une innovation, est l'émergence d'innovations comptables vu par la théorie de la pratique. En effet, l'appropriation d'une innovation est dans le domaine du «faire», dans la création de nouvelles pratiques (Gaglio, 2011). En se concentrant sur la façon dont les pratiques entourant l'innovation « comptabilité carbone » sont formées, la recherche menée a permis de voir comment les nouvelles connexions ont été formées, de nouveaux espaces créés pour les nouvelles pratiques (Sharma et al., 2010), ainsi que comment la comptabilité interagit avec les pratiques existantes et a co-émergé avec les nouvelles pratiques de stratégie. Grâce à cette approche axée sur la pratique, l'article montre comment les pratiques ne sont pas seulement créées à la périphérie mais en liaison avec le centre. Les nouvelles connexions à créer les nouvelles pratiques se produisent avec le temps (co-émergence de deux pratiques qui se renforcent mutuellement) et l'espace (local-centre).
Le processus d'innovation est définie comme partant d'une idée (invention) à la pratique actuelle de l'innovation (Garud et al., 2013). A travers les trois articles de cette thèse, nous allons explorer la complexité des processus d'innovation qui sont co-évolutionnaires, car ils impliquent simultanément plusieurs niveaux d'analyse; relationnels, car ils impliquent un ensemble diversifié d'acteurs sociaux et d'éléments matériels; inter-temporels, comme les événements temporels et les séquences sont expérimentés de multiples façons et culturels, comme ils se déroulent dans des situations contextuelles (Garud et al., 2013). Cela implique que l'on doit adopter une perspective multi-niveaux, longitudinale, et suivre les événements impliquant les acteurs, les artefacts et les institutions dans le temps (Garud et al., 2013). Par conséquent, les trois articles suivent les innovations de l'idée à la pratique, en suivant les événements, les acteurs, les innovations comptables, et l'environnement institutionnel entourant ces innovations (pour l'analyse de cycle de vie comme pour la comptabilité carbone).

3 L'objet de recherche: le contrôle de gestion environnemental

Cette recherche se concentre sur l'innovation comptable "contrôle de gestion environnemental" pour plusieurs raisons. Premièrement, le statut de la dégradation de l'environnement qui nous entoure est visible, important dans l'ampleur, et de nombreux scientifiques déclarent l'urgence d'agir pour remédier à cette dégradation grandissante (Costanza et al., 2013). Deuxièmement, comme Medley (1997) a écrit, la façon dont la profession comptable va aborder la question de l'environnement indiquera sa capacité à évoluer ou pas, avec le reste de la société. Troisièmement, il est d'une importance et d'un intérêt pour les organisations, car selon une enquête Accenture / Global Compact 2010,

96% des dirigeants conviennent que les questions de développement durable doivent être intégrées dans la stratégie et les opérations des entreprises. En outre, certaines caractéristiques des innovations en contrôle de gestion environnemental en font des objets d'étude intéressants pour l'étude de la fois du processus d'innovation et du changement institutionnel en comptabilité. Premièrement, le contrôle de gestion environnemental constitue un domaine intéressant de l'innovation car certains outils sont encore en gestation (comptabilité de l'eau par exemple), d'autres sont des pratiques émergentes dans les organisations (la comptabilité carbone) et enfin, d'autres ont une durée courte mais constituée de vie qui permet de reconstituer des généalogies (l'analyse de cycle de vie). Le domaine du contrôle de gestion environnemental est également intéressant car il permet d'observer l'interaction, la concurrence, et l'association des différentes innovations dans leur fabrication (L'analyse de cycle de vie et le Life Cycle Costing (LCC), l'analyse de cycle de vie et la comptabilité carbone, la comptabilité analytique des flux de matières (MFCA) et l'analyse de cycle de vie). En outre, le contrôle de gestion environnemental se trouve à la croisée de plusieurs courants scientifiques, au nom desquels les sciences naturelles, l'économie écologique, la comptabilité de gestion et la comptabilité financière traditionnelle. Ce nœud particulier de la connaissance est une caractéristique intéressante de ces innovations, car il réunit de nombreux acteurs institutionnels, de nombreuses idées et a un impact sur les «réseaux» qui doivent être construit autour de ces innovations, et sur les acteurs qui décideront de l'adoption ou non, et de la pratique de ces innovations.
Enfin, le contrôle de gestion environnemental a plusieurs caractéristiques intéressantes car il rend de nouveaux espaces calculables (Vaivio, 1999; Miller, 1998; Antheaume, 2013). Le contrôle de gestion environnemental étend la dimension temporelle de la du contrôle de gestion, par exemple en prenant en compte les dommages à l'environnement, allant de quelques années à plusieurs milliers d'années (Antheaume, 2013). Enfin, le contrôle de gestion environnemental augmente le nombre d'acteurs et d'acteurs non-humains pris en compte dans le domaine du contrôle de gestion. Par exemple, lors du calcul d'une analyse de cycle de vie, la rivière et sa pollution sont intégrées dans le domaine de la comptabilité, ainsi que les voisins (leur santé) d'une usine polluante (Antheaume, 2013).
Le contrôle de gestion environnemental est par ailleurs une notion complexe qui se rapporte à une variété de concepts. D'une part, il se rapporte à la comptabilité de gestion traditionnelle, ses outils et ses systèmes. D'autre part, elle est également liée à des concepts récents tels que la responsabilité sociale des entreprises (RSE), l'environnement, l'écologie et le développement durable (DD).

Pour les besoins de notre recherche, nous allons donc adopter une définition large du contrôle de gestion environnemental qui est la suivante:

> *« L'identification, la collecte, l'estimation, l'analyse et la communication des informations physiques et monétaires liés aux questions environnementales. »*

Les outils de contrôle de gestion environnemental peuvent prendre la forme d'outils de contrôle de gestion traditionnel (budget, tableau de bord équilibré, examen des investissements), mais aussi prendre la forme d'outils récemment développés tels que l'analyse de cycle de vie, la comptabilité en coût complet, l'évaluation du coût total (total cost assessment) ou la comptabilisation des coûts des flux de matières (MFCA), et enfin celle de nouveaux indicateurs de performance intégrée. Le contrôle de gestion environnemental est également concerné par des domaines spécialisés tels que la comptabilité de l'eau, la comptabilité de la biodiversité et la comptabilité du carbone.

Deux exemples d'innovations de contrôle de gestion environnemental sont étudiés dans cette thèse: les outils dits «écobilan» (plus tard «d'analyse de cycle de vie» et de «comptabilité carbone». L'analyse du cycle de vie (ACV) est l'outil le plus largement reconnu pour la comptabilisation de l'environnement et le premier à avoir été normalisé au niveau de l'ISO en 1997. L'analyse de cycle de vie est définie comme suit:

> *« Une évaluation quantifiée des flux de matières et d'énergie entrant et sortant à l'intérieur d'un système représentatif du cycle de vie d'un produit ou d'un service. » (Grisel et Osset, 2004)*

En 2005, l'ADEME a dit à propos de l'ACV: « dans le domaine de l'évaluation globale et multicritère des impacts environnementaux, l'ACV est l'outil qui s'approche le plus de la perfection. Sa pratique actuelle et sa diffusion contribuent à en faire un outil efficace et reconnu » (2005). Selon les normes ISO (2006), l'ACV est un outil complet (qui évalue le cycle de vie d'un produit et tous les attributs ou aspects de l'environnement naturel, de la santé humaine et des ressources), permettant de révéler « l'image actuelle, réelle et vraie et la totalité de l'impact environnemental » des produits de l'entreprise (Freidberg, 2013).

Ces dix dernières années, le carbone a émergé comme l'indicateur environnemental clé. La comptabilité carbone comprend:

> *« La reconnaissance, l'évaluation non monétaire et monétaire et le contrôle des émissions de gaz à effet de serre à tous les niveaux de la chaîne de valeur et la reconnaissance, l'évaluation et le suivi des effets de ces émissions sur le cycle du carbone des écosystèmes. » (Stechemesser et Guenther, 2012)*

Dans cette recherche, nous nous intéressons uniquement à l'évaluation physique des émissions de GES. Il ya des comptabilités carbone à différents niveaux: pays, territoires, villes et organisations. Trois types de comptabilités de carbone concernent les entreprises: par site, par produit et par projet. La comptabilité carbone par projet concerne les projets de compensation de carbone et n'est pas incluse dans cette recherche. La comptabilité carbone par site est généralement basée sur le cadre volontaire nommé « GHG Protocol Corporate Standard » (2004) ou des méthodes similaires. La comptabilité carbone par produit est généralement basée sur le PAS 2050 conçu par le British Standard Institute (BSI) en 2008.

L'ACV a une durée de vie assez courte mais consistante, ce qui permet de dérouler une généalogie, et ce qui constitue donc un bon champ de recherche pour l'analyse rétrospective de la création d'un l'outil dans le contexte français. La comptabilité carbone est une bonne représentation du contrôle de gestion environnemental à la croisée de plusieurs courants scientifiques, tels que les sciences naturelles, le contrôle de gestion et la comptabilité financière traditionnelle. Ce nœud particulier de la connaissance est une caractéristique intéressante de la comptabilité carbone, car il réunit de nombreux acteurs institutionnels, des idées et a un impact sur les «réseaux» qui doivent être construit autour de cette innovation, et sur les acteurs qui décideront de l'adoption et de la pratique de cette innovation.

4 Cadre théorique: la théorie institutionnelle et la théorie des pratiques

Les innovations de contrôle de gestion environnemental sont étudiées en utilisant le prisme de la théorie institutionnelle et de la théorie de la pratique dans les trois articles de cette thèse. Hopwood (1977) a encouragé l'examen « des processus institutionnels qui peuvent à la fois faciliter et entraver le développement de la comptabilité ». Bien qu'il existe une tension inhérente entre l'institutionnalisation (stabilisation) et

l'innovation (nouveauté), nous croyons que la théorie institutionnelle apporte des idées théoriques intéressantes concernant le processus menant à la stabilisation et de la stabilisation à la « déstabilisation » et la mort des innovations (Hopwood, 1978).
Parmi les études du changement institutionnel, certaines ont exploré le rôle de l'agent, plus récemment, le travail ciblé des acteurs (Lawrence et Suddaby, 2006), les phénomènes de découplage (liés à l'adoption des innovations) et le processus de désinstitutionnalisation (Peton, 2012; Hiatt et al., 2009) .Jusqu'à récemment, il y avait encore des critiques sur le déficit en théorie institutionnelle d'une approche de la pratique (Lounsbury et Crumley , 2007) . Cependant, des travaux récents ont fait le lien entre les processus sociaux plus larges et les pratiques organisationnelles (Arjalies, 2010; Labatut et al, 2012). Malgré cette connexion, la théorie de la pratique a longtemps approché les pratiques plus comme une routine et un processus de stabilité (Feldman et Pentland, 2003) que comme un processus dynamique. Ce que nous cherchons ici à montrer est une explication de la façon dont les innovations émergent à travers une étude des pratiques en émergence constante (Ciborra, 2000; Andon et al, 2007; Bjorkeng et al, 2009; Gherardi, 2012).
Cette thèse utilise le cadre théorique de la pratique et de la théorie institutionnelle pour tenir compte de la totalité et de l'interdépendance des différentes phases du processus d'innovation (de l'origine à la diffusion, de l'adoption à la pratique, de la mise en œuvre en retour sur l'adoption et la création). En effet, cette thèse vise à comprendre l'ensemble du processus de l'innovation, de l'idée à la pratique. L'objectif de cette thèse nécessite donc d'être capable d'analyser à la fois le champ dans lequel les innovations naissent, le lien entre ce champ et les adoptants, et la pratique réelle des innovations. La combinaison de ces deux cadres théoriques permet le faire en expliquant l'environnement social et institutionnel qui façonne, contraint et en retour, est mis en forme par les innovations; l'agence des acteurs et de leur travail institutionnel; ainsi que les micro fondations des innovations institutionnelles dans l'analyse des pratiques émergentes qui façonnent constamment et remodèlent les innovations dans leur pratique quotidienne.

5 Processus de recherche

La position épistémologique de cette thèse est interprétative (Burrell et Morgan, 1979) et cette recherche a suivi une démarche qualitative.
Les études interprétatives répondent aux questions pourquoi et comment, et les questions explicatives sont plus susceptibles de conduire à l'utilisation de méthodes de recherche qualitative (Yin, 2009). Les processus d'innovation impliquent souvent plusieurs niveaux simultanément, dans un contexte culturel particulier, nécessitant de riches études de cas longitudinales (Garud et al. 2013). Les études des contextes institutionnels et celles qui font ressortir le travail institutionnel exigent également des études de cas qualitatives (Lawrence et al, 2009).
Le cadre méthodologique de cette thèse utilise une approche qualitative et repose sur deux champs différents, l'un réalisé en dehors des organisations, dans le champ de l'analyse du cycle de vie, et l'autre au sein d'une organisation. Les deux champs permettent de couvrir tout le cycle de vie d'une innovation en contrôle de gestion environnemental, de la création, à l'adoption (non-adoption) et enfin à la phase de mise en œuvre. Ce cadre permet une meilleure compréhension des processus d'institutionnalisation à l'œuvre pour les innovations en contrôle de gestion environnemental, des idées à la pratique.

Le premier article est une généalogie de l'outil «écobilan». Nous croyons que l'étude de la généalogie des outils de comptabilité nous permet d'enrichir les connaissances sur le comment et le pourquoi les outils que nous utilisons couramment aujourd'hui ont été créés et diffusés. « Cette histoire non officielle (des généalogies) vise à explorer les nombreux « petits » moyens par lesquels cette technique de connaissances a émergé et s'est propagée » (Loft, 1986). Dans le même temps, « la perspective historique permet à la société d'évaluer l'avenir de la comptabilité, de ses objets et de ses manifestations » (Carnegie et Napier, 2012). Les généalogies explorent l'identification et l'explication des facteurs à l'origine de la comptabilité, tout en étant attentif aux changements de sens qui accompagne leur émergence (Miller et Napier, 1993). Différents calculs sont déployés en fonction de différents objectifs ou idéaux, et les pratiques actuelles sont le résultat d'événements et de processus disparates (Miller et Napier, 1993) qui ont besoin d'être davantage exploré et analysé.

Les généalogies suivent souvent une « approche longitudinale », donc nous allons étudier les processus d'institutionnalisation de l'analyse de cycle de vie en France sur une période de vingt ans (Tolbert et Zucker, 1996). Cela permet de voir les différentes phases contextuelles et les différents processus d'institutionnalisation jusqu'à présent. Nous allons aussi être en mesure d'analyser les relations de pouvoir, les réseaux en jeu et de « localiser les processus historiquement » (Ball et Craig, 2010). Les approches longitudinales étudient un phénomène dans le temps (Thiétart, 2007). Le temps est un élément important de l'analyse du processus d'innovation, car ils se produisent sur une longue période de temps (Garud et al., 2013). Les approches longitudinales exigent de recueillir des données provenant des différentes périodes considérées (ici 1990-2012), et d'obtenir des informations de personnes qui étaient actives au cours des différentes périodes.

Les données recueillies pour l'article 1 sont principalement des entretiens (33 au total). En outre, pour étudier l'objectivation de l'ACV et le discours entourant cette innovation, nous avons recueilli des données secondaires importantes telles que des livres sur la méthodologie et des articles de 1989 à 2012, ainsi que les archives de l'ADEME. Enfin, nous avons pu assister à un séminaire sur le thème « réinvestir l'analyse de cycle de vie ».

Les articles 2 et 3 sont basés sur une étude de cas unique. L'étude de cas est préférée dans l'examen des événements contemporains sur lesquels le chercheur a peu ou pas de contrôle, et pour répondre aux « comment » et « pourquoi » (Yin, 2009). En outre, l'étude de cas permet d'interpréter le système social étudié (Scapens, 1990). Une étude de cas est « une exploration d'un système bornée dans le temps par le biais d'une collecte de données détaillée, en profondeur, impliquant de multiples sources d'information riches en contexte » (Creswell, 1998).

Dans la littérature de comptabilité sociale et environnementale, il a également été avancé qu'il existe un besoin pour des approches plus engagées avec les organisations qui pratiquent la comptabilité du développement durable, avec le « but de mieux comprendre à partir du terrain les logiques que les acteurs utilisent pour construire la comptabilité du développement durable, la responsabilité et, directement ou indirectement, l'amélioration des pratiques » (Adams et Larrinaga-Gonzalez, 2007). Par conséquent, nous croyons que des études de cas avec une forte approche de l'observation participante répondent à l'appel pour des approches plus engagées avec les organisations.

Lorsque l'on étudie une situation sociale, il est recommandé de sélectionner une situation sociale unique pour permettre une meilleure compréhension de la complexité

intégrée dans cette situation (Spradley, 1980). L'étude attentive d'un seul cas conduit les chercheurs à voir de nouvelles relations théoriques et de questionner les anciennes (Gibb Dyer et Wilkins, 1991). Le but d'une étude de cas unique est de révéler la « structure profonde du comportement social » (Gibb Dyer et Wilkins, 1991). La théorie qui naît de perspectives profondes sera plus « juste » car le chercheur prendra en compte les « subtilités et conditions d'un contexte particulier » (Gibb Dyer et Wilkins, 1991).

Nos questions de recherche répondent aux questions « comment » et sont de nature explicative. Notre objet d'enquête (le contrôle de gestion environnemental) est relativement nouveau quand il s'agit de l'étude qui pu en être faite au niveau organisationnelle. Par conséquent, nous croyons que le cas ici sera un cas révélateur, où le chercheur a « l'occasion d'observer et d'analyser un phénomène inaccessible à l'enquête en sciences sociales » (Yin, 2009). En effet, les pratiques du contrôle de gestion environnemental à l'intérieur d'une organisation, et l'étude de l'adoption d'une innovation en interne sont des phénomènes qui ont rarement été étudiés « de l'intérieur » (Burritt et al, 2011; Zawawi et Hoque, 2010). De plus, nous croyons que l'étude de cas représente un « cas intense » dans le sens de Miles et Huberman (2003), il s'agit d'un cas riche qui exprime les phénomènes avec intensité, sans être de caractère extrême. En utilisant une étude de cas unique pour être aussi proche que possible du phénomène à l'étude est important pour révéler les mécanismes en jeu dans les études d'innovation (Gibb Dyer et Wilkins, 1991; Garud et al, 2013). La richesse des études de cas uniques est primordiale pour contribuer à la théorie de la pratique ainsi qu'à la théorie institutionnelle.

Dans notre étude de cas, le principal mode de collecte de données est l'observation participante qui a duré12 mois (Spradley, 1980). Les autres sources de preuves utilisées sont des entretiens, des documents de l'entreprise et sur l'entreprise et l'accès et l'utilisation d'objets physiques, à savoir les outils liés à la comptabilité du carbone. Les entretiens et les réunions transcrits ont été d'abord lu comme en première lecture rapide, puis relus et des notes ont été prises. Les premières idées ont émergé de la lecture et les données ont été annotées manuellement.

Dans un deuxième temps, nous sommes retourné à la lecture de la littérature sur la théorie. Le codage a été effectué par l'intermédiaire d'un logiciel d'analyse qualitative des données. Une analyse thématique a été menée dans un premier temps, à la fois inductive et déductive de la lecture des théories.

6 Présentation de l'entreprise du cas

Pour étudier les phases d'adoption et la mise en œuvre d'une innovation en contrôle de gestion environnemental dans le processus d'institutionnalisation, une étude de cas unique dans une société multinationale a été menée. Les multinationales représentent aujourd'hui une immense partie de l'économie mondiale, et sont accusées d'être responsables de la plupart des dommages à l'environnement, comme leur comptabilité (Gray et Bebbington, 1998). Au contraire, d'autres disent que les multinationales sont le seul mécanisme assez puissant pour produire les changements nécessaires pour inverser la dégradation globale environnementale et sociale (Hawken, 1993). Les multinationales s'engagent donc à ne pas être seulement accusées de ces torts, mais aussi s'engagent à être moteur dans la remise en état des dommages causés à l'environnement (Gunningham, 2009). Par conséquent, nous nous concentrons sur un multinationale pour chercher à comprendre son implication dans le débat sur

l'environnement et sur le développement durable (Gray et Bebbington, 1998) et afin de contribuer à la compréhension de ce paradoxe.
L'entreprise étudiée est une multinationale de taille moyenne dans le secteur alimentaire, qui est leader dans ses segments, mais ne représente pas un mastodonte de l'industrie alimentaire dans le monde. Cette société est un exemple typique de l'hybridité, une forme transitoire d'organisation qui est un exemple de mélange, où « la possibilité de nouvelles pratiques de comptabilités alternatives (...) n'est plus délimitée par la dichotomie organisations/société, mais permet leur fusion et leur perméabilité » (Baxter et Chua, 2003). Il représente une forme d'organisation transitoire qui est un exemple d'organisation privée « aux prises avec leurs responsabilités environnementales et sociales croissantes » (Baxter et Chua, 2003). L'entreprise étudiée a une longue histoire d'entreprise responsable qui est ancrée dans son « double projet économique et social » datant des années 70. Malgré cette forte identité, les sujets environnementaux n'ont été que rarement mis en avant (à l'exception des actions emblématiques en 1971 et en 1992, Vacances Propres et Eco-Emballages) jusqu'à tout récemment.
Une nouvelle approche plus intégrée de la RSE a été développée après 2006, avec quatre piliers dont « nature ». Sur la base de ce nouveau programme, une équipe « nature » a été créée en 2009 et la comptabilité carbone a été conçue pour être à la pointe des efforts de l'entreprise sur l'environnement. Ça a été particulièrement visible publiquement à l'annonce de l'objectif de réduire les émissions de GES de l'entreprise de 30% entre 2008-2012.
La société est le terrain pour aussi bien l'article 2 que l'article 3 sur la base d'une observation participante de douze mois en tant que comptable carbone dans l'équipe nature au siège.

Cette thèse se compose de trois articles qui explorent ensemble les différentes facettes de l'innovation en contrôle de gestion. Nous allons maintenant présenter ces trois articles.

7 Article 1

Le premier article aborde la question de la façon dont les innovations sont créées et sur le chemin de l'institutionnalisation. La perspective adoptée est de se concentrer sur les acteurs et leurs stratégies, le « qui » et le « comment » du processus d'institutionnalisation. L'étude suit l'outil historiquement des années 1990 à 2012, en regardant les différentes phases du processus d'institutionnalisation. Il répond aux questions de recherche: Quel est le rôle des élites nationales dans l'institutionnalisation des innovations de contrôle de gestion? Comment l'élite française contribue à sa diffusion dans les entreprises? Quels sont les éléments et les circonstances qui ont contribué à ou entravé l'institutionnalisation de cet outil dans le contexte français? Le concept de « travail institutionnel » (Lawrence et Suddaby, 2006) est mobilisé pour faire la lumière sur les stratégies de l'élite dans la conception d'une innovation comptable. Cet article est une généalogie d'un outil de contrôle de gestion environnemental sur une période de 22 ans, et combine des entretiens semi-structurés et l'analyse des données secondaires, y compris des archives, livres et articles de presse.
L'article montre que dans le contexte français, les élites ont été les principaux acteurs dans le processus d'institutionnalisation de l'outil « écobilan ». En expliquant le rôle de ces agents particuliers dans la fabrication d'un outil de contrôle de gestion

environnemental, cet article favorise notre compréhension de la façon dont les questions environnementales sont mises en forme et acceptées dans le contexte français. En outre, découvrir les stratégies déployées pour créer l'outil nous éclaire sur la façon dont les outils de comptabilité environnementale jouent un rôle crucial dans les relations de pouvoir, rendant la performance environnementale visible pour certains, mais invisible pour les autres.
L'article contribue à la théorie institutionnelle en définissant quel travail institutionnel les élites utilisent pour se maintenir au pouvoir, malgré la menace exercée par un phénomène nouveau, les préoccupations environnementales ici, sur leur position dominante. Contrairement à la littérature précédente qui a défini le travail d'élite comme un travail de création de pont vers l'extérieur, de création de liens vers l'extérieur pour casser leur enracinement, l'article démontre que l'élite a conduit des travaux de création de façon à ce que tout se connecte, au contraire, à nouveau vers leur propre statut d'élite.
Il contribue en outre à la littérature sur les généalogies des innovations de contrôle de gestion par l'introduction d'un point de vue sur les stratégies des acteurs et donc pas seulement en se concentrant sur le contexte culturel, géographique et historique du processus d'innovation. Le travail institutionnel a été réalisé pour identifier fortement le nouvel outil avec l'identité de l'élite, en créant des mécanismes de verrouillage forts qui permettraient d'éviter toute interférence de personnes non issues de l'élite. L'ACV est un exemple de l'innovation en contrôle de gestion qui a été réalisée de manière très complexe et haut de gamme afin de ne pas être attrayante pour à un large public, contrairement à ce qui est attendu d'une innovation pour se propager, ou contrairement à d'autres outils tels que les coûts standards. Il a été réalisé avec peu de souplesse d'interprétation.

8 Article 2

Cet article décrit la mise en place d'un nouvel outil comptable sous la forme de la comptabilité carbone, dans une organisation multinationale. Il permet de comprendre un moment particulier dans le processus d'institutionnalisation, qui relie l'innovation créé avec les utilisateurs potentiels, c'est à dire le moment de l'adoption de l'innovation. Cet article répond aux questions de recherche suivantes: Comment une nouvelle pratique comptable peut devenir le centre d'un conflit de légitimités? Comment la légitimité interne interagit avec légitimité externe et quel rôle joue-t-elle dans le maintien de la légitimité de l'organisation?
L'étude utilise la théorie institutionnelle, en mettant l'accent sur la légitimité, pour comprendre la mise en place du nouvel outil comptable et sa confrontation avec le champ organisationnel externe de la comptabilité carbone. Il explique dans une étude longitudinale sur cinq ans comment un outil de comptabilité carbone créé en interne a été confronté aux exigences des parties prenantes externes, et comment le conflit des légitimités s'est déroulé. Grâce à une étude de cas approfondie d'une organisation, l'article révèle le processus de la non-adoption d'une méthodologie de comptabilité carbone. Le papier mobilise l'observation participante dans une étude de cas unique ainsi que des entretiens.
L'article contribue à la théorie institutionnelle en démontrant le rôle joué par la légitimité interne dans la décision de non-adoption, et comment elle a été recombinée avec la légitimité externe pour renforcer la légitimité de l'organisation. Il contribue à la littérature sur les innovations en contrôle de gestion en introduisant le rôle crucial joué

par la légitimité interne dans le processus d'adoption des innovations, et aussi en affirmant que la légitimité interne pourrait également être le fondement de la légitimité de l'organisation et donc un facteur de succès dans le processus d'adoption des innovations. Cet article suggère que les légitimités interne et externe ne sont pas en opposition, mais deux facettes de la même manifestation, la légitimité de l'organisation. En effet, perdre sa légitimité externe peut conduire indirectement à des conséquences sur la performance de l'organisation, mais une perte de la légitimité interne a des conséquences similaires et peut désorganiser le comportement des entreprises. Enfin, cet article met l'accent, comme Human et Provan (2000), sur le fait qu'une approche forte et précoce de l'intérieur vers l'extérieur d'une organisation est plus susceptible d'atteindre la légitimité globale de l'organisation que l'approche inverse.

9 Article 3

Le troisième article analyse les pratiques entourant une innovation comptable dans une multinationale. Grâce à l'analyse des pratiques aux niveaux local et central, l'article permet de mieux comprendre comment la pratique comptable contribue à l'émergence d'une nouvelle stratégie. Il répond à la question: Comment une pratique comptable émergente se croise et s'entremêle avec une stratégie émergente dans la pratique quotidienne? Le cadre théorique est la théorie de la pratique et met l'accent sur les pratiques épistémiques et l'objet épistémique. Cet article utilise l'observation participante, des entretiens semi-structurés, ainsi que des données secondaires de l'entreprise étudiée tels que les e-mails, powerpoints et comptes-rendus de réunions.
Littérature précédente a souligné le rôle clé de la décentralisation dans le processus de création de nouvelles stratégies et de nouvelles connaissances. Cette étude de cas contribue à cette littérature en démontrant que les connaissances locales ne suffisent pas à faire émerger celles-ci et que la coordination et l'expertise siège renforce la création en local.
L'article montre comment la comptabilité et la stratégie peuvent être co-produits. La stratégie a été à la fois constituée par et a rendu possible la comptabilité carbone. Dans une deuxième étape, les stratégies carbone potentielles, les projets d'innovation ont conduit à l'affinement de la comptabilité. Cet article approfondit l'analyse de comment la comptabilité et la stratégie interagissent dans un processus d'émergence, en montrant comment les deux peuvent se mélanger dans le processus pour rendre un nouvel espace, non seulement calculable, mais aussi gérable.

10 Conclusion

<u>Contributions théoriques</u>

Cette thèse fait trois principales contributions théoriques sur le travail institutionnel spécifique développé par l'élite, le rôle de la légitimité interne dans la légitimité organisationnelle, et sur es processus d'émergence de nouvelles pratiques.
Le travail institutionnel des élites, en raison de leur enracinement inhérent, a été défini dans la littérature précédemment (Greenwood et Suddaby, 2006; Boxenbaum et Battilana, 2005) comme un travail de création de pont vers l'extérieur, de création de liens vers l'extérieur pour casser cet enracinement et être les moteurs du changement. Cependant, au contraire, cette thèse montre que l'élite effectue un travail créatif pour se connecter à nouveau et avant tout à leur propre statut d'élite, sans faire aucun effort

pour se connecter avec les autres. Au lieu de tendre la main, le travail a été réalisé pour identifier fortement le nouvel outil à l'identité des élites, et construire des mécanismes de verrouillage fort qui permettraient d'éviter toutes interférences d'autres personnes dans la fabrication et l'utilisation de l'outil. Par exemple, les alliés qui ont été mobilisés étaient aussi exclusivement du groupe des élites et le travail de mimétisme a été basé sur d'autres groupes des élites.

Cette thèse contribue également aussi à la littérature émergente sur comment répondre aux multiples demandes de légitimité (O'Dwyer et al, 2011; Kostova et al, 2008) et comment les faire coexister sans choisir l'une ou l'autre. Certes, aucune organisation ne peut complètement satisfaire tous les publics, et il est souvent dit que l'une des légitimités prévaut sur les autres (Suchman, 1995). En effet, le deuxième article souligne que la légitimité interne peut être le fondement de la légitimité de l'organisation, confirmant que un fort accent mis au début sur l'intérieur puis sur l'extérieur est plus susceptible de réussir à créer la légitimité globale de l'organisation, que l'inverse (Human et Provan, 2000). Aucun manager peut complètement sortir du système de croyance qui rend plausible l'organisation à lui-même, ce qui signifie que pour fonctionner, les personnes en interne ont besoin que la légitimité de l'organisation soi cohérente avec le système de croyances de l'organisation (Suchman, 1995). Les deux légitimités interne et externe cohabitent pour former la légitimité de l'organisation. En temps de changement organisationnel, la légitimité interne peut aider à ne pas perdre la légitimité externe (Whetten, 2006).

En outre, cette thèse contribue à une meilleure compréhension du phénomène de découplage. La littérature sur le découplage montre que sous-estimer l'importance de la légitimité interne peut entraîner des conséquences négatives telles que la perte de la motivation des employés, mais aussi la perte de légitimité externe de l'organisation (MacLean et Behnam, 2010), perdant ainsi l'intégrité organisationnelle (Dacin et al, 2002). Boulding (1967) stipule qu'« une perte de légitimité interne conduit à la désorganisation du comportement et une incapacité à jouer le rôle assigné ». Par conséquent, cette thèse contribue à la littérature en déclarant que la légitimité de l'organisation peut également être conserver en s'adressant aussi bien aux parties prenantes internes qu'externes (Human et Provan, 2000). Cette recherche suggère que les légitimités internes et externes ne sont pas opposées, mais deux facettes de la même manifestation, la légitimité de l'organisation.

Enfin, cette thèse contribue à une meilleure compréhension de l'émergence des innovations dans la pratique à travers l'espace et le temps. L'article trois montre comment la comptabilité et la stratégie peuvent être co-produites dans un processus naissant. La stratégie est d'abord constituée et activée par la comptabilité carbone. De nouveaux espaces de calcul ont été créés (Vaivio, 1999) et des projets de productivité ont été traduits dans des possibilités de réduction des émissions carbone. En créant ce qui peut être vu, la comptabilité conditionne et permet l'action (Robson, 1992). En effet, la comptabilité a joué le rôle d'un révélateur photographique sur des projets de productivité existants, donnant une visibilité aux puits potentiels de réduction d'émissions carbone. Grâce à des laboratoires et des projets de productivité, la stratégie du changement climatique a émergé au rythme où les projets ont été traduits en carbone. La comptabilité a permis à la stratégie de réduction des émissions carbone d'émerger. En outre, dans une deuxième étape, la réduction des émissions carbone

potentiels et les projets d'innovation ont conduit à l'affinement de la comptabilité à travers, par exemple, la recherche de données de fournisseurs plus précises. Par conséquent, la stratégie a également été le pilote de l'émergence d'une comptabilité plus précise et plus rigoureuse.
Les innovations sont également créées dans l'espace en collaboration entre le centre et la périphérie. La littérature précédente avait souligné la décentralisation comme élément clé de la création de nouvelles stratégies et de nouvelles connaissances (Regnér, 2003; Morris et Empson, 1998; Quattrone et Hopper, 2001; Birkinshaw et Mol, 2006). Cette thèse contredit cette littérature en démontrant que les connaissances locales ne sont pas suffisantes dans le processus d'émergence et que la coordination et l'expertise du siège renforcent la création locale.

Contributions à la littérature en comptabilité sociale et environnementale

Compte tenu du rôle central jouée par la comptabilité dans la gestion et la responsabilité des organisations, les nouvelles formes de comptabilités affecteront notre capacité à atteindre le développement durable (Unerman et al., 2007). Notre recherche sur les innovations en contrôle de gestion environnemental contribue donc à comprendre aussi comment le développement durable peut être atteint à travers une comptabilité différente dans les organisations. En outre, cette thèse a contribué à comprendre le potentiel de soutien, ou le manque de soutien de l'infrastructure, de la réglementation ou de la demande des utilisateurs (Brown et Dillard, 2013) pour les innovations en contrôle de gestion. En effet, elle a exploré le champ institutionnel de l'analyse du cycle de vie en France, et les liens avec le gouvernement, les règlements et les élites économiques, et l'absence de liens avec la recherche universitaire et le domaine de l'éducation.

L'étude du contrôle de gestion environnemental en tant qu'innovation devrait permettre de comprendre comment certaines innovations sont plus «progressives» dans leur nature, comprendre les verrous et les liens étroits entre certaines innovations et le « régime » actuel, et comment ils pourraient être «déverrouillés» (Brown et Dillard 2013). L'étude de la comptabilité carbone, et plus particulièrement de la non-adoption de la norme générale du GHG Protocol, explore les verrous et les liens étroits de la présente norme avec la culture financière et la culture d'entreprise américaine. L'étude de cas démontre un moyen de débloquer la nature « incrémentale » en adoptant une approche plus « engagée » de la comptabilité pour le scope 3 aussi. Le deuxième article souligne également l'inertie existante dans la structure de comptabilité carbone actuelle (2012) et la difficulté à contester le statu quo, puisque le GHG Protocol occupe l'espace principal dans les méthodes de comptabilité carbone aujourd'hui, après avoir verrouillé les relations avec les gouvernements (US EPA, Brésil, Mexique...), l'ISO et les investisseurs (CDP). Les développements récents autour de l'analyse du cycle de vie montrent également comment les réseaux de soutien d'outils en contrôle de gestion environnemental doivent continuellement reconstruire les liens pour défendre l'outil contre la concurrence, par exemple lorsque le gouvernement français a renversé la décision de la Commission Européenne d'élaborer un outil uni-critère (qui devait être la comptabilité carbone) pour revenir à une méthodologie multi-critères (aujourd'hui les méthodologies du PEF et de l'OEF qui seront testées à partir de 2014).
Notre recherche contribue également à analyser le rôle des managers dans la promotion d'une meilleure performance sociale des entreprises (Norris et O'Dwyer, 2004), avec la

décision de l'entreprise étudiée de ne pas adopter la norme de comptabilité carbone légitime externe qui, selon eux, ne correspondait pas à leur point de vue de leur responsabilité sociale. L'accent mis sur la décision d'adopter ou non un outil de contrôle de gestion environnemental est en ligne avec le point de vue que les entreprises ne sont pas « un acteur organisationnel abstrait; mais des acteurs humains individuels qui font constamment des décisions et des choix, certains grands et certains petits, certains mineurs et d'autres de grande importance » (Wood, 1991).
Bien que l'observation participante ne soit pas une nouvelle technique de recherche (Spradley, 1980), cette thèse est l'une des premières recherches en contrôle de gestion environnemental à utiliser cette technique. Contrairement à certains chercheurs comptables critiques qui font de la recherche en comptabilité environnementale «de l'extérieur», nous croyons, comme Adams et Larrinaga-Gonzalez (2007), qu'une recherche engagée est une meilleure approche méthodologique pour l'étude du contrôle de gestion environnemental. Pour obtenir une meilleure compréhension de comment fonctionne le contrôle de gestion environnemental dans la pratique, d'autres études sur le terrain doivent « rapprocher le monde désordonné des organisations plus près du lecteur » (Ahrens et Dent, 1998).

Limites méthodologiques

La perception d'un observateur participant est influencée par la proximité de l'équipe à laquelle le participant appartient pour faire sa recherche. Un observateur participant tente de s'isoler des réalités quotidiennes du travail sur le terrain, mais il est irréaliste de penser que vous pouvez ne pas être affecté (Jorgensen, 1989). Cela est particulièrement le cas dans de participations longues, qui sont aussi intenses lorsque vous jouez un rôle dans l'organisation. Dans l'étude de cas, la durée de la participation était de douze mois, et donc les résultats sont affectés par les réalités liées à cette longue participation. Deuxièmement, la généalogie est une étude longitudinale, qui a pour limite principale qu'elle est rétrospective (Thiétart, 2007) et nous avons donc fait appel à des données secondaires (archives), car les données des entretiens pourraient souffrir du biais appelé la reconstruction du passé. La collecte de données secondaires a permis la «triangulation» des données, afin de montrer que l'interprétation des données des entretiens et des données secondaires recueillies vont dans le même sens, ou tout au moins ne sont pas en contradiction avec nos résultats (Miles et Huberman , 2003) .

Limites théoriques

La thèse peut être critiquée sur trois points principaux. Tout d'abord, la thèse vise à contribuer à notre compréhension du processus d'institutionnalisation des innovations en contrôle de gestion environnemental. Cependant, il n'a pas été en mesure d'étudier consécutivement la création, l'adoption et la pratique d'un même objet de la recherche. Par conséquent, même si nous supposons la boucle de rétroaction de chacun des trois « étapes » du processus, les trois articles n'ont pas un champ commun qui aurait permis de théoriser entièrement le processus d'institutionnalisation. Deuxièmement, les conséquences de la non-adoption et de la réalisation d'un outil interne dans le domaine de la comptabilité carbone n'ont pas été étudiées de manière approfondie en raison de contraintes de temps. L'impact du choix de l'entreprise sur l'avenir de la comptabilité carbone demeure inconnu. Troisièmement, le champ d'investigation a été limité au contexte français, en ignorant volontairement que le domaine dans lequel le contrôle de

gestion environnemental est en cours d'élaboration est de nature internationale (L'ACV a des racines aux États-Unis et plusieurs pays européens ont donné suite à sa mise en forme récemment, la comptabilité carbone a des racines américaines, mais 30 autres méthodologies existent).

Recherche future

Suite à cette thèse, plusieurs axes de recherches futures peuvent être envisagés. Le premier article décrit comment un outil a été faite par l'élite pour l'élite, il ne donne pas de conseils pour comprendre comment cet outil pourrait être mis à la disposition des PME, ou être rendu plus simple sans perdre la qualité de l'analyse, un problème encore aujourd'hui auquel l'expérience française d'affichage environnemental a été confronté. Finalement, la question qui se pose est : comment un outil créé par l'élite peut-il se démocratiser, car selon Hopwood (1977), les innovations en comptabilité sociale et environnementale devraient être démocratiques? En outre, la complexité intégrée dans l'analyse de cycle de vie, devenu un « système expert » (Giddens, 1990) soulève des questions sur la confiance placée dans ces systèmes, en particulier liés à des thèmes environnementaux. Par ailleurs, de plus en plus d'éléments environnementaux deviennent calculables (l'eau sera le prochain), les organisations seront confrontées à un nombre croissant d'objets et de pratiques épistémiques. Comprendre comment les organisations peuvent s'adapter à la constante émergence de nouvelles pratiques, dont la connaissance est constamment remise en question, exige de nouvelles études de cas.

Le deuxième article pose la question de savoir comment et quand participer aux processus de normalisation. Une organisation a ses moyens limités pour participer aux processus de création des normes privées; cependant cette étude de cas d'une non-adoption d'un standard externe soulève la question de savoir si l'entreprise aurait dû participer pour s'assurer un standard plus proche de son identité organisationnelle qui aurait pu lui assurer à la fois une légitimité interne et externe. D'autres recherches pourraient étudier comment les organisations cherchent à influer a nature des normes externes dans leur environnement lorsque leur légitimité interne est compromise (Bromley et Powell, 2012).

Le troisième article soulève des questions sur l'apprentissage organisationnel et sur l'évolution du rôle du contrôle de gestion dans l'intégration de nouveaux espaces (tel que l'environnement), et comment ces nouvelles comptabilités poussent le contrôleur de gestion de plus en plus près de son rôle de « business partner » que la profession a toujours temps voulu réaliser.

Cette thèse a été basée principalement sur une observation participante de douze mois, et donc nous croyons que « la coopération entre les chercheurs et les praticiens est de première importance pour la production de connaissances innovantes » (Arjalies, 2010; Adams et Larrinaga-Gonzalez, 2007). La recherche engagée dans le domaine de la comptabilité environnementale et sociale devrait être encouragée et permettra une compréhension plus riche des pratiques actuelles dans les organisations.

Etant donné que les preuves s'accumulent pour confirmer que le capitalisme n'est pas écologiquement durable (Gray et Bebbington, 1998) et que la comptabilité financière telle qu'elle est aujourd'hui continue de rapporter des informations biaisées et

incorrectes de l'impact de nos organisations sur notre environnement (Birkin, 1996), cette recherche vise à apporter une contribution à travers une approche engagée, pour faire progresser notre connaissance de la façon dont la comptabilité - au sens large - devrait évoluer, grâce à des innovations, afin de reconsidérer les modalités de gestion des organisations (Brown et Dillard, 2013). Grâce à l'étude de deux innovations en contrôle de gestion environnemental, cette thèse vise à approfondir notre compréhension de la façon dont la création de nouvelles formes de comptabilité aura une incidence sur notre capacité à poursuivre un développement durable (Unerman et al. 2007).

Environmental Management Accounting Development: Institutionalization, Adoption and Practice

Abstract
This dissertation explores the notion of environmental management accounting innovation and aims to explore how they are created, if they are adopted or not into companies and the consequences thereof, and finally how they are practiced. Research methods combine participant observation, semi-structured interviews and secondary data. This dissertation is composed of three articles that together explore the different facets of management accounting innovations. The first article tackles the question of how innovations get created and on their path to institutionalization. The focus is on the actors and their strategies, the who and how of the institutionalization process. Through an in-depth case study of one organization, the second article uncovers the process of the non-adoption of a carbon accounting methodology. The third article analyzes the practices surrounding an accounting innovation in a multinational.
Overall, this dissertation makes three main theoretical contributions on the specific institutional work developed by elite, the role of internal legitimacy in organizational legitimacy, and on the processes of co-emergence of new practices. This research on EMA innovations also contributes to further understanding how sustainable development can be pursued through accounting in organizations.

Keywords: management accounting innovation (MAI) – environmental management accounting –elites – institutional work – internal legitimacy – organizational legitimacy – institutional theory – carbon accounting – practice theory

Le développement du contrôle de gestion environnemental: institutionnalisation, adoption et pratiques

Résumé
Cette thèse explore la notion d'innovations en contrôle de gestion environnemental et vise à explorer la façon dont elles sont créées, si elles sont adoptées ou non dans les entreprises et les conséquences de l'adoption, et enfin comment elles sont pratiquées. Les méthodes de recherche combinent l'observation participante, les entretiens semi-directifs et des données secondaires. Cette thèse est composée de trois articles qui explorent ensemble les différentes facettes de l'innovation en contrôle de gestion. Le premier article aborde la question de comment les innovations sont créées et leur processus d'institutionnalisation. L'accent est mis sur les acteurs et leurs stratégies, le qui et le comment du processus d'institutionnalisation. Grâce à une étude de cas approfondie d'une organisation, le deuxième article révèle le processus de non-adoption d'une méthodologie de comptabilité carbone. Le troisième article analyse les pratiques entourant une innovation en contrôle de gestion dans une multinationale .
Dans l'ensemble, cette thèse fait trois principales contributions théoriques sur le travail institutionnel spécifique développé par les élites, le rôle de la légitimité interne dans la légitimité organisationnelle, et sur les processus de co-émergence de nouvelles pratiques. Cette recherche sur les innovations en contrôle de gestion environnemental contribue également à mieux comprendre comment le développement durable peut aussi être atteint à travers la comptabilité dans les organisations.

Mots-clés: innovation en contrôle de gestion – contrôle de gestion environnemental –élites – travail institutionnel – légitimité interne – légitimité organisationnelle – théorie institutionnelle – comptabilité carbone – théorie de la pratique