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# The business model of innovation ecosystem : public-private projects in automotive and transportation industries

Nasim Bahari

► **To cite this version:**

Nasim Bahari. The business model of innovation ecosystem : public-private projects in automotive and transportation industries. Business administration. Télécom ParisTech, 2018. English. NNT : 2018ENST0008 . tel-02899942

**HAL Id: tel-02899942**

**<https://pastel.hal.science/tel-02899942>**

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EDITE ED 130

## Doctorat ParisTech

# THÈSE

pour obtenir le grade de docteur délivré par

## Télécom ParisTech

Spécialité “ Sciences de Gestion ”

*présentée et soutenue publiquement par*

**Nasim BAHARI**

le 15 Février 2018

## **Le business model de l'écosystème d'innovation :**

### **Les projets public-privé dans les industries de l'automobile et du transport**

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**The business model of innovation ecosystem :**  
**public-private projects in automotive and transportation industries**

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## Acknowledgements

I would like to thank the Vedecom Institute for financing this research. I would like to express my appreciation to Telecom ParisTech and my PhD supervisors, Professor Valérie Fernandez and Professor Rémi Maniak. I am grateful to my dissertation jury, Professor Franck Aggéri, Professor Sylvain Lenfle, Professor Patrick Cohendet and Patricia Jonville.

This project was undertaken in collaboration with several public and private partners, therefore several meetings and interviews were done with directors. Accordingly, I would like to thank the Vedecom institute, the Chamber of Commerce and Industry of Versailles-Yvelines, Paris-Saclay Development Authority, Valeo, Renault, Ifsttar, the municipality of Versailles, Citroën Racing, Renault Trucks Defense, Nexter, French National Research Agency, the urban community of Versailles Grand Parc, Dr. Jérôme Perrin, Jean-Laurent Franchineau, Dr. Victor Etgens, Nadège Faul and Antoine Mullender.

Several parts of this research have been presented in international management conferences including “European Group for Organizational Studies” and “Association Internationale de Management Stratégique”. Moreover, this research has been presented at different events of i3 “Interdisciplinary Institute on Innovation”. I also actively reported and presented the progress and intermediate results of this research to the steering and scientific committees of IMR (Ignis Mutat Res) inter-ministerial research program including Ministry of Culture and Communication, and also Ministry of Ecology, Sustainable Development and Energy. Therefore, I had the opportunity to receive feedbacks of highly distinguished professors and researchers for improving my research. In this regard I would like to thank Christophe Midler, Charles Baden-Fuller, Emeric Fortin, Albert David, Raphaël Maucuer, Vincent Mangematin, Xavier Lecocq, Sébastien Ronteau, Romain Beume, Stefan Häfliger, Panos Mantziaras and Fredrik Hacklin.

I want to thank my family and friends and in particular my mother. My deepest debt of gratitude is to my husband, Behnam Ahmadi Mehr, for his support.

And Daniel who joined me at the end of this journey and gave me hope.

## Summary

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## Summary

This dissertation in management has been accomplished within the collaboration between Telecom ParisTech and the Vedecom Institute.

Several incentives motivate the governments, industrial companies, universities and civil societies to put more emphasis on innovation for boosting the economy. According to different incentives of various actors, the innovation does not concern just developing a new product, providing a new service or improving the production processes. The innovation has become the core of socio-economic development model for cities and regions and involves several actors both from public and private sectors with heterogeneous motivations and expectations. Today, the Vedecom Institute is piloting the innovation ecosystem of the autonomous vehicle experimentation in Satory. Vedecom institute is an administrative organization for leading the consortium of more than 40 members of different public authorities, research institutes and industrial companies from different industry sectors including automotive, aeronautics, system engineering, electronic components, ITC, numerical simulation, infrastructure management, transport operators, digital and energy grid operators.

This dissertation attempted to develop the business model concept for public private ecosystems in order to provide new theoretical and managerial insights for innovation projects in automotive and transport industries. Consequently, action research methodology has been selected for conducting this research as it is beneficial both for management practice and management science. In this regard, the process of action research was progressive and the emergence of each research question was accompanied by appropriate actions such as literature review, applying complementary methodologies, data collection and analysis.

The literature review covers the business model concept in terms of its definitions, trends and components in order to identify the research gaps. However, researchers from different fields such as information management, strategy and organizational theory have contributed to the business model concept but it has been almost studied away from multi actor concepts; in other words, the business model concept has been developed quite far from multi-actor concepts such as business ecosystems, public private partnerships and value



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network. Therefore, the business model literature is almost firm-centric, proposes few system-level viewpoints. Moreover, the business model components have been considered diversely and the business model dynamics both in terms of dynamics among the components and over time has not been deliberated appropriately. According to the context of the research, alongside reflections and actions through action research, the need for designing a conceptual framework has been outlined. The business ecosystem concept has been adopted as the underlying structure for the business model; it assists to have a system-level perspective for the business model and provides a panorama of all the actors involved such as public authorities, industrial companies and users. Moreover, it supports an evolving context and describes the dynamics over time. The value network concept has been articulated with the business ecosystem concept in order to understand interlinking and relations among the actors as well as different value exchanges. By means of the business ecosystem and value network as the underlying structure, the business model concept has been adapted for multi-actor contexts. Subsequently the business model of ecosystem and its three main components including offer system, demand system and value structure have been defined. In parallel to the definition of the business model of ecosystem and its components, two types of dynamics have been defined: dynamics among the business model components and the longitudinal dynamics of the business model of ecosystem over time.

Despite the considerable importance of business model innovation, underlying processes are less deliberated and there are few evidences and theoretical propositions for business model innovation processes. Business model innovation provides a dynamic perspective to business model, its components and their interactions. Dynamics and underlying mechanisms for the business model innovation have been studied based on the conceptual framework and insights from the cases. The business model of ecosystem includes the offer and demand systems and value structure, therefore different types of articulations among these elements lead to different approaches for the business model innovation. In this regard two different approaches for business model innovation have been defined; first one is the reactive business model innovation that is used by managers to overcome the influencing factors that impact their businesses. The second one is the proactive business model innovation which is adopted to foster the innovation in uncertain situations. Reactive approach is based on the causation logic and moves from the demand system toward the offer

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system. On the contrary, the effectuation logic when applied to business model innovation assures appropriate conformity to explain proactive business model innovation and is able to explain the track from the offer system towards the demand system. Effectual processes may be used as a framework for business model innovation in established companies who have also entrepreneurial attitude to enhance their business model portfolio, to enter in totally different businesses and to enact new markets. Effectuation logic facilitates to interpret the dynamics of the offer system of the business model, particularly its application to three basic modules of offer system including resources, competences and partnering. The dynamic interaction among the components of business model modifies also the business model overtime.

From the beginning of the action research with the Vedecom institute, we were requested to provide a study of the actors of urban passenger transport in Satory and their financial contributions. This factual problem has been examined in line with the existing literature on the concept of business model. The literature on business model has important shortcomings regarding multi actor projects and evaluation mechanisms. According to the insights from the literature, some developments including having a system-level perspective and developing management tools were assumed to make the business model as a pertinent tool for initiating, evaluating and simulating sustainable innovation projects in public-private ecosystems. Value proposition in transportation is a mix of public and private facilities which influence each other. Offer system includes public and private actors who have a role in producing, innovating, offering and financing offers. Demand system involves all actors who need, pay and use offers. Value structure includes the processes of creating and capturing tangible or intangible values. Cost-revenue structure as a subset of value structure reflects economic costs and benefits among the actors involved in the business model. A prototype of the management tool has been constructed for a car sharing service and afterward the prototype has been used through the action research methodology for Satory in evaluating the reference situation and autonomous vehicle experimentation.

Innovation ecosystems and their business models are dynamic and evolve over time. Innovation projects are complex and uncertain, they require several actors from public authorities, industrial companies and customers to come on board the project and collaborate

## Summary

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together, while they may have not enough information about the project, their contributions and their potential advantages. By bridging the literature on exploration project, business ecosystem and value network the longitudinal dynamics of innovation ecosystems has been deliberated and four phases including ideation, shaping, experimentation and preparation have been identified. Innovation ecosystems differ from routine product development projects. They have not an established business model from the beginning and different components of business model evolve over time. The innovation ecosystem may experiment a primary offer that targets some customers who agree to be the first users of an innovation. In this regard, the autonomous vehicle experimentation has been studied through the value structure of the business model. Accordingly, tangible and intangible values created or captured by the actors have been identified. Actors prepare themselves for the next stage according to values created and captured. Monitoring, tracing and revising the value creation and capture as one of the principal components of business model, assists the actors to reflect more efficiently about the outcomes of the innovation ecosystem and to decide about further strategizing actions or even reinitiating new businesses by entrepreneurship.

This dissertation attempted to meet its mission and allowed for various suggestions for management practice, provided several theoretical contributions to management science and proposed several topics for future research. The process of action research was performative and helped the Vedecom institute to bring together different actors from public and private sectors as well as the users. Semi-structured interviews with the actors introduced the project, facilitated its acceptance and encouraged the actors for some technical and financial contributions. This research revealed challenges and motivations for innovation in automotive industry and transportation and identified shared and mutually beneficial strategies. This dissertation supported also the managers in their decision makings by proposing several insights and tools particularly in dealing with uncertainty in business model innovation and evaluating the business model of ecosystem. From the theoretical point of view, this dissertation provided a conceptual framework for the business model of ecosystem. According to the designed conceptual framework and the articulation between the real context and a number of management concepts, research questions have been answered. Accordingly, it has contributed to the generalization of management concepts such as business model, effectuation and business ecosystem and proposed new developments for these concepts.

### 1. Introduction

Countries are progressively searching for new ways to promote economic activity, recover industries, create new jobs and enhance the competitiveness while simultaneously tackling environmental and social challenges. Several incentives motivate the governments, industrial companies, universities and civil societies to put more emphasis on innovation for boosting the economy. Innovation could be served as a driver both for macro and micro level developments and progresses (Midler et al., 2012) by addressing complex challenges regarding economic, environmental and societal issues. According to different incentives of various actors, the innovation does not concern just developing a new product, providing a new service or improving the production processes. The innovation has become a part of a new, evolving and complex organizational environment by including diverse actors from different sectors. The innovation stands as the strategy for socio-economic development model of industries, cities or regions and involves several actors both from public and private sectors with heterogeneous motivations and expectations. Subsequently such ambitious innovations become complex that their development and implementation require the coordination and collaboration of heterogeneous actors for working on various inter-connected technological and non-technological issues.

In France and particularly in Ile-de-France region, the automotive industry plays a major role in economic development and job creation. The French automotive industry has started to work on complex innovations (e.g. electric vehicle, autonomous vehicle, etc.) that incorporate diverse actors both from public authorities and industrial companies. Supporting the innovation in automobile industry with the aim of making it competitive has been determined as one of the major axes of the France's "Automobile Plan"<sup>1</sup>. The Vedecom institute as a part of the "Automobile Plan" is a French public-private partnership dedicated to research and training on carbon-free and sustainable mobility. It is based on an unprecedented collaboration between industries of the automotive sector, infrastructure, services operators, academic research institutions and local communities. The Vedecom institute aims at

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<sup>1</sup> The "Automobile Plan" has been stated in July 2012 by the Ministry of economy, production and industry and the Ministry of labor, employment, professional education and social dialogue.

## Chapter 1 : Introduction

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becoming a European leader for innovation in the fields of electrified vehicles, autonomous and connected cars and new infrastructure and services for shared mobility and energy. The trend of Vedecom institute dates back to 1999 and since then different actors have joined together over time. Different actors and political decisions have influenced the research and reoriented it toward the autonomous vehicle experimentation in Satory. In other words, both the product (i.e. autonomous vehicle) and the location (i.e. Satory) are the results of several years of interaction among different actors.

From the technological point of view, the autonomous vehicle requires to be developed gradually; in other words, on one hand, from the beginning, the French car manufacturers, suppliers, telecommunication providers and other technological actors are not able to support (i.e. design, production and exploitation) a totally autonomous vehicle, on the other hand legislations do not permit the circulation of a totally autonomous vehicle in cities. In this regard, the experimentation of the autonomous vehicle is indispensable in a dedicated road that other vehicles do not circulate in it<sup>1</sup>. The choice of Satory as the experimentation zone is due to historical and economical aspects; from the historical point of view, Satory's development has been accelerated since early 2000s when several active companies and research institutes (e.g. ifsttar, Renault Trucks Defense, Peugeot Citroen Sport) in the mobility and automotive industries implemented their companies in Satory. From the economical point of view, Satory belongs to the department of Yvelines whose economical ambition is to support and promote the automotive industry (the main economic activity in the department of Yvelines is the automotive industry and several car manufacturers and related industries are located in the department of Yvelines).

The autonomous vehicle project stands as a multi-actor innovation project since it is complex and requires the collaboration of several actors both from public and private sectors. The complexity of the autonomous vehicle project in Satory is due to at least two factors; first the “technical object” is not just a product (i.e. autonomous vehicle) but also includes several external complementary objects and also associated services. In other words, the autonomous vehicle requires an ecosystem for its deployment. In contrast to conventional cars that are sold

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<sup>1</sup> Source : Lettre Vedecom #7, June 30th, 2014, Author : Jérôme Perrin

## Chapter 1 : Introduction

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to the customer through a BtoC model, the autonomous vehicle exploitation requires the provision of complementary technologies during the use of vehicle.

Today, the autonomous vehicle experimentation in Satory includes the Vedecom Institute as the leader of the consortium, Founders (Renault, Peugeot, and Valeo), French National Research Agency (ANR), Paris-Saclay Development Authority (EPPS) and other public or industrial partners. Vedecom as the leader of consortium undertakes the research on electric, autonomous and connected vehicles, and new infrastructure and services for shared mobility and energy. Moreover, it leads the innovation experimentation phase. The founders including Renault, Peugeot and Valeo have governed the consortium because these three companies have invested more than 60% of the private sector contribution. Since 2014, when the ITE Vedecom has been established, the French National Research Agency (ANR), as the mediator for attributing public funds to innovation projects within Future Investment Program (PIA) has covered 50% of the Vedecom's costs. This investment will last 10 years from 2014 on. The Paris-Saclay Development Authority (EPPS) is the coordinator of the development of Paris-Saclay cluster. Other public or industrial partners participate in some aspects of projects according to their interests with lower level of financial and non-financial contributions to the partnership.

The Vedecom institute federates several actors from public and private sectors who commit on innovation, support collaborations and partnerships, attempt to improve the image, attractiveness and competitiveness, and try to promote the automotive and transportation industries despite having diverse motivations and backgrounds. They are searching for new ways to promote economic activity, recover the automotive industry, create new jobs and improve the competitiveness. Autonomous vehicle experimentation goes beyond developing a new product or providing a new service; after several years of interactions among diverse actors, today it is a strategy for the development in different layers such as recovering the automotive industry, economic development, attractiveness, competitiveness, environment protection, job creation and supporting research. According to this context this dissertation attempts to explore the development and application of the business model concept in public private ecosystems for innovation.

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During the past fifteen years numerous scientific articles and books were published regarding to the business model concept. Furthermore several scientific journals dedicated special issues to the business model concept. All these acts manifest the high interest of researchers to this subject and their commitment to answer the questions and to consolidate the body of literature while various contributions from different fields of research have led to heterogeneous definitions for business model.

Business model concept has been developed by focusing on the company level. In parallel several concepts that imply to multi-actor collaboration have been developed in almost the same period. Therefore these multi-actor concepts have been studied quite separately from the business model concept which is almost firm-centric. As described, the context of this research refers to innovation projects in public private ecosystems. Accordingly research questions are formulated based on the research context and literature gaps.

## Research design

This dissertation has been accomplished within the constructivist worldview; Constructivism is becoming influential among researchers in management sciences (David et al., 2012). According to the epistemological position of the research, the reality has been constructed by the process of knowing (Thietart, 2001) and the interaction with the actors (David et al., 2012). Consequently the knowledge has been created and contributed to management science and suggested several managerial implications.

From the methodological point of view, this dissertation is based on action research (David et al., 2012; Lewin, 1951). Action research methodology has several characteristics that make it useful for collaborating management research and management practice: it facilitates the use of research in practice through providing the interaction between knowledge generation and knowledge application (Bradbury, 2008). It facilitates solving factual problem in management practice side, while it develops knowledge in management science side (Myers, 2013).

Through the action research methodology, management scientist and management practitioners attempt to find out what is useful in contrast to finding out what is interesting in

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qualitative research or what can be proven in quantitative research (Bradbury, 2008). Accordingly, the research results are responses for real problems in practice and fill simultaneously the research gaps and add something new to the academic body of literature. Therefore the research requires to be realized in the field with the objective to solve a real problem and should contribute to the management science and provide actionable knowledge for practice.

However action research methodology has proved its effectiveness in making closer the management research and practice, but no methodology is perfect enough for conducting a research in an organization (Pasmore et al., 2008b). Several factors led us to use complementary methodologies such as case study alongside action research; the research question was too complex that required being break down to several sub questions and answering them through different methodologies. Moreover Vedecom was in its shaping phase, therefore there were not any data. As a result through the action research methodology we had to go one step before the data collection, in other words we contributed also to the data generation. Alongside this data generation, we used also the case study methodology in order to facilitate the research and particularly creating a prototype of a management device which has been used afterward through the action research.

## Research questions

Action research is a continuous and iterative process. In this dissertation the iterative characteristics of action research manifests particularly in designing new research questions according to previous cycles of research. Dumez, (2013) explains that the research question is not created just at the beginning of the research, but several research questions may be created during the research. In this research, each cycle included the research question formulation, taking action and reflection upon the results for defining further research questions, contribute to the literature and provide managerial implications.

This research was started for assisting the Vedecom institute in understanding the cost-revenue structure among different actors of the mobility ecosystem in Satory. This problem in practice has been studied beside literature review on business models. The literature review revealed that there are several research gaps; therefore the utility of research in terms of



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theoretical contribution has been confirmed. A cycle of actions (e.g. data collection, analysis, etc.) has been accomplished. The first cycle of research has replied the real problem in practice by providing a management tool for evaluating the business model of a public private ecosystem. But through the first cycle, the need for a general conceptual framework has manifested. Therefore another research question has been formulated for establishing a conceptual framework for the business model of a public private ecosystem. This cycle of research helped to establish a framework for the business model of ecosystem. According to the conceptual framework, two other questions have been emerged; on one hand understanding the business model innovation mechanisms and on the other hand understanding the dynamics of an innovation ecosystem over time appeared interesting to be answered. These four research question are explained as below:

➤ **How to design a conceptual framework for the BM of public-private ecosystems?**

The business model concept has been developed in recent two decades by focusing on the company level. Scholars from technological orientation have considered the business model as a representation of a small part of a company and scholars from the organization orientation see the business model as a tool for abstracting a company (Wirtz et al., 2015). In parallel several concepts that imply to multi-actor collaboration and cooperation such as platforms, open innovation and public private partnership have been developed in almost the same period. As a result, it is understood that concepts related to the multi-actor concepts have been studied quite separately from the business model concept, or in other words, the business model concept is almost firm-centric.

On the other hand, for dealing with the main case of this research, a public private partnership for innovation, however the business model concept appeared pertinent because it incorporates several aspects such as value, resources, customer, but quickly its shortcomings in dealing with multi-actor context raised. Therefore, first of all we required developing the business model concept for innovative public-private ecosystem. So I formulated the first question as “How to design a conceptual framework for the BM of public-private ecosystems?”

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The main methodology for conducting this dissertation is action research. Accordingly, the research question regarding to designing the conceptual framework for the business model of public private ecosystems, has been formulated in line with the factual problem in practice and literature gaps. This thesis deals with innovation ecosystem of urban passenger transportation that involves several actors from public and private sectors as well as the users. On the other hand, according to the literature review on multi-actor concepts, such as platforms, open innovation and public private partnership, it is understood that the research on business model could not be developed and enriched just by focusing on one firm. Multi actor contexts represent inter-organizational networks or societal systems that do not focus on one firm but shape a system. For constructing the conceptual framework, it is essential to clarify the underlying multi-actor infrastructure. Beyond the requirement for determining the underlying infrastructure, the business model components need to be defined. The last but not the least important issue would be having an understanding for business model dynamics both among the business model components (this aspect is formulated as the second research question) and also over time (this aspect is formulated as the forth research question).

## ➤ **What are the mechanisms of business model innovation?**

Business model innovation has attracted significant attention both from management scholars and managers; scholars have various points of views regarding the business model innovation. however technology development can facilitate new business models but also business model innovation can also occur without technology development (Baden-Fuller and Haefliger, 2013). In other words, however the business model innovation could be resulted from a technological innovation, but it could be outcome also from new articulations among business model components.

Most of the contributions to the business model literature have a static view while it appears that it is necessary to pass to the dynamic view for business models. However this need has been confirmed recently by several scholars but there are few considerations for business model dynamics (Casadesus Masanell and Ricart, 2010; Cavalcante et al., 2011; Demil and Lecocq, 2010; Voelpel et al., 2004; Wirtz et al., 2015).

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Demil and Lecocq, (2010) define the business model as a framework consisting, resources, competences, organizational structure and value propositions. They call it RCOV<sup>1</sup> framework and discuss that there are interactions among the business model components; the organization accumulate resources over time that constantly react with each other and with other components. These reactions over time create unique combinations within the firm and shape particular capabilities of the firm that contribute to its differentiation from other companies (Demil and Lecocq, 2010). Consequently, the organization's management may articulate accumulated resources and capabilities for proposing new products and services to the markets (Demil and Lecocq, 2010).

Some authors bridge the business model dynamics with innovation; as instance, Voelpel et al., (2004) state that only the disruptive or radical innovation leads to innovating the business model. Casadesus Masanell and Ricart, (2010) point out that firms are forced to innovate their business models because of external drivers such as globalization, deregulation and technological change, therefore they require always to analyze their competitive environment and develop competitive advantages.

However there are some few temptations for integrating a dynamic perspective to the business model concept in recent years (Casadesus Masanell and Ricart, 2010; Cavalcante et al., 2011; Demil and Lecocq, 2010; Wirtz et al., 2015) but existing literature has mostly taken a static perspective regarding the business model (Linder et al., 2010; Wirtz et al., 2015). And mechanisms of business model innovation are less deliberated. The interaction between business model components pointed out by Demil and Lecocq, (2010) appears as an interesting issue, but it is conceptualized only within the RCOV framework. This research gap requires to be filled by applying a system-level perspective to business model, consequently the interactions between the components need to be studied and underlying mechanisms necessitate to be identified.

### ➤ **How to evaluate the cost-revenue structure of the business model of a public private ecosystem?**

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<sup>1</sup>They base their definition of business model on a framework consisting **R**esources, **C**ompetences, **O**rganizational structure and propositions for **V**alue delivery.

## Chapter 1 : Introduction

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Urban passenger transport stands as a public-private ecosystem whose business model involves several actors from public and private sectors as well as the users who have various interrelations and transactions. Despite the growing development of the business model concept in recent decade, most of its applications take firm-level perspective, while investigating public-private ecosystems necessitates the system-level view for integrating sustainability issues. On the other hand, there are few tools for assisting decision-makers to interpret and evaluate existing business models to initiate innovation projects and design new business models. Business model design is mostly studied as how business models can be demonstrated through ontologies, visualizations (Wirtz et al., 2015) and mappings. According to the literature, business model demonstration is limited to few mapping tools; The business model canvas (Osterwalder, 2004), value network analysis (Allee, 2011, 2000) and value mapping tool (Bocken et al., 2013) are examples for such business model mapping approaches. However mapping tools are useful for communicating, illustrating a representation of both current and prospective business models, explaining the business model and generating new data and information, but they cannot support the managers to take actions (Chesbrough, 2010). On the other hand, the qualitative characteristic of business model mapping and the lack of quantitative data make it difficult to understand overall financial state of the business. So we are supposed to reflect about how to develop new tools to support both demonstration and evaluation of the business model. Firm-level scope of analysis in business models stands as a limitation. Particularly studies of sustainable innovation bring into focus the relevance of relationships with other actors (Boons and Ludeke-Freund, 2013). Environmental and economic benefits of industrial symbiosis are achievable only within a system consisting of business actors (Tsvetkova and Gustafsson, 2012). Adopting a system-level perspective assists to integrating sustainability dimensions to the business and shared value creation (Bocken et al., 2015) by involving other stakeholders in business model and deeper consideration of their business processes and benefits (Tsvetkova and Gustafsson, 2012). Given the importance of system-level view for the business model, it is surprising that scholars (with a few exceptions) have paid little attention to this topic. Moreover evaluation and feasibility study are established subjects in project management literature (Cano, 1992; Halawa et al., 2013; Shen et al., 2010) but they have not attracted enough attention in business model literature.

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Therefore, the third research question is “How to evaluate the cost-revenue structure of the business model of a public private ecosystem?”

### ➤ **What is the dynamics of an innovation ecosystem over time?**

Innovation ecosystems are complex and uncertain, they require several actors from public authorities, industrial companies and customers to come on board the project and collaborate together, while they may have not enough information about the project, their contributions and their potential advantages. Particularly the formation stage of innovation ecosystem necessitates different management principles from routine product development projects. An ideal business ecosystem and its associated business model are not established from the beginning, but they shape gradually. Therefore it is interesting to understand the dynamics of an innovation ecosystem over time.

### **Structure of the dissertation**

This dissertation consists of three main parts. Figure 1 illustrates the structure of the dissertation.

**Chapter 1** is an introduction of the dissertation that discusses the research questions and explains the structure of the dissertation.

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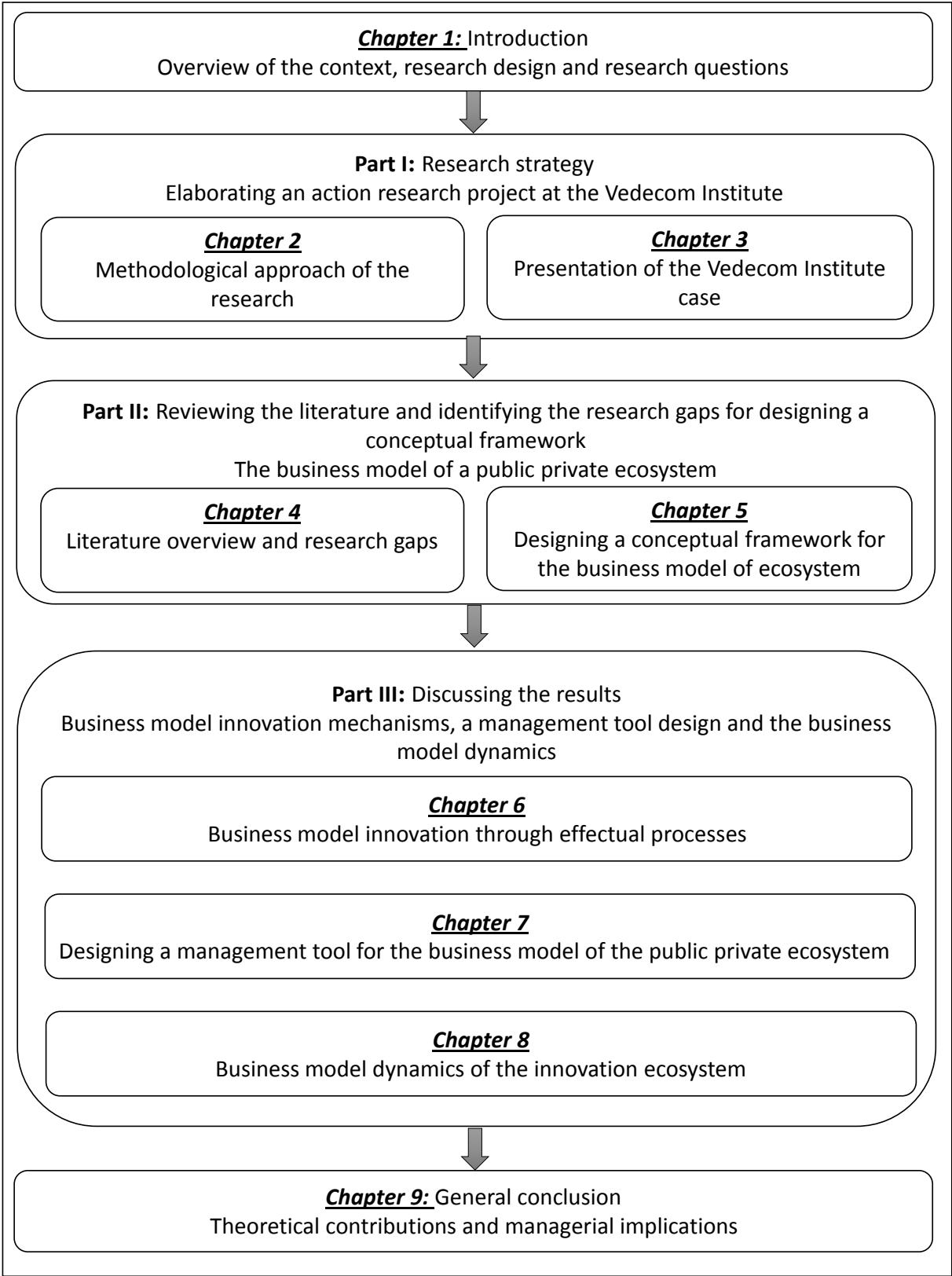


Figure 1: Graphical summary of the dissertation

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- **Part I** describes the research strategy for elaborating an action research methodology at the Vedecom Institute. It involves two chapters:

**Chapter 2** explains precisely the methodological approach of the research. It outlines the process of action research project including the initial reflection for collaboration, research question formulation, assessment for complementary methodologies, data collection by qualitative and quantitative approaches.

**Chapter 3** presents the case of the Vedecom institute comprehensively; today the Vedecom Institute stands as a public private partnership for innovation in transportation and automotive industries. It has not been existing from the beginning as same as its today's state; its partners, its mission and its projects were subject to numerous evolutions over time. Therefore this chapter studies the interactions among the actors and evolution path of the projects. Moreover it analyses the challenges and motivations for innovation in automotive industry and transportation. According to the data collected through action research, principal shared beneficial solutions and strategies among the actors have been identified.

- **Part II** reviews the literature in order to identify the research gaps and as a result it proposes a conceptual framework for the business model of a public private ecosystem.

**Chapter 4** summarizes a literature review of the business model concept. Researchers from different fields such as information management, strategy and organizational theory have worked on the business model concept. Their contributions have led to the creation of different trends in business model literature. Moreover researchers have identified diverse set of components for business model.

Analysis of the literature reveals three main research gaps:

First, the business model literature is almost firm-centric and there are few system-level viewpoints while several concepts have been emerged in recent two decades that deal with multi-actor contexts. Therefore the business model concept has been developed quite far from multi actor concepts.

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Second, various contributions from different fields of research have resulted to dispersed considerations for the business model components. Accordingly scholars have not been agreed on a set of components for the business model. The lack of a definition for the business model components not only limits the creation of pertinent research questions but also blocks finding appropriate approaches for dealing the research question.

Third, the dynamics of the business model has not attracted enough attention from scholars while it requires to be studied both in terms of the dynamics among the components of the business model and also the evolution of the business model over time.

**Chapter 5** proposes a conceptual framework for the business model of the public private ecosystems regarding to identified literature gaps and action research. According to the literature review, the business model concept has been developed by focusing on one firm with a static view. Few scholars have addressed it in multi-actor contexts and studied its dynamics. According to the reflections and actions through action research, the need for designing a conceptual framework has been outlined.

The business ecosystem concept is adopted as the underlying structure for business model since it assists having a system-level perspective for business model and provides a panorama of all the actors involved (i.e. firms, users, public authorities, etc.), and supports an evolving context (i.e. business ecosystem evolution over time). The value network concept is articulated with the business ecosystem concept in order to understand interlinking and relations among the actors as well as different value exchanges among them. The combination of the business ecosystem and value network as the underlying structure for the business model, provides a pertinent structure for studying the business model in multi-actor contexts.

Subsequently three main components for the business model of ecosystem are defined: offer system, demand system and value structure. Moreover to business model components, the business model dynamics is defined. These attempts lead to a conceptual framework for the business model of a public private ecosystem.

- Part III involves three chapters and discusses the results of the research in dealing with research questions in the field.



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**Chapter 6** focuses on the business model innovation and attempts to study it based on the conceptual framework developed in chapter 5. Business model innovation provides a dynamic perspective to business model, its components and their interactions. Despite the considerable importance of business model innovation, underlying processes are less deliberated and there are few evidences and theoretical propositions for business model innovation processes.

In this chapter, the dynamics and underlying mechanisms for the business model innovation are studied. According to the proposed conceptual framework in chapter 5, the business model includes the offer and demand systems as well as the value structure. Therefore different types of articulations among these components lead to different approaches for the business model innovation. So two different approaches for business model innovation are defined, first one is the reactive business model innovation, this approach is used by managers to overcome the influencing factors that influence their businesses. The second one is the proactive business model innovation that is adopted to foster the innovation in uncertain conditions. Reactive approach is based on the causation logic while the effectuation logic assures appropriate conformity to proactive business model innovation. Effectual processes could be used as a framework for business model innovation in established companies who have also entrepreneurial attitude to enhance their business model portfolio, to enter in totally different businesses and to enact new markets. Effectuation logic facilitates to interpret the dynamics of the offer system of the business model, particularly its application to three basic modules of offer system including resources, competences and partnering. It is able to explain how a company modifies its business model overtime. This chapter brings effectuation logic and applies it to the business model innovation, in order to provide meaningful contribution to this body of literature. In parallel it assists the innovation mangers to reshape their approaches for acting more efficiently in uncertain situation of some projects that have high level of innovativeness.

**Chapter 7** addresses the literature gaps regarding demonstration, scope of analysis and evaluation of the business model. This part of the research proposes how to go beyond the firm-level perspective and how to develop new tools to support both demonstration and

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evaluation of the business model for a public-private ecosystem. Problematic has been identified through the action research methodology; since 2013, when we joined the project, the Vedecom institute requested us to provide a study of the actors of urban passenger transportation in Satory and their financial contributions. A prototype of the management tool has been constructed for a carsharing service and afterward the prototype has been used through the action research methodology for the Satory project.

**Chapter 8** addresses the dynamics of the innovation ecosystem over time; Innovation ecosystems are complex and uncertain, they require several actors from public authorities, industrial companies and customers to come on board the project and collaborate together, while they may have not enough information about the project, their contributions and their potential advantages. This chapter particularly focuses on the formation stage of the autonomous vehicle innovation ecosystem that is different from routine product development projects. An ideal business ecosystem and its associated business model are not established from the beginning, but they shape gradually. The formation stage is about identifying innovations, technologies or concepts that will create better products and services than those already available, a primary offer targets some customers who agree to be the first users of an innovation, and the actors try to define the value structure, new actors may come on board and they prepare themselves for the next stage. How the actors prepare themselves for expanding the business or new cycle of entrepreneurship? We explain the answer by business model and its dynamics and we focus on the value creation and capture as a core component of business model. In this chapter created and captured values by different actors through autonomous vehicle experimentation have been identified. In the end of the formation stage, the actors prepare themselves for the next stage according to values created and captured. Monitoring, tracing and revising the value creation and capture as one of the principal components of business model, assists the actors to reflect more efficiently about the outcomes of the formation stage and to decide about further strategizing actions or even reinitiating new businesses by entrepreneurship.

**Chapter 9** summarizes the dissertation's theoretical contributions and managerial implications.

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## **Part I: Research strategy: Elaborating an action research project at the Vedecom Institute**

## **2. Methodological approach of the research**

### **2.1. Introduction**

This chapter reviews the evidence for elaborating an action research project within the Vedecom institute. It starts with an enhance explanation of the research design. This chapter gives an overview of the research methodology; Action research has been selected as the main methodology according to it provides enhanced features on collaboration between management researchers and practitioners, facilitates problem-solving, improves the practice and contributes to the science and theory development. Subsequently, initial reflection for collaboration, research question formulation criteria and assessment for complementary methodologies are discussed.

### **2.2. Methodological approach of the research**

For conducting this research, the assumptions of a constructivist worldview were implied. The reality has been considered as being constructed by the process of knowing and the researcher interacted with the actors to build the management tools and experiment them. In other words a process of interaction between the researcher and the actors involved built the research findings. Moreover the created knowledge contributed to management science and suggested several managerial implications. The following section explains more details regarding to the methodological approach utilized in this dissertation.

Management science and management practice require getting closer to each other; in fact research methods in management science need to be involved in a field approach and the researcher's role must include several intervenes such as designing new management tools based on real situations and interactions with the actors (David, 2012). In this regard, management scholars attempt to define pertinent methodologies and suggest useful actions. Several attempts in this subject led to define different types of methodologies for combining management science and management practice such as action research (David, 2012; Lewin, 1951), intervention research (David and Hatchuel, 2008; Hatchuel, 1994; Hatchuel and Molet, 1986; Moisdon, 1984) and collaborative management research (Shani et al., 2008). However

## **Chapter 2: Methodological approach of the research**

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academics use different names for entitling these approaches, but all imply to conduct a research which is beneficial both for management science and management practice.

This research is based on constructivist viewpoint and action research methodology; therefore it would be pertinent to investigate the characteristics of this methodology and its application in management science research.

Action research methodology has emerged after the end of the Second World War by Lewin within the Research Center for Group Dynamics at the University of Michigan (Lewin, 1951). By elaborating action research methodology, Lewin applied the theories of social psychology to practical social problems in order to learn from experience and afterward add to the knowledge by modifying the theory or suggesting new theory (Myers, 2013).

Action research practices have influenced effectively the business world. As instance, the “balanced scorecard” (Kaplan and Norton, 2005) was developed as an action research project through a close work between academics and clients; it brought multiple stakeholder perspectives into the financial decision making of the company (Bradbury, 2008).

When action research methodology is adopted by the researcher, it influences the process of the research from the beginning. The departure point in action research methodology is the research design and formulating the research question. The research should be done in the field with the objective to solve a real problem; moreover the research should contribute to the management literature satisfyingly and provide actionable knowledge for practice.

Therefore it is important to design the research based on the action research characteristics. Action research has several characteristics that distinguish it from other forms of research; the collaboration between the researcher and practitioners, finding solutions for real problems in practice, theory development and communicating the results constitute the action research.

The researcher has important role in conducting a research using action research methodology; management researcher who is engaged in action research needs to have several skills in order to conduct the research more efficiently (Pasmore et al., 2008a): researcher should have expertise in theoretical thinking and model creation. Moreover the

## **Chapter 2: Methodological approach of the research**

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researcher has to have good analytical reasoning for interpreting detailed empirical work and making theoretical constructs.

Management practice and management science may have different motivations in joining the research. Managers may desire quick solutions for existing problems in order to fix them as soon as possible, on the other hand, researchers are interested in establishing generalizable solutions to widespread issues (Pasmore et al., 2008a), therefore the researcher has to reconcile these different motivations while trying to maintain the quality of research and providing quick, reasonable and actionable solutions for practice.

The researcher has to find equilibrium between “the quest for generalizable patterns and the development of specific applications, between time-consuming analysis and quick fixes, between conceptual reasoning and concrete problem solving” (Pasmore et al., 2008, p.13)

The researcher may make recommendations about possible applications of the research results in real management situations (David and Hatchuel, 2008, p.34).

When using action research methodology, the researcher is forced to work with many people from different hierarchical positions, different organizations and various educational and professional backgrounds. Therefore the researcher requires having social and consultancy skills in addition to research skills.

The researcher may need not only to develop own analytical skills but also has to develop those for others in order to become more successful in bridging knowledge and action (Rooke and Torbert, 2005) and moving toward action-oriented knowledge (Bradbury, 2008).

One of difficulties of action research is to do the action and research at the same time; it is not simple to do a research that solves a practical business problem (Myers, 2013), therefore the researcher needs to manage this situation in terms of time, quality and overall costs of the research project in order to satisfy both academic world and business world.

### **2.3. Choice of the industry**

The context of this dissertation is innovation projects in automotive industry and mobility services. However this dissertation has been started following the request of the Vedecom institute whose mission is innovation in automotive and transportation industries,

## **Chapter 2: Methodological approach of the research**

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but the automotive industry stands also as an important body of knowledge for management studies while several management concepts like “platforms”, “business units”, “market forecasting”, “production planning” (Moore, 1996), “lean management” and “new product development” find their origins in automotive industry. In addition automotive industry has deeply reconceptualized in past two decades by introducing new technological innovations (Maniak and Midler, 2014) and new business models. As nowadays we witness several innovations in terms of technology and service in automotive industry which have changed conventional BtoC business model of automotive manufacturers regarding private car use.

The case of the Vedecom institute whose main mission refers to research projects in mobility and transport issues stands as the principal case of this dissertation. Moreover, today, the main contribution of the Vedecom institute concerns autonomous vehicles which is new in automobile industry. If nowadays Vedecom works on the research on autonomous vehicles, it is not a research domain determined from the beginning, it is a research field that has evolved over time. In parallel to the Vedecom institute case, the Bollore group case has been studied as a case study. The starting point for thinking about choosing the Bollore group as the case study was its recent offer in urban mobility: the electric vehicle carsharing service. The electric carsharing service which is provided by the Bollore group is even new for the group because Bollore stands as an established firm in totally different domains and industries. In other words, Bollore has been operating and existing before the introduction of disruptive innovation and its associated business model.

Both of the cases bring out the automotive industry from its traditional boundaries and its conventional customers and try to integrate it more directly to urban transport decision makings and enhance the automobile market.

### **2.4. Initial reflection for collaboration**

Action research methodology represents the collaboration between management practice and management science that make them closer and mutually reinforcing. Action research methodology finds its roots in the strategies for enhancing the use of research in practice and forging closer bonds between split worlds of knowledge generation and knowledge application (Bradbury, 2008). Accordingly the collaboration is the interaction between a researcher or research team and a practitioner or group of practitioners.

## Chapter 2: Methodological approach of the research

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Action research methodology helps the researcher to collect data from the organizations in order to produce knowledge. Action research facilitates a research “in” the field (David, 2012) as the practitioners know the field from their points of view and are able to give their information. The researcher may be act like an outsider but usually like a coworker of practitioners (Zuber-Skerrit, 1992).

Action research methodology assists the managers and researchers to frame collaboratively a research agenda that responds to the questions of practice and develops implications for action while it is interesting theoretically and reinforces the academic knowledge.

As soon as I joined the project as a researcher in 2013, we organized a meeting with the general director and the director of Eco-mobility program. This two-hour meeting was an initial reflection and presentation of the project by the directors. The aim of the initial reflection was to explore the dimensions of the project and understand how different people see it. Therefore in this stage we avoided getting into arguments for reaching agreements. We just provided a favorable condition in which participants expressed their viewpoints.

According to this meeting:

- The internal organization of Vedecom was consisted of a general director, a program director for Eco-mobility, a program director for vehicle and a training director. Vedecom also had recruited 20 PhD students.
- Satory existed in the mind of directors as the location of project.
- Directors had different backgrounds and they had come together recently. Therefore they did not have a same organizational culture and they did not have a common agreement on what the project was and where it would be launched.
- It appeared that the director of the Eco-mobility program was searching for some public funds for the project while he did not have any estimation of the overall costs of urban passenger transport in Satory.
- Several mobility solutions were understudy and protecting the view of the Palace of Versailles was an important criteria. For example two engineering companies (INGEROP and E.R.I.C) had realized a study for CASQY<sup>1</sup> (The urban community of Saint-Quentin-

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<sup>1</sup> Communauté d’Agglomération de Saint-Quentin-en-Yvelines



## Chapter 2: Methodological approach of the research

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en-Yvelines) in April 2013 for connecting several locations by telecabin in Saint-Quentin-en-Yvelines.

This meeting revealed the existence of several ambiguities; the project was not defined, it was not agreed that the project would be launched by which product, whether the product would be accompanied with a service or no, where it would be implemented and which urban community would be concerned directly. Satory was mentioned during the meeting as the eventual location of the project; Satory belongs to the urban community of Versailles<sup>1</sup> and the urban community of Versailles belongs to Department of Yvelines and the Department of Yvelines is in the Ile-De-France Region. We studied the annual reports and websites of these public authorities in order to understand if they have any plan for Satory. This study clarified that however the urban community of Versailles had several plans for economic development (e.g. creation of business incubators, support of the competitiveness clusters, attracting new enterprises, development of Satory), urban development (e.g. support of housing construction), environment protection (e.g. waste management, energy consumption reduction, noise and air pollution diminution) but it did not have any major plan for transportation. Therefore, it was far to expect the urban community of Versailles to contribute financially to the Vedecom's project.

### 2.5. Research question formulation

As discussed above, the objective of adopting action research methodology is dual effectiveness and productiveness both in management science and management practice. Therefore for research question formulation, these two factors must be considered.

The action research methodology is used when a real problem exists and it is recognized at least in practice, therefore practitioners and scientists collaborate together on a factual problem.

Action research targets real problems and aims to assist practitioners facing factual concerns; therefore it includes iterative cycles of identifying a problem, planning, acting and evaluating (David, 2012). Action research explores existing state and provides possible reflections for transforming it (David, 2012). It is not as same as other research methodologies

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<sup>1</sup> Communauté d'Agglomération de Versailles Grand Parc

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in which the researcher studies organizational phenomena with no will to change it; on the contrary the aim of action researcher is to create change in parallel to studying the process (Baburoglu and Ravn, 1992).

Action research concerns about the research “in the field” in contrast to the research “on the field”. Research “on the field” is what the researches do by adopting the observation methodology, when they observe the phenomena from the outside for extracting constants and regularities. On the contrary, action researchers integrate themselves in the field to collect empirical data in order to design appropriate models and management tools, furthermore they investigate in what extend these management tools and models work (David, 2012).

As action research methodology deals with a factual problem, therefore the first step is to identify the primary problems that require to be answered in the host organization (Susman and Evered, 1978). Research questions necessitate to be formulated in cooperation with management practitioners in the organization (Bradbury, 2008) for being sure that they approve the existence of a real problem in the organization.

The aim of action research is to generate knowledge that is valid in scientific community and is practical in practice. In action research, the produced knowledge during the research serves practice while simultaneously contributes to academic and theoretical understanding in management and organizations fields (Mohrman et al., 2008). In other words, action research process influences the development of both academic and practice communities (Coghlan and Shani, 2008). Action research is contextual and it is not deduced from general normative theories, because it engages in the real problem within the field to generate knowledge for theory and practice (David, 2012). Therefore in using action research methodology, the objective is not just to apply scientific knowledge to the practice, it is also about contributing to the body of knowledge (Myers, 2013). Therefore this double functionality of action research influence the research question formulation processes.

Through action research, all the endeavors to solve a real existing problem end to the generation of practical knowledge and contribution to literature. Reaching the objectives of action research including the contribution to academic literature and generating practical knowledge for practice requires appropriate research framework.

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Knowledge becomes more actionable if theoretical conclusions lead to provide managerial implications. Therefore “management implications” of the research validates its actionable knowledge generation for practice.

Actionable knowledge is the knowledge that allows the implementation of a singular solution to a contextual problem (David and Hatchuel, 2008, p.36). Actionable knowledge for practice stands as a measure to evaluate the quality of the action research in practice; the capability to produce a desired effect according to the acquired knowledge is generating scientific knowledge applicable for practice (Bradbury, 2008). In other words, through applying the action research methodology, not only the scientific knowledge is generated but also it is applied in practice in order to overcome real problems.

When a research is conducted by action research methodology, it should guarantee that the results are actionable for the practice while they address research gaps and contribute to the scientific literature.

### **2.5.1.Literature survey and refining initial research questions**

The aim of action research is to provide both managerial implications and theoretical contributions at the end of the research project. Therefore conducting the action research for a real problem in practice requires mobilizing existing knowledge in order to first, refine the research question and second, make sure that solving the problem will fill a literature gap in management science.

Advancing the scientific knowledge necessitates several prerequisites; the researcher should be aware of the existing literature. Understanding the work of others avoids reinventing the wheel, allows the researcher to build upon the foundations constructed by other scholars (Pasmore et al., 2008b). In other words when researchers are more aware of other scholars’ contributions, they progress more rapidly and the quality of their research improves significantly. Moreover literature review is the principal factor for positioning the research questions which are being constructed progressively (Dumez, 2013).

According to the first meeting with the directors for having an initial reflection of the project, it seemed that they need to know who the actors for urban passenger transportation in Satory are and what their contributions are. From the beginning, I started to find the relevant

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literature according to the context of project. Several body of literature have appeared pertinent for further reading; the business model and business ecosystem concepts, public private partnerships. The literature review showed that however the business model concept has the potential to be used in this project but its demonstration and evaluation are less understood. Moreover, most of the scholars have the firm-level perspective which makes the business model concept inappropriate for multi actor contexts. Therefore the business ecosystem concept appeared as a pertinent underlying infrastructure for the business model of a public private ecosystem. However the business model concept provides a system-level view of all the actors both from public and private sectors as well as the users, but it does not explain the interrelations among the actors. So it seemed useful to transpose the value network concept to the business ecosystem in order to be able to understand the value exchanges among the actors. These actions led to design a conceptual framework for the business model of a public private ecosystem (for more information see chapter 5). The conceptual framework made the business model concept applicable to the multi actor contexts; therefore it stands a theoretical contribution which helped also to address a real problem upon it. Based on this conceptual framework I designed a management tool prototype (for more information see chapter 7). The prototype of the management tool has been designed and applied to a carsharing service. Afterward this prototype has been used for the case of Satory.

### **2.5.2. Reflecting for further research questions**

As this research has been realized through the collaboration with the Vedecom institute, therefore, action research methodology has been used to address the question in practice. Several scholars consider that the action research is a progressive problem solving process that includes iterative cycles. For example Susman and Evered (1978) consider a cyclical process for action research (see figure 2); they assume five phases in a cyclical process: Diagnosing (identifying or defining a problem), Action planning (considering alternative courses of action for solving a problem), Action taking (selecting a course of action), Evaluating (studying the consequences of an action) and Specifying learning (identifying general findings).

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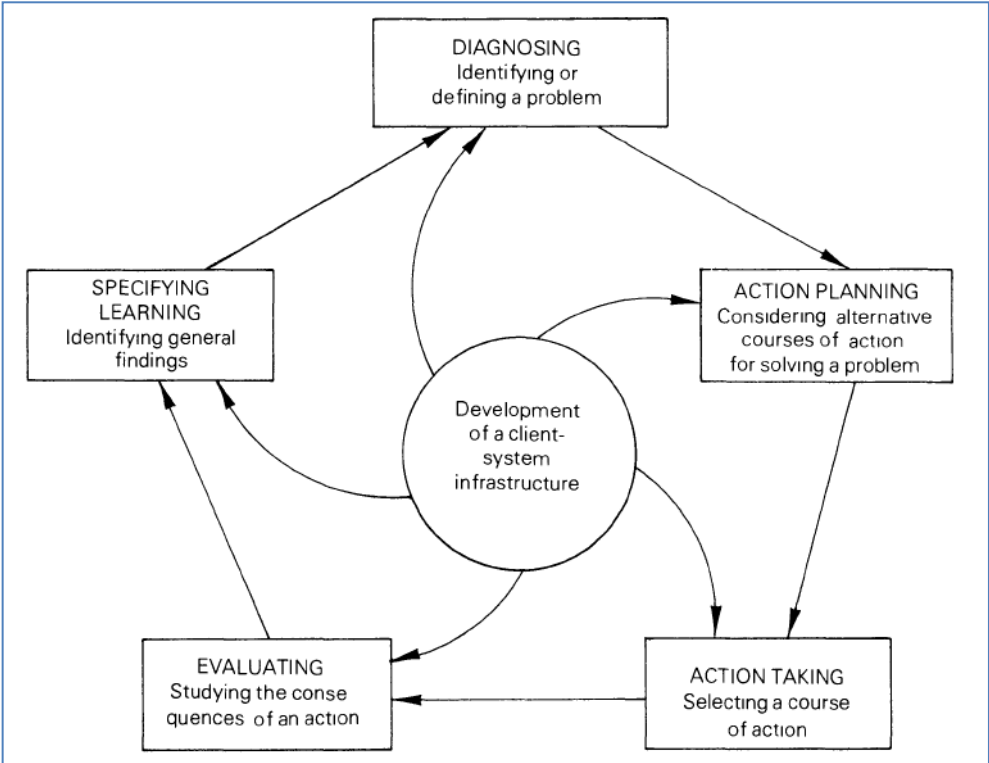
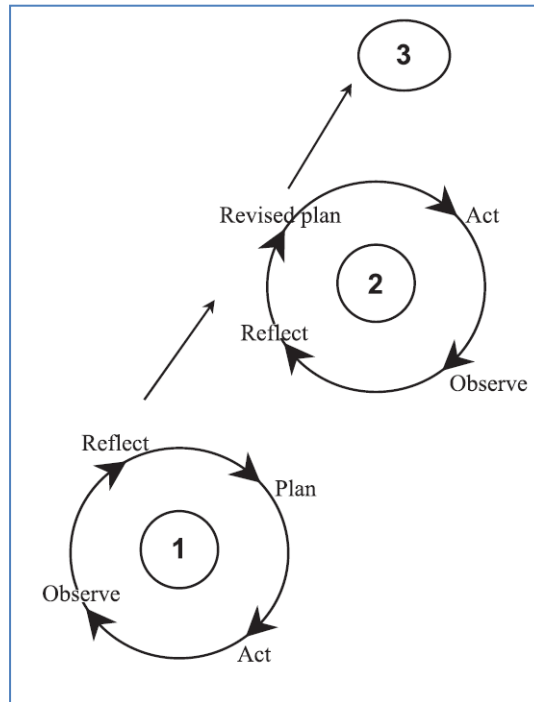


Figure 2: The cyclical process of action research, adapted from (Susman and Evered, 1978, p:588)

Zuber-Skerrit (2001) suggests a schematic model as a spiral of cycles that each of them consists of four phases: planning, acting, observing and reflecting (see figure 3).

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**Figure 3 : The spiral of action research cycle, adapted from (Zuber-Skerrit, 2001, p:15)**

In summary, action research is a continuous and iterative process. In this dissertation the iterative characteristics of action research manifests particularly in designing new research question according to previous cycles of research. Dumez, (2013) explains that the research question is not created just at the beginning of the research, but several research questions may be created during the research.

As described before, this research was started for assisting Vedecom institute in understanding the cost-revenue structure among different actors of the mobility ecosystem in Satory (phase A corresponds to chapter 7). This problem of practice has been studied beside literature review on business models. The literature review revealed that there are several research gaps; therefore the utility of research in terms of theoretical contribution has been confirmed. A cycle of actions (e.g. data collection, analysis, etc.) has been accomplished. The first cycle of research has replied the real problem in practice by providing a management tool for demonstration and evaluation the business model of a public private ecosystem. But through the first cycle, the need for a general conceptual framework has manifested. Therefore the research question B was defined as “how to design a conceptual framework for the business model of a public private ecosystem?” (Phase B corresponds to chapter 5). This cycle has been accomplished by a deep literature review of several concepts (i.e. business

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ecosystem, value network, value, etc.) in different management science disciplines. This cycle of research helped to have framework for the business model of ecosystem. Consequently we were able to bring up new research questions: first, regarding to the business model innovation mechanisms (phase C corresponds to chapter 6), second regarding to the dynamics of an innovation ecosystem over time (phase D corresponds to chapter 8). For solving each of these questions, different actions (e.g. data collection, analysis, etc.) have taken place.

As a result a conceptual framework has been designed and based on the conceptual framework a management device for demonstrating and evaluating the business model of a public private ecosystem has been created and used. According to the conceptual framework, the business model of an ecosystem includes the offer and demand systems as well as the value structure. The management tool unlocks specifically the cost-revenue structure as a subset of value structure.

However the application of the management device has answered the problem of Vedecom satisfyingly and added something new to the management science but it seemed that this research has the potential for more development. The business model dynamics appeared as an interesting issue for further research. The business model dynamics can be translated both as the interaction among the business model components and also the business model dynamics over time. The first approach is deliberated comprehensively in chapter 5 and the second approach is explained in chapter 7.

The first approach led to define a new research question as “what are the mechanisms of business model innovation?” The effectuation logic has been transposed to the business model concept. In this regard two cases were studied, first one refers to the case of Bollore who has changed its business model in recent two decades and entered new businesses. The second case refers to the trajectory of the Vedecom institute and shows how the business model of a research program has been evolved.

Figure 4 shows the progressive process of action research during my research; an initial reflection resulted to a primary research question, afterward a series of actions such as data collection and analysis have been done. According to the results another research question has raised and the process has been continuing until the end of the research. As it is illustrated in this scheme, “Reflection” in each phase not only encouraged me for another research question but directly provided theoretical contributions and managerial implications.

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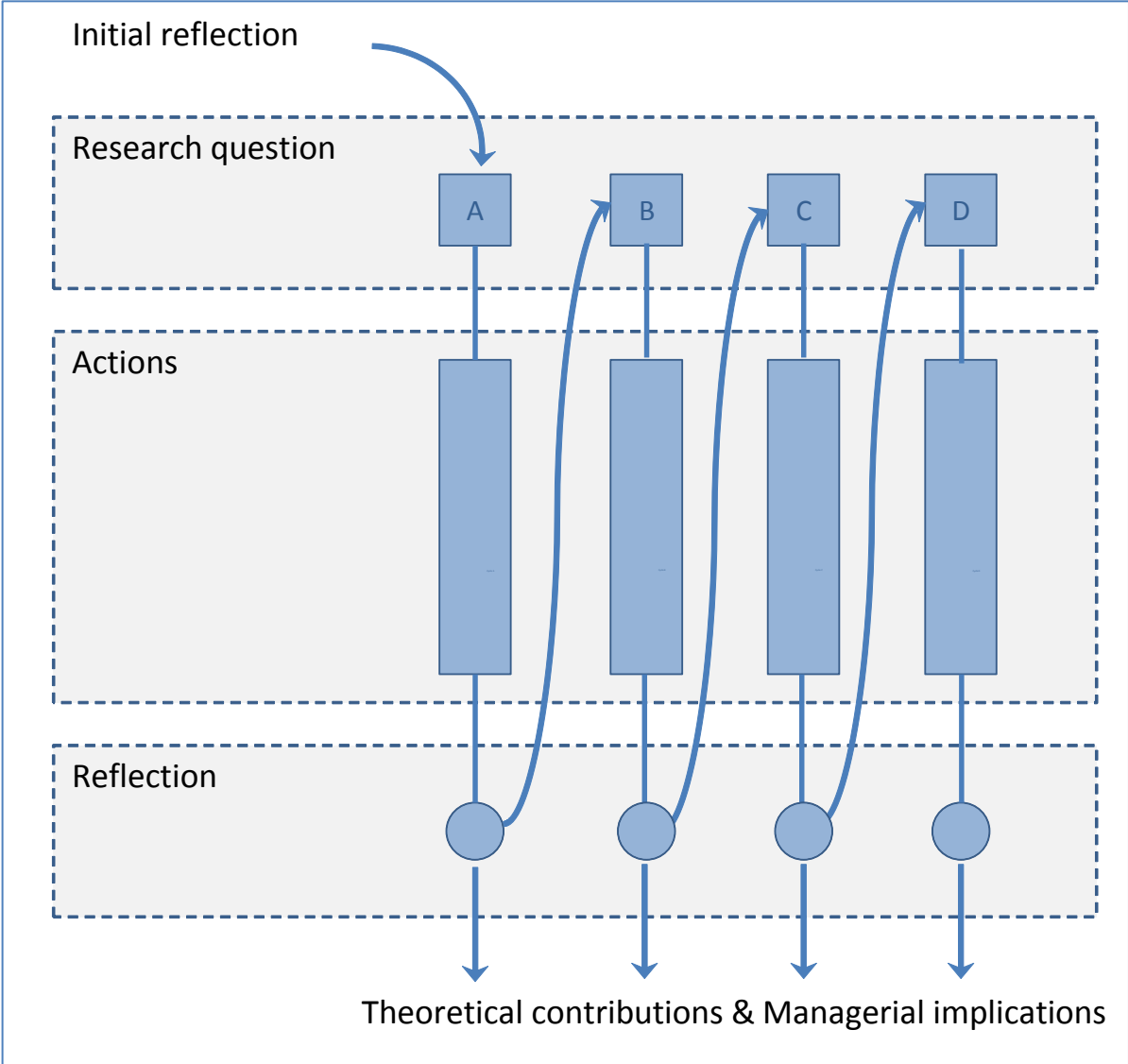


Figure 4 : The progressive process of action research in this dissertation

## 2.6. Assessment for complementary methodologies

No methodology is perfect and complete enough for conducting research in an organization (Pasmore et al., 2008b). One type of methodology may not cover the global research question thoroughly. However management research has tended to offer a dichotomy of approaches, in reality, multiple methods are required to conduct the research, in other



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words research projects usually include different research questions; therefore a research method may be appropriate for one question but not for another (Gray, 2013).

Each research method has its particular strengths and weaknesses and it may cover a part of required data. Therefore using multiple methods for collecting the data from different sources and over different times, provides a more exhaustive data by profiting from strengths of each method (Easterby-Smith et al., 2002; Gray, 2013).

The research question may be too complex and too big that it requires being break down to several sub-questions which need different methodologies to be answered. Another reason to complete action research methodology with other methodologies such as case study research refers to the collaboration mechanism between management science and management practice; in other words through action research methodology, the researcher has access to the organization and expect to collect data from the organization, on the other hand organization expect rapid and practical answers for its in-life questions. The challenge arises when the organization in not mature itself and it is in its early stages, the challenge aggravated when the organization is not only immature but also wants to work on innovation. Here the researcher is forced to accompany action research methodology by other methodologies such as case study research methodology. The researcher has two objectives to do; first, as the organization is new therefore it needs to be nourished by academic concepts and theories and the researcher brings the academic knowledge to the practice. This helps the organization to have access to actionable knowledge and use it to develop itself. Second, the new established organization wins time to develop data which will be used in action research methodology. Therefore using a complementary methodology alongside the action research methodology is beneficial both for researcher and the organization.

As this dissertation deals with the management of a public-private ecosystem for innovation and more profoundly designing pertinent management tools related to the business model concept, therefore this research is more complicated than being covered just by one type of methodology. Moreover the researcher joined the organization when it had not even a juridical status; therefore it was really in the first stages while it wanted to work on innovation. This is why different methodologies were applied in parallel. The main used methodology in this dissertation is action research which is enriched by using case study research methodology to answer some sub-questions of the research. The organization in

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which we aimed to conduct action research was new and at the same time was very demanding for new concepts, therefore case study research targeted both contributing to the theory and providing pertinent managerial implications. In this regard the organization was nourished with effective results in very early stages while generating data for action research methodology; Data generation also has reinforced the formalization process of the organization. Moreover data collection for this dissertation is a bundle of qualitative and quantitative approaches.

## 2.7. Data collection by qualitative and quantitative approaches

Research design when using action research methodology may require benefiting from further qualitative and quantitative approaches. Complementary qualitative approaches may include wide range of interviews and focus groups, while quantitative approaches may include surveys (Bradbury, 2008). Through action research methodology, some complementary approaches may be used while the researcher aims to conduct the research in the field. Table 1 shows the summary of data sources.

Data sources
Semi-structured interviews with public authorities and private companies, transport survey of users, online reports of public organizations (INSEE, ADEME, URSSAF, STIF), handbooks and standards, Vedecom’s internal and external communications reports, IEED tender documents, annual reports, newspapers articles, conference articles, media communications, scientific books and articles accessed on scientific information portal of CNRS

Table 1 : Summary of the data sources

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One part of the data collection returns to identifying all the actors involved in the project directly or indirectly. This is a joint phase between the researcher and the practitioners in order to identify all the stakeholders and partners. It is easier for the practitioners to identify their direct partners and contacting them for further data collection. In contrast some indirect stakeholders are more difficult to identify, here the researcher based on her wider or systemic view is able to identify all the actors involved even the indirect ones.

Action researchers may use different techniques for data collection including questionnaire, observation and interviews, they may also use the records and reports that the client organization regularly produces (Susman and Evered, 1978).

Interview is one of the most commonly used methods in management sciences (Romelaer, 2005). Interviews stand as qualitative research methods. As a part of the research, the interviewer aims to start a debate on an already defined subject with her interviewee. Interview clarifies not only the ideas and thinking of the interviewee but also the reality of the subject of interview.

Identifying the actors and their preoccupations, expectations and point of views leads to continuously clarifying the objectives of the research. Action research may have some consequences on different actors, therefore they must feel that they are a part of the project and they are/will not be imposed by the objectives of the project. Interviews beyond their function for data collection serve as a communicative tool for integrating different stakeholders in a project and profiting from their support.

Interview may be done just with one interlocutor or with several interlocutors (Gavard-Perret et al., 2008). In this research, in all the interviews I interviewed the interviewees one by one and in different sessions. Individual interviews are pertinent particularly when the subject is complex and the researcher needs to reach the interviewee's point of view and decision making processes.

Three types of individual interviews exist: structured, semi-structured and non-structured interviews (Gavard-Perret et al., 2008). This classification refers to the interviewer's intervention degree in discussion and the interviewee's liberty degree in expressing himself. Management researchers use semi-structured interview more than two others. In this research also, the interviews were semi-structured.

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Semi-structured interview helps the interviewer to conduct the interview in the framework that she has already defined; therefore the interviewee can express himself more profoundly. The interviewer may alternate, substitute or modify her questions according to the responses that she receives from the interviewee during the interview. These supplementary impromptu questions help the interviewer to make the interviewee express more profoundly his answers. Therefore the overall interview will be richer and the responses stimulate better questions that will lead to better comprehension and results.

It is better that the interviewer prepare a document as a guide for herself in order to not to lose her objectives during the interview following the answers to her questions (Gavard-Perret et al., 2008). The interview guide assists the interviewer to reorient the interviewee if his answers are out of the subject. Moreover it will be easier for the interviewer to conduct the interview and be sure if all her questions have been answered. Preparing a document as a guide for interview necessitates taking into account several items: the guide should be personalized according to the position of the interviewee, in other words the interviewer has to collect some information about her interview before. The information may include some personal aspects such as his education, experience and position or may refer to the organization where he works. This action helps the interviewer to ask pertinent questions that are answerable by the interviewee. Moreover the interviewer has to dedicate some minutes in the beginning of the interview to introduce her research topic. This would make the interviewee familiar with the interviewer and the motivation of the interview which facilitates good progress of the interview. The guide also may include several categories that each consists of several questions. Therefore the interviewer asks several diverse open questions which may be narrowed by asking further questions. At the end of the interview couple of minutes should be dedicated for concluding the interview and making sure that all the questions were answered and the interviewer has got the ideas of the interviewee accurately.

In this research also a strategy for interviews was provided and different interview guides were written according to the interlocutors. Choice of interviewees is an important element for the semi structured interviews; the researcher may use different channels to access the interviewees and requesting them an appointment. One of the benefits of action research methodology is the direct access to the field. In this research also I had the opportunity to access the interviews thanks to different professional channels. Therefore I was able to organize an appointment directly or indirectly. As the Vedecom institute is a public private

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partnership; therefore there are several companies and public authorities who are involved in the partnership. Contacting the managers in partner identities was not too complicated while they were themselves motivated to participate in the research. On the other hand realizing the interviews with non-partners was not easy and I was forced to use my professional network to get closer to them. In parallel the director of the program at the Vedecom institute requested a letter from partner public authorities (Chamber of commerce and industry of Versailles and Urban community of Versailles) to introduce me and my research to the enterprises of the research zone.

An introductory meeting with the directors of the Vedecom institute explained that there were several ambiguities about the innovation, in terms of the product and/or service, the location, the actors involved and their contributions. Particularly Vedecom was trying to find a funder for its project; CAVGP did not have a major plan for implementing new urban passenger transportation projects. As we did not have any information about the users in Satory, we required to collect and generate data and information. Therefore I classified the actors in three categories: the public authorities, the industrial companies and the users. Subsequently, through qualitative data collection method, we organized the questions for conducting individual semi-structured interviews with the actors. Semi-structured interviews helped to understand different viewpoints of various actors without neither restricting them to reply just to our questions nor letting them to get out of the subject of interview (i.e. semi-structured interviews place between fully structured and unstructured interviews).

The first interview was with the Chamber of Commerce and Industry of Versailles-Yvelines; according to this interview the Chamber of Commerce explained its interest in economic development and attracting new enterprises ranging from startups to incumbents. On the other hand investing for transportation was not among its responsibilities. This interview helped Vedecom to be recognized by the Chamber of Commerce as an institute who works on transport innovation and formalized the role of Vedecom as the leader of consortium and its projects and activities. Subsequently the Chamber of Commerce agreed on giving us the information about the enterprises in Satory and also addressed a letter to the enterprises in which it had introduced me as a researcher who will contact them for requesting an interview. In line with the Chamber of Commerce, the CAVGP and EEPS (Paris-Saclay Development Authority) did the same. These actions show the importance of the research for

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local public authorities and their supportive attitude regarding innovation and understanding better the zones under their supervisions.

We decided also to elaborate a transport survey of users in order to collect some quantitative data about the daily urban transport in Satory. For organizing this survey we had over than ten internal meetings and we discussed profoundly about the format of the survey and its questions. Finally we designed the survey whose questions included the distribution of place of residence, place of work, worked days per week, flexibility of work day schedule, work displacement during the day, utilized mode of transport, travel time, distance from home to work, weekly delays and general insights and expectations from transport.

In the next step, we contacted the directors of the companies in Satory and requested each of them a one hour meeting. The questions of these interviews were designed for understanding the viewpoints of the directors of the enterprises in Satory. Questions were about their general insights and expectations about the accessibility of their organizations and their eventual plans for human resource increase in near future. According to their answers they did not have any plan for recruiting new employees at least for coming five years. Furthermore they declared that most of their employees use their own cars and regarding this issue they did not identified major problem. Moreover to these answers, the interviews with directors had several secondary outcomes; first, they committed to distribute the transport survey to their employees and request them to answer the survey. Second, considering that the objectives of a project could not be forced to the stakeholders and the success of project is due to the involvement of stakeholders from the beginning, therefore these interviews made the directors aware that there will be a project that may affect their organizations, so interviews provided a favorable environment in order to introduce the project and to create the first contacts.

This research also includes quantitative data collection and analysis. Required quantitative data was about transportation issues in the studied zone. For collecting the data about the transportation issues in the zone, we needed the employees to answer a survey about their transportation. To do so, we had several intern meetings to design the survey. The transport survey provided quantitative data; the analysis of quantitative date was used to design and application of a management tool which will be discussed in chapter 7. The interviews facilitated us to access the users and motivate them to answer the survey, at the end

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of the interviews, I asked the directors (interviewees) to commit to diffuse the Vedecom's transport survey amongst their employees and to allow some of their employees to participate in creativity workshops. Transport survey provided both quantitative and qualitative information about the users of different modes of transport in the zone.

The data extracted from the mobility survey revealed important information about the existing situation. The statistical information about the distribution of place of residence, place of work, worked days per week, flexibility of work day schedule, work displacement during the day, utilized mode of transport, travel time, distance from home to work and weekly delays provided quantitative information.

This information was analyzed in line with secondary data sources such as public reports, and calculated either directly (e.g., public transport costs, fuel consumption costs, economics of transport, fuel consumption taxes) or by calculation methods such as life cycle assessments and externalities calculation.

When using action research methodology, the researcher interacts more closely with the organization, therefore she may collect the data for current research while her interaction provides her additional data that might be used in further researches.

### **2.8. Evaluation of the methodology and exploitation the results**

Basic requirements for evaluating a research through action research methodology are: first, the research should contribute or have the potential to contribute to practice (the action); second the research must have a clear contribution to theory (the research).

My position as PhD researcher and using action research methodology had positive impacts on the practice, created better understanding and opened up new horizons. Action research is different from observation; by adopting action research methodology that deals with real problems, the researcher interacts experimentally with the problem and any change takes place in the real world in contrast to pure observation where the researcher works in limited and decontextualized perimeter of the laboratory (David, 2012).

#### **Problem-solving and change in practice**

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Action research methodology assists to solve a real problem in management practice (Myers, 2013). Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of management science by joint collaboration within a mutually acceptable ethical framework (Rapoport, 1970, p.499).

For research design and research question formulation, while using action research methodology, management scientist and management practitioners attempt to find out what is useful in contrast to finding out what is interesting in qualitative research or what can be proven in quantitative research (Bradbury, 2008). Moreover the research results are what the practitioners need really in order to overcome their problems, therefore in formulating the research question it should be considered that the research and its results are at prompt importance for practice and creating practical knowledge and results remain fundamental during the research. Moreover the research process itself transforms the system (Pasmore et al., 2008a) and influences the organization.

As it is mentioned in this chapter, the overall methodology of this research was action research, but the organization in which we aimed to conduct action research was new and at the same time was very demanding for new concepts, therefore this research targeted both contributing to the theory and providing pertinent managerial implications. In this regard the organization was nourished with effective results in very early stages while generating data for action research methodology; Data generation also has reinforced the formalization process of the organization. Comprehensive explanation of managerial implications of this research is provided in chapters 5 to 9.

### **Theory development and scientific communication**

However the results and insights obtained from the action research should lead to practical improvements but they should have also a theoretical importance (Zuber-Skerrit, 1992). The research must fill the research gaps and add something new to the academic body of literature. One of the objectives of action research is that the researcher develops new theories or expands existing scientific theories (Holter and Schwartz-Barcott, 1993). Two cases are studied in this dissertation; one refers to the case of the Bollere group and another one refers to the case of the Vedecom Institute. Multiple cases assist to the external validity of the research, the generalizability of the findings (Yin, 2003), going beyond initial impressions



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of data, improving the likelihood of accurate and reliable theory (Eisenhardt, 1989). In this regard, two cases have assured the validity of the research and generalization of its findings.

The results, theories, insights and solutions which are developed through the action research methodology may be made public to the scientific community or whom may have an interest in that research (Zuber-Skerrit, 1992). The research's audiences are other researchers and management practitioners (Myers, 2013).

Several parts of this research have been presented in international management conferences including "European Group for Organizational Studies" and "Association Internationale de Management Stratégique". Moreover, this research has been presented at different events of i<sup>3</sup> "Interdisciplinary Institute on Innovation". I also actively reported and presented the progress and intermediate results of this research to the steering and scientific committees of IMR (Ignis Mutat Res) inter-ministerial research program including Ministry of Culture and Communication, and also Ministry of Ecology, Sustainable Development and Energy. Therefore I had the opportunity to communicate my research findings, to contribute to management science and receive the feedbacks of highly distinguished professors and researchers for improving my research. Comprehensive explanation of theoretical contributions of this research is provided in chapters 5 to 9. Moreover this research has been presented to the Vedecom institute in several regular intervals through meetings, steering committees and workshops.

Figure 5 summarizes the chronology of the undertaken tasks during this dissertation.

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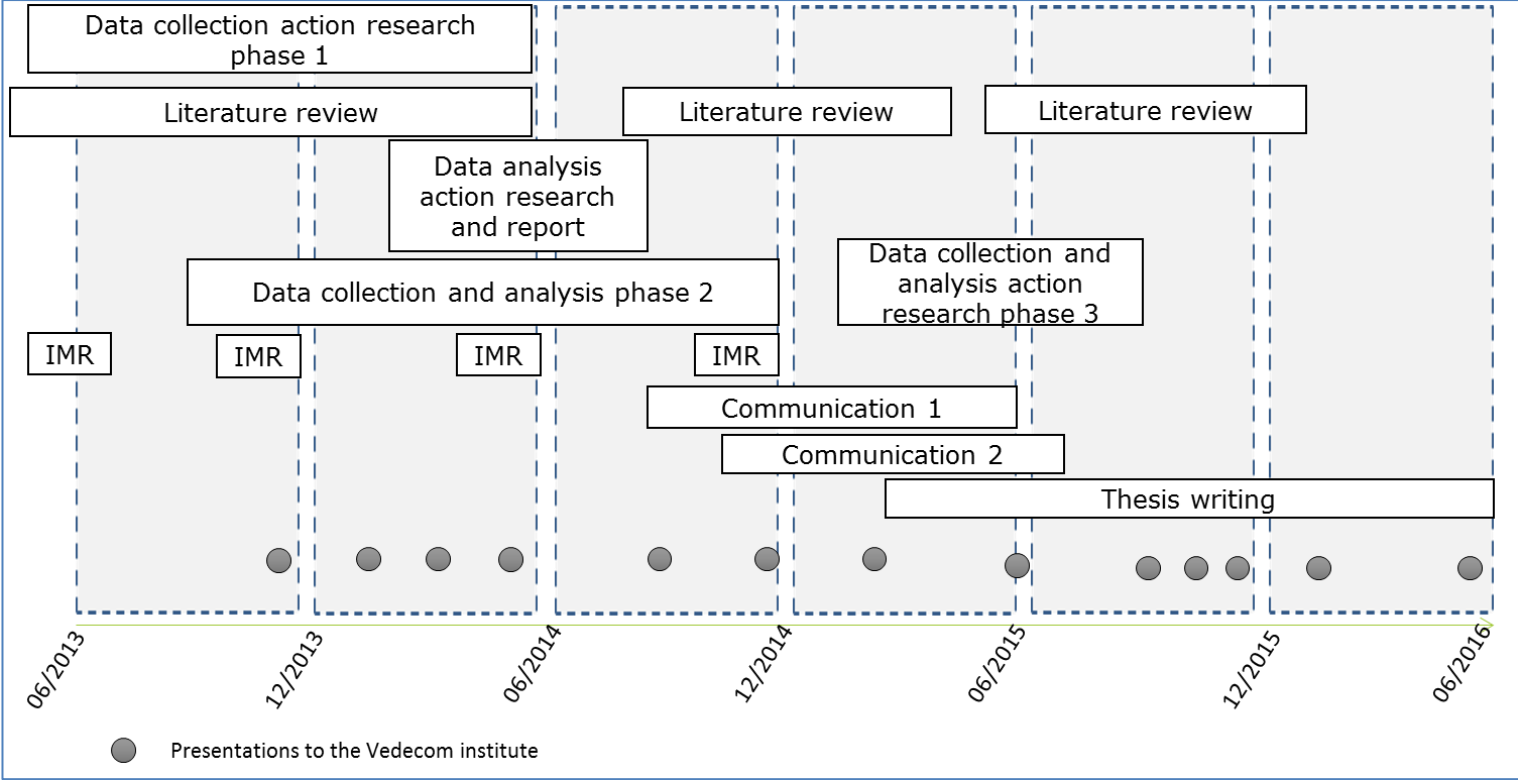


Figure 5 : Chronology of the undertaken tasks

## 2.9. Conclusion

This chapter introduced the research design for conducting this dissertation. More clearly, the research orientation and research methodology of the entire dissertation were discussed. This chapter has outlined the researcher’s constructivist orientation through applying action research methodology. This chapter also has given further details on how the researcher approached the real problems in the organization and mobilized her knowledge on management science literature and methodologies. The objective of this research was to conduct it beneficially both for management practice and management science, therefore action research methodology has been selected. Moreover the organization’s real problem was large and complex, therefore covering all its aspects necessitated applying complementary methodologies to action research methodology.

Action research methodology makes practitioners and academics closer. At different moments of the research, researcher may alternate between practice and science. The researcher associates other academics to the world of practice. Mastering the literature enables the researcher to mobilize what already exists in literature to frame more pertinent research

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question in order to answer a real problem in practice. Moreover the researcher's awareness of the work of other scholars facilitates the theoretical contribution to science thanks to direct access to the field through action research methodology.

Action research is fruitful both for science and practice; as the action research deals with a factual problem, therefore academic finding's implementation by practitioners is more probable. Moreover action research may lead to a management tool that explains the functions of the organizational system and essential instruments and methods. Action research methodology offers a pertinent and direct field to the researcher; the researcher has direct access to the organization and its real preoccupations, therefore the researcher is capable to develop and examine theories by exploiting useful information extracted from the practice. The acquired knowledge through action research not only influences the practice but also enhances academic knowledge that will feed higher education programs.

Action research is also beneficial for the practice; the involvement of the researcher in studies of real problems of the organization provides new approaches for solving factual problems and new comprehension of the system's functioning mechanisms. When a researcher adopts action research methodology, the close interaction with the practitioners, make them aware about the recent advancement in management research. Furthermore the researcher helps the practitioners to face real problems with new approaches beyond what they have been using before. Moreover, the analytical skills of the researcher assist practitioners to find out the causes of events and probable consequences of different lines of action.

In addition to qualitative and quantitative approaches, the researcher may need to conduct other methodologies in parallel to action research. Action research in contrast to observation and case study methodologies of research involves the researcher in a real issue within the organization (Pasmore et al., 2008b). Case studies or interpretative works do not directly lead to actionable knowledge. They should be used as complementary to action research. Therefore the researcher requires adopting multiple methodologies to produce a rigorous knowledge that is actionable in practice. Adopting multiple methodologies assists the researcher to go beyond the activities like reading and observing and move toward designing and experimenting.

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While using action research methodology, the management sciences researcher gathers empirical observations and designs appropriate models and management tools (David, 2012). Action research is a valuable methodology to improve the practical relevance of management and business research (Myers, 2013). Accordingly in this dissertation appropriate practical and theoretical models and management tools have been designed. They are discussed in chapters 5 to 9.

In summary in constructivist epistemology and more precisely while using action research methodology, the researcher plays important role between management science and management practice communities. As figure 6 illustrates this issue, management researcher interacts as follow:

The researcher masters management academic literature, concepts, theories and methodologies, therefore when the researcher deals with a real managerial problem in practice, the first task would be to evaluate if the problem in practice is also a research problem. Choosing the action research methodology facilitates to overcome the real problem. Afterward the researcher formulates the research question in accordance with her scientific knowledge and through collaborating with the organization. Subsequently the researcher verifies if the research question is also a literature gap. If so, the researcher evaluates if action research methodology covers all the requirements of the organization or other complementary methodologies (e.g. case study) are needed to answer sub-questions. Thanks to the direct access to the organization and its partners, the researcher starts to collect data by qualitative and/or quantitative approaches. The researcher analyses the data, provides results and suggests solutions to the organization. The organization uses the results to gain new ideas, understanding and inspiration. Therefore the research results are validated in practice and for its validation in management science side, it requires to contribute to management science literature.

## Chapter 2: Methodological approach of the research

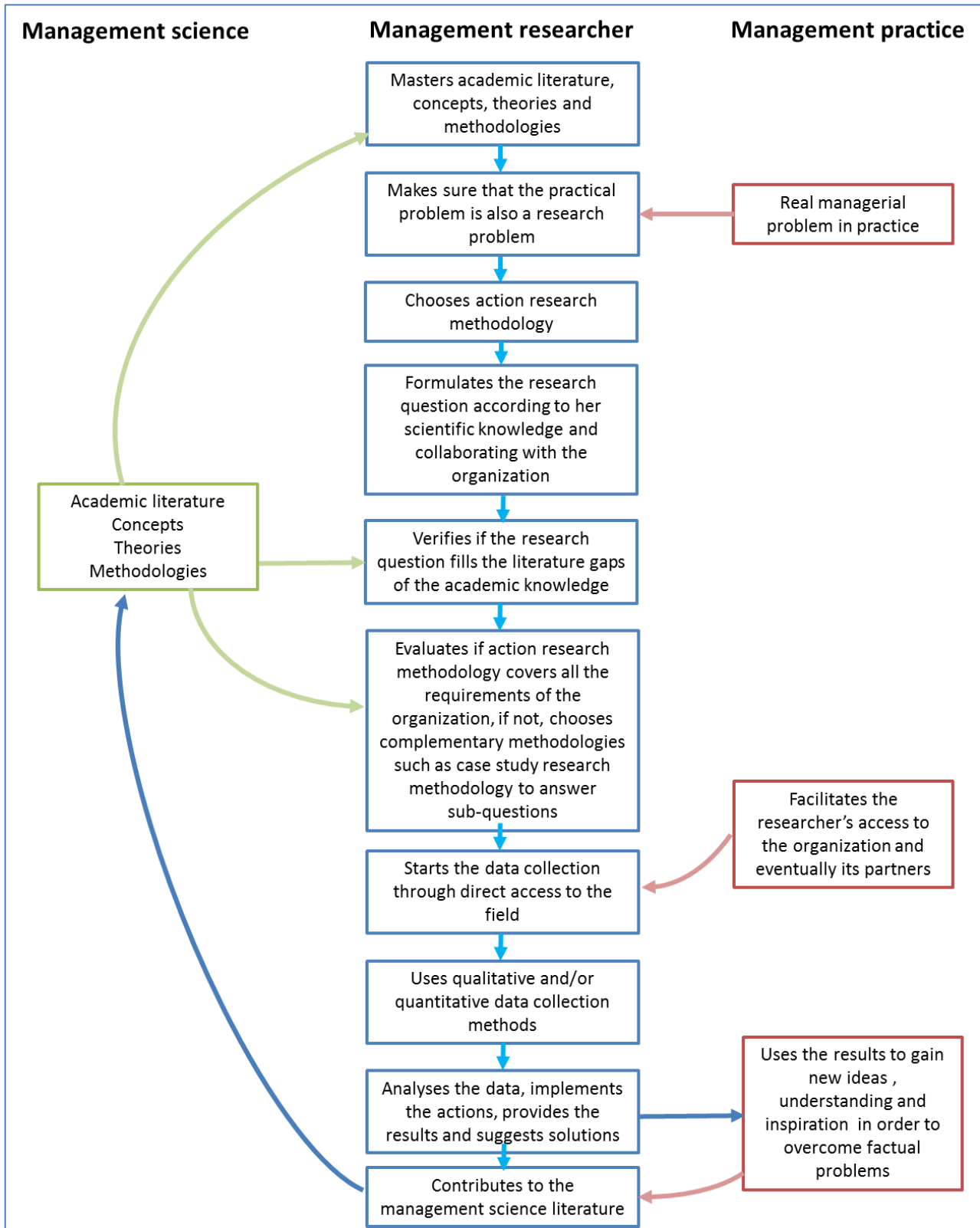


Figure 6 : Relations among management science, management researcher and management practice during this action research project

### 3. Presentation of the Vedecom Institute case

#### 3.1. Introduction

After discussing the research methodology, this chapter provides a global panorama of the Vedecom institute case.

This chapter also aims to explain the processes undertaken through the action research project and provides a primary analysis *in situ*. The Vedecom institute did not exist with this name, strategy and mission from the beginning. Therefore flashing back would be useful to find out its roots and to have a comprehensive case description. Despite diverse motivations of the actors involved, they have committed to experiment the autonomous vehicle in Satory. This chapter provides a primary analysis of the project through three main features: first, identifying the interactions among the actors and evolution path of the projects, second, identifying the challenges and motivations of the actors for innovation in automotive industry and transportation, and third, identifying shared and mutually beneficial solutions and strategies taken by the actors.

Today the Vedecom Institute stands as a public private partnership for innovation in transportation and automotive industries. It has not been existing from the beginning as same as its today's state; its partners, its mission and its projects were subject to numerous evolutions over time. Subsequently it is a complex phenomenon and requires understanding its roots, context and process.

#### 3.2. Interactions among the actors and evolution path of the projects

Understanding why and how the autonomous vehicle has been selected requires deliberating its roots in recent years. In this regard, the strategy process has been studied through several interviews with the directors of Vedecom, the IEED tender's documents and Vedecom's internal and external communications reports.

Van de ven (1992), identifies three definitions for the "process": first, logic for explaining a causal relationship in a variance theory, second, a category of concepts that refer

## Chapter 3: Presentation of the Vedecom Institute case

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to actions of individuals or organizations, and third, a sequence of events that describe how things change over time.

For understanding the roots of the Vedecom Institute establishment, we adopt the process as developmental event sequence. In this regard the “process is a sequence of events or activities that describes how things change over time or stands as the underlying pattern of cognitive transitions by an entity in dealing with an issue” (Van de ven, 1992, p:170).

The notion of “time” is central in most case studies (Flyvbjerg, 2011; Langley, 1999; Langley et al., 2013), and assists to identify “how” and “why” things emerge, develop, grow and terminate over time (Langley et al., 2013). In other words, a string of interrelated events in different times constitute the case as whole that evolves over time (Flyvbjerg, 2011).

When time is excluded in case-study, some knowledge may be provided, but it is not actionable, on the contrary considering the aspect of time contributes to produce the “know-how knowledge” by focusing empirically on evolving nature and temporal progressions of the organization (Langley et al., 2013).

### 3.2.1. Research program on transportation issues

In 1999, director of INRETS<sup>1</sup> (National research institute for transport and its safety) and director of LCPC<sup>2</sup> (Central laboratory for bridges and roads) decided to create a new joint research laboratory LIVIC<sup>3</sup> (Laboratory for vehicle, infrastructure and driver interactions). Following the study for the site location, they chose Satory because of its vehicle test tracks. Fortunately GIAT-Industries (nowadays NEXTER) as the only enterprise in Satory those days and the owner of vehicle test tracks had opened them its doors.

Three following research projects were defined as follow:

- PREDIT<sup>4</sup> (research program for innovation in land transport)

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<sup>1</sup> Institut National de Recherche sur les Transports et leur Sécurité

<sup>2</sup> Laboratoire Central des Ponts et Chaussées

<sup>3</sup> Laboratoire sur les Interactions Véhicules-Infrastructures-Conducteurs

<sup>4</sup> Le Programme de Recherche et d’Innovation pour les Transports Terrestres

## Chapter 3: Presentation of the Vedecom Institute case

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- ARCOS<sup>1</sup> (research project for safe driving)
- LAVIA<sup>2</sup> (research project on speed limiting)

The PREDIT project launched with 15M€ and the ACROS project during four years attracted several public and private partners whom had assisted to the formation of the LAVIA project.

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**1999**

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<b>Main actor's identity</b>	INRETS <sup>3</sup> - Public research institute
<b>Other actors' identity</b>	LCPC <sup>4</sup> - Public research institute
<b>Network's resources and competences</b>	Research on transport and safety
<b>Artifacts and effects</b>	New joint research institute "LIVIC <sup>5</sup> " in Versailles – Satory (for profiting from Satory's vehicle test tracks) for research on the interactions between drivers, vehicles, and infrastructures with three main projects:  PREDIT <sup>6</sup> - research program for innovation in land transport  ARCOS <sup>7</sup> - research project for safe driving  LAVIA <sup>8</sup> - research project on speed limiting

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<sup>1</sup> Action de Recherche pour une Conduite Sécurisée

<sup>2</sup> Limiteur assujettissant à la vitesse autorisée

<sup>3</sup> Institut National de Recherche sur les Transports et leur Sécurité

<sup>4</sup> Laboratoire Central des Ponts et Chaussées

<sup>5</sup> Laboratoire sur les Interactions Véhicules-Infrastructures-Conducteurs

<sup>6</sup> Programme de Recherche et d'Innovation pour les Transports Terrestres

<sup>7</sup> Action de Recherche pour une Conduite Sécurisée

<sup>8</sup> Limiteur assujettissant à la vitesse autorisée



# Chapter 3: Presentation of the Vedecom Institute case

Table 2: Initiation for a research program on transportation issues

## 3.2.2. French government’s priority on road transport safety

On December 2002, the road safety became one of the priorities of President Jacques Chirac, so CISR<sup>1</sup> (Inter-ministerial committee for road safety) became in charge in a research program, particularly for conducting a feasibility study for development the vehicle test tracks in Satory in order to use them not only for military activities but also for the research on road safety. This project was given to INRETS who started to work with LIVIC and the partners of the ARCOS project, therefore the project became the VESTA project (Versailles advance safety technologies).

2002 - 2003

<b>Actor’s identity</b>	INRETS - Public research institute
<b>Partners’ identity</b>	LIVIC – Joint research institute between INRETS and LCPC
<b>Network’s resources and competences</b>	Research on transport and safety
<b>Artifacts and effects</b>	New joint research project “VESTA <sup>2</sup> ” concerning advance transport safety technologies.

Table 3 : French government’s influence on the research project

## 3.2.3. French government call for competitiveness clusters tender

In fall 2004, the French government launched the tender for “competiveness clusters”; at the time the selection criteria was based on the strong geographical concentration of activity on one hand and leading the cluster by an industrial company on the other hand. VESTA was interested to propose a competitiveness cluster for road safety. But none of the

<sup>1</sup> Comité Interministériel de Sécurité Routière

<sup>2</sup> Versailles Sécurité Technologies Avancées

## Chapter 3: Presentation of the Vedecom Institute case

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two main French automobile manufacturers PSA and Renault tended to play the first role to lead the cluster.

The VESTA competitive cluster benefited two major supports, one from VALEO and other from Department of Yvelines. VALEO decided to expand its research partners, and found out that competitiveness clusters are good structure for its new strategies, so it decided to support INRETS. The Department of the Yvelines<sup>1</sup> defined the support of research and innovation in automobile industry as a principal aspect of its economic politics. In fact the department of Yvelines had already contributed to bring the Technocentre of Renault and advanced design center of PSA to its territory, therefore it was motivated to support a project in line with its strategies. In addition, the municipality of Versailles started to support the project because Satory was the only available place for developing economic activities in Versailles.

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**2004**

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<b>Actor's identity</b>	VESTA project
<b>Partners' identity</b>	VALEO – French automotive supplier Department of Yvelines <sup>2</sup> Versailles municipality Renault Peugeot
<b>Network's resources and competences</b>	Research on transport and safety Political support Automotive equipment know-how

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<sup>1</sup> Conseil général des Yvelines

<sup>2</sup> Conseil Général des Yvelines

## Chapter 3: Presentation of the Vedecom Institute case

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### Artifacts and effects

Initiating to reply to the French government's tender for competitiveness clusters

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Table 4 : Initiating to reply to the French government's tender for competitiveness clusters

### 3.2.4. Developing a competitiveness cluster

One of the barriers in front of VESTA competitive cluster was its concentration on automotive industry which was challenged by the "Verts"<sup>1</sup> and their influence on regional council<sup>2</sup>. For overcoming this threat, the VESTA adopted the name "VESTAPOLIS" to show its openness to urban mobility. In parallel two new actors commenced to support the VESTAPOLIS; first UVSQ (University of Versailles Saint Quentin en Yvelines) with a project about the handicap person mobility and Veolia Transport for public transport.

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#### Early 2005

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#### Actor's identity

VESTAPOLIS project

#### Partners' identity

UVSQ<sup>3</sup> – a French university

Veolia Transport

#### Network's resources and competences

Research on transport and safety

Political support

Automotive equipment know-how

Public transport experience

#### Artifacts and effects

Replying to the French government's tender for

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<sup>1</sup> The Greens political party in France

<sup>2</sup> Conseil Régional

<sup>3</sup> Université Versailles-Saint-Quentin-en-Yvelines

Table 5 : Replying to the French government’s tender for competitiveness cluster

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### 3.2.5. The fusion of two competitive clusters

However the VESTAPOLIS project was made official by the presence of the minister of equipment (in charge of road safety issues) in Satory, but the prime minister requested the VESTAPOLIS to join Normandy Motor Valley in order to work on “embedded energy” and “hybrid vehicles”. One of the difficulties in the fusion of these two competitive clusters was the role of French automobile manufacturers within these clusters. Normandy Motor Valley was majorly oriented to Renault while in VESATPOLIS, Renault and PSA-Peugeot-Citroen, both of them have had balanced influence. While turning the power towards Renault was unacceptable by PSA, therefore the solution was found on working on “Future vehicle<sup>1</sup>”.

However working on the fusion of these two competitive clusters was time and energy consuming, finally they agreed and they even proposed a new name “Mov’eo”. Consequently the President of France, the Ministry of interior and the Ministry of competitive clusters signed the protocol of the “Mov’eo” and made it official on 19 January 2006.

At the beginning, scientific research fields at Mov’eo were energy, road safety and mobility services. Mechatronics was another research field that was added to previous fields because of Renault and Valeo. Adding this fourth dimension to research fields assisted to the better agreement among the industrial actors. Renault was engaged in energy, Valeo in mechatronics, PSA in road safety and Veolia Transports in mobility services.

### 3.2.6. Establishment of the Mov’eoTec competitiveness cluster

In 2006, the Mov’eo competitive cluster has started regular meetings around its four strategic axes: energy, mechatronics, road safety and mobility services. In parallel Mov’eo was preparing itself for FUI<sup>2</sup> tenders. FUI was a public fund that finances the research and development projects within the competitive clusters. Profiting the FUI funds required

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<sup>1</sup> Véhicule du Futur

<sup>2</sup> Fonds Unique Interministériel

## Chapter 3: Presentation of the Vedecom Institute case

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winning the project's tender. The FUI project had to be collaborative between at least two companies and one research and education institute.

UVSQ, academic partner of Mov'eo has already inaugurated the CEREMH<sup>1</sup> (center for expertise on research for mobility of the handicaps) by partnering with INRETS, Garches Foundation, AFM<sup>2</sup> (French association against myopathies) and AFP<sup>3</sup> (French paralyzed association). Mov'eo framed the CEREMH as a territorial and structural project. The project benefited the label of the competitive cluster while it was in line with the objectives of the cluster and it was a territorial project that gathered the members of the cluster. CEREMH as the first project of Mov'eo was installed in Satory in order to establish a platform to test the wheelchairs.

The second project of Mov'eo was about its work on mechatronics. For the test and experimentation of this project, Satory was ideal because of its test tracks. This project was called Mov'eoTronics afterward.

The third project, named Mov'eoLab was resulted from the VESTAPOLIS and LIVIC entities, particularly from the ARCOS and LAVIA projects. The project was about benefiting from the test tracks of Satory for developing the security through investigating the interactions between vehicle and infrastructure. This project served as a departure point for working on captures and moreover reflecting on intelligent and communicating roads.

Finally the name "Mov'eoTEC" was selected for the competitive cluster.

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### 2006

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#### Actor's identity

VESTAPOLIS competitive cluster

#### Partners' identity

Normandy Motor Valley competitive cluster

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<sup>1</sup> Centre d'Expertise et de Recherche pour la Mobilité des Handicapés

<sup>2</sup> Association Française contre les Myopathies

<sup>3</sup> Association des Paralysés de France

## Chapter 3: Presentation of the Vedecom Institute case

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<b>Network's resources and competences</b>	Research on transport and safety  Political support  Automotive and its equipment know-how  Public transport experience
<b>Artifacts and effects</b>	MoveoTec competitiveness cluster was formalized with 4 strategic axes:  Energy, mechatronics, road safety and mobility services

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Table 6: Establishment of the Mov'eoTec competitiveness cluster

### 3.2.7. Mov'eoTec foundation creation

Mov'eoTec foundation was initiated by Mov'eo competitive cluster. From August 2007, the LRU law<sup>1</sup> (the liberty and responsibilities of universities) simplified the creation of public interest foundations by universities. So the Mov'eoTec Foundation was created by UVSQ<sup>2</sup> (University of Versailles and Saint Quentin en Yvelines). The LRU law facilitated the financial contribution of enterprises in research projects. This law has also several benefits for the donors; first one is about its fiscal advantage, it means that the donors profit from tax diminution because of their financial contribution to the foundations with public interest. The second advantage is that the donors have the right to govern the foundation.

The Mov'eoTec foundation was created on May 2010 by UVSQ (University of Versailles Saint Quentin en Yvelines). The director was from Valeo and the main subject of the foundation was working on sustainable solutions for transport. The priority of the research was facilitating the emergence of carbon-free, sustainable and communicating vehicles.

The founders of the Mov'eoTec foundation were: UVSQ, CETIM, ESIGELEC, ESTACA, IFP EN, IFSTTAR, Peugeot Citroën Automobiles SA, Renault SAS, Valeo and Safran.

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<sup>1</sup> Libertés et Responsabilités des Universités

<sup>2</sup> Université de Versailles-Saint-Quentin-en-Yvelines

## Chapter 3: Presentation of the Vedecom Institute case

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The Mov'eoTec foundation has the objective to elaborate the Vedecom IEED project. The project was about creating a center for research on electromobility. Vedecom was the result of the decision of three main founders of Mov'eoTec foundation (Renault, Peugeot, and Valeo). Vedecom fixed its objective for recruiting 300 researchers in three years and 400 in six years, the estimated budget was at least 500 M€ in 10 years.

### 3.2.8. French government call for IEED<sup>1</sup> projects

In 2011, ANR<sup>2</sup> (National Agency for Research), launched a call for 5 to 10 projects as IEEDs (Institutes of excellence for decarbonized energies). Each IEED was issued to a grant for its investment and operation.

The IEEDs program as a subset of PIA<sup>3</sup> (Future investment program) was aimed to constitute a limited number of technological innovation clusters for energy and climate. The submission of an IEED to ANR was expected to justify the fulfilment of following requirements:

- To have the potential to acquire worldwide position by collaborating with public or private research and education institutes, realizing prototypes and industrial demonstration.
- To provide technological results, competences and know-how who are directly applicable in the IEED's economic sector to make it the leader of the sector. As a successful innovation requires the involvement of different actors, so an IEED should facilitate the emergence of projects that integrate different actors including research labs.
- To realize the research and experimentation adapted to the market requirements.
- To design academic or professional training programs.
- To monitor the socio-economic impacts of the project.
- To assure the transfer of knowledge to the partner enterprises.

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<sup>1</sup> Instituts d'excellence dans le domaine des énergies décarbonées

<sup>2</sup> Association Nationale de la Recherche

<sup>3</sup> Programme d'Investissements d'Avenir

## Chapter 3: Presentation of the Vedecom Institute case

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- To develop new innovative products and increase the attraction of France for companies.

- To assure the involvement of students in real requirements of companies and to facilitate their professional integration.

On 25th July 2012, two ministers of French government, the Ministry of economy, production and industry and the Ministry of labor, employment, professional education and social dialogue stated the “Automobile Plan” in order to recover the automobile industry in France. However the automobile industry is strategic for France’s economy and more than 800000 employees work in this industry, but till to 2012, in a period of ten years, employment and production have been declined.

The “Automobile Plan” consisted of eight axes:

1. Encourage the users and public administrations to buy electric or hybrid vehicles by proposing them the bonuses and implementing the charging stations in France.
2. Cash support and investment in automobile industry companies particularly the SMEs.
3. Support the innovation in automobile industry in order to differentiate the products and to become competitive. The launch of Vedecom was announced in this axe till the end of 2012, which would associate principal actors of the automotive industry, consisting: PSA, Renault, OEMs and research institutes: CEA and ParisTech. Furthermore it was announced that 350 million euros of the budget of “future investment program” will be dedicated to finance the R&D in automotive industry.
4. Encouraging and supporting the creation of strategic companies to increase the solidarity among the companies of the automobile sector.
5. Maintaining the jobs in automotive sector.
6. Helping to create new jobs related to the deconstruction and recycling issues in automotive industry.
7. Establishing close collaboration with urban communities involved in automobile sector.
8. Reorienting the European and international rules in favor of a fair exchange.



### 3.2.9. Establishment of the Vedecom Institute

Vedecom was finalizing its financial, juridical and administrative issues as an “IEED” with “General Commissioner for investment<sup>1</sup>” and “National Agency for research<sup>2</sup>”.

Vedecom started to work officially on first September 2012 in a business incubator building of the “Versailles Grand Parc”.

Three programs were defined as: the vehicle program, the eco-mobility program and the research program. Moreover three axes for research projects were announced:

- Electrification the vehicles
- Driverless and connected vehicles
- Mobility and shared energies

Vedecom hired seventeen Ph.D. students and four post doctorate researchers from different nationalities and different education domains to work in various subjects in three different research axes.

Vedecom has engaged to collaborate in national and European programs:

Ignis Mutat Res: the Ministry of culture and communication and Ministry of ecology, sustainable development and energy conduct the Ignis Mutat Res (fire transform all things) program in which two thesis are selected for a 100000 euros funding, one of the two thesis is Nasim Bahari’s thesis with the aim of collaborating with the program, reporting and presenting the project’s achievements to the steering and scientific comities.

FABRIC project: this European project was submitted on 14/11/2012 as a response to GC.SST.2013-1 for “Feasibility analysis and technological development of on-road charging for long term electric vehicle range extension” coordinated by Fiat and Vedecom (and its

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<sup>1</sup> Commissariat Général à l’Investissement

<sup>2</sup> Agence Nationale de la Recherche

## Chapter 3: Presentation of the Vedecom Institute case

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partners including PSA, Renault, IFSTTAR, IFPEN, Intempora, and ParisTech) for an experimentation in Satory.

**OPTICITIES:** this European project was submitted on 14/11/2012 as a response to SST.2013.3-1, “Managing integrated multimodal urban transport Network”, Coordinated by Grand Lyon and Vedecom (and its partners including Veolia, PSA, Renault, Telecom-ParisTech, ATOS, Continental, and IFSTTAR).

**SYSMO 2015:** a project of the program titled: “Véhicules du Futur” (future vehicles) for “Investissements d’Avenir” (future investments) as a response to the tender of ADEME for passengers mobility. SYSMO was the project for development, test and experimentation of the new systems for urban mobility in Saclay-Satory, focusing on multimodality for going from the point A to the point B for passengers and land-use planning by integrating all the modes of transport. It was launched on 16/10/2012 and coordinated by RATP and some partners of Vedecom including Continental, SNCF, Renault, Fondaterra, GreenCove, Covivo, Technolia, DeWays, WebGeoservice, CEA-LIST, IFSTTAR-LVMT, UVSQ, UTBM, ENSCI, Telecom-ParisTech, FCS, CASQY, CAVGP, CAPS, and CAEE.

Vedecom was responsible to assure the coherence between the two projects: SYSMO and OPTICITIES.

According to my interview with the general director of Vedecom in the 2012-2014 period, these projects assisted Vedecom to prove its existence regarding to public authorities and industrial partners.

Alongside these subprojects, the main project of Vedecom was framed as the experimentation of the autonomous vehicle in Versailles; in this regard the project was named Satory according to its placement at Satory, a city in Versailles urban community.

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**2012**

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**Actor’s identity**

Mov’eoTec Foundation

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## Chapter 3: Presentation of the Vedecom Institute case

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<b>Partners' identity</b>	A network of industrial companies and public authorities
<b>Network's resources and competences</b>	Research on transport  Political support  Automotive and its equipment know-how  Public transport experience
<b>Artifacts and effects</b>	Vedecom Institute with three major programs:  Electrification the vehicles <sup>1</sup> , connectivity and delegated driving <sup>2</sup> , Mobility and shared energy <sup>3</sup> .

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**Table 7: Establishment of the Vedecom Institute**

### 3.2.10. ITE Vedecom and the ANR's funds

Vedecom replied to the government's call for tender regarding "institutes for energetic transition". The objective of Vedecom from becoming the institute for energetic transition was benefiting the ANR's public funds with the amount of at least 50% of overall costs. The dossier consisted 9 parts:

Part A: This part was dedicated to introduce 45 public and industrial partners of the consortium.

Part B: This part presented the Vedecom Institute and provided some indicators for monitoring results and impacts.

Part C: This part defined the budgetary plan both for short term (0-3 years) and long term (10 years).

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<sup>1</sup> Electrification des véhicules

<sup>2</sup> Délégation de conduite et connectivité

<sup>3</sup> Mobilité et énergie partagées

## Chapter 3: Presentation of the Vedecom Institute case

Part D: This part explained the financial engagement of the partners.

Part E: This part described the research programs and the projects.

Part F: This part explained the training program.

Part G: This part described the Intellectual properties valorization.

Part H: This part explained the governance and partnerships.

Part status: This part described the status of the Vedecom.

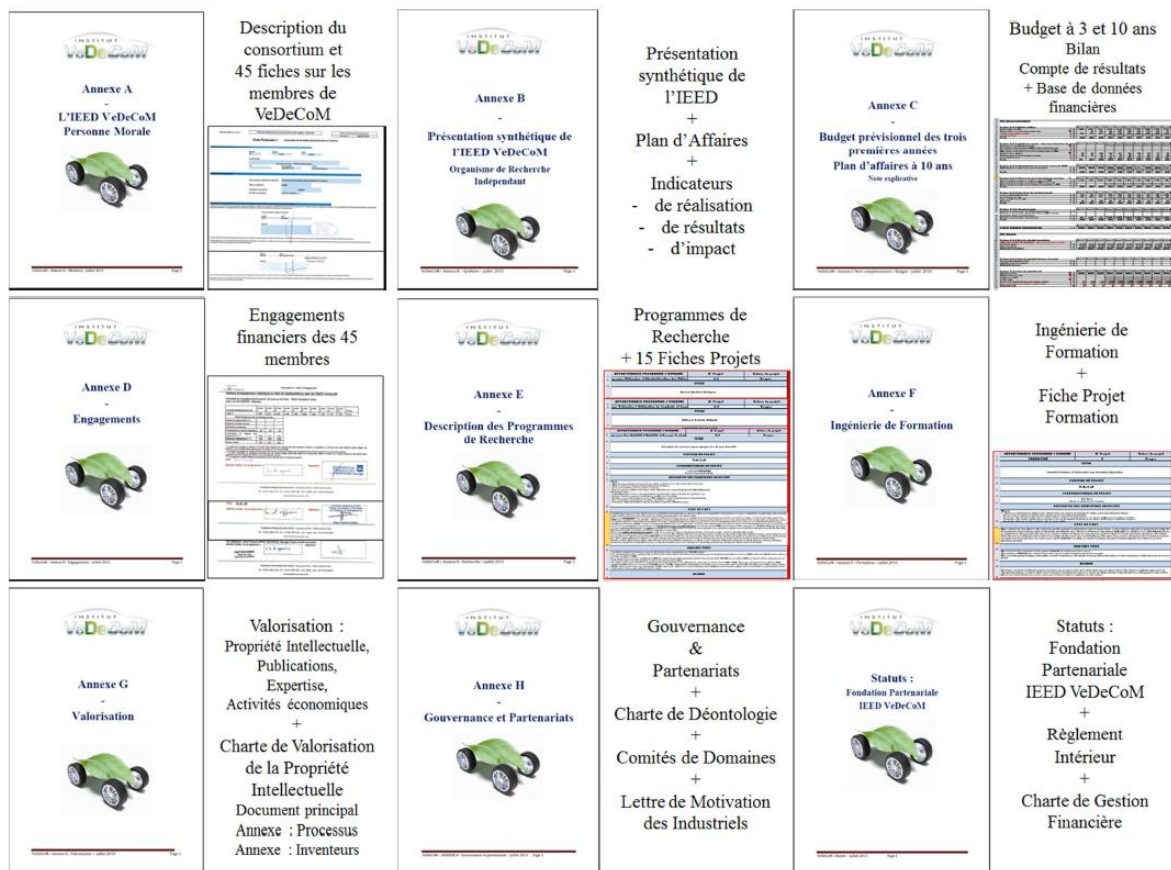


Figure 7 : Final dossiers for replying to the government's tender for IEED (Source: see the footnote<sup>1</sup>)

<sup>1</sup> Lettre Vedecom #5, 31 Aguste 2013, author: Jérôme Perrin.

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On February 11, 2014, Vedecom and ANR signed the convention of the Vedecom at Satory with the presence of the minister of transportation<sup>1</sup> and the director of General Commissariat of investment<sup>2</sup>.

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2014

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<b>Actor's identity</b>	Vedecom Institute
<b>Partners' identity</b>	ANR (National Research Agency)
<b>Network's resources and competences</b>	Research on transport  Political support  Automotive and its equipment know-how  Public transport experience
<b>Artifacts and effects</b>	ITE Vedecom with four programs:  Electrification of the vehicles <sup>3</sup> , delegated driving <sup>4</sup> , mobility and shared energy <sup>5</sup> and connectivity <sup>6</sup> .

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**Table 8 : ANR as the main public partner of the Vedecom Institute**

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<sup>1</sup> Ministre chargé des Transports, de la Mer et de la Pêche

<sup>2</sup> Commissaire Général à l'Investissement

<sup>3</sup> Electrification des véhicules

<sup>4</sup> Délégation de conduite

<sup>5</sup> Mobilité et énergie partagées

<sup>6</sup> Connectivité

## Chapter 3: Presentation of the Vedecom Institute case

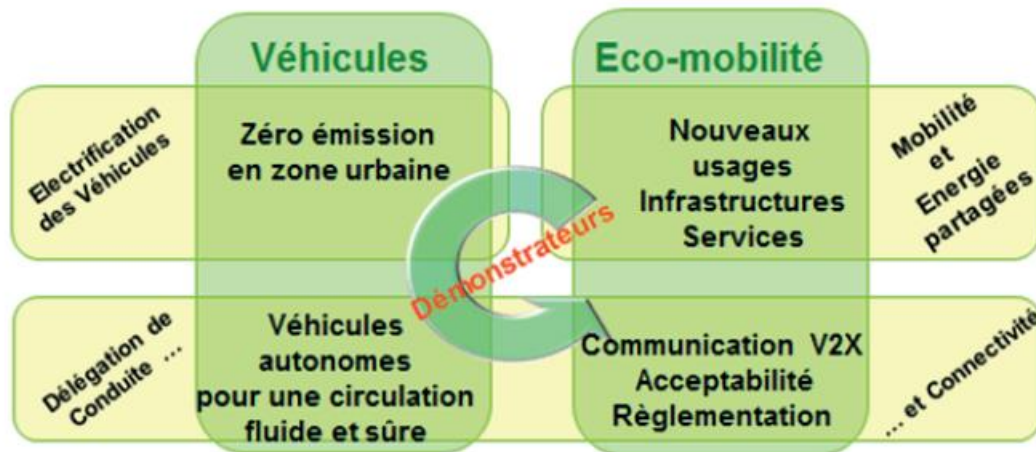


Figure 8: ITE Vedecom's programs<sup>1</sup> (source: see the footnote)

### 3.2.11. Shaping the innovation experimentation

Since we joined the project in 2013, Vedecom had recently fixed its mission to work on three programs including electrification the vehicles, driverless and connected vehicles and mobility, these three projects were running separately (these three programs have been converted to four in February 2014). Vedecom had two preoccupations in this phase, first finding a new mobility solution, second connecting Satory to somewhere outside. Regarding finding new mobility solution, Vedecom had demanded some external engineering design companies to propose a mobility service and provide related technical and financial studies.

Vedecom prepared a report for proposing new solutions for mobility to local public authorities (R#2014-01). Through this report the ambition of Vedecom for conducting the research on autonomous vehicle has been introduced to the public authorities. In September 2013, the president of France has announced a bundle of priorities of industrial policies for France; among them, two cases were interesting for Vedecom. First one was about the vehicles that consume less than two liters per 100 kilometer and second was about the autonomous vehicle that will change the individual transport. For example the user will have some free time to do something else instead of driving, furthermore old or handicapped people may benefit from personal mobility despite their disabilities.

<sup>1</sup> Press release, Investissement Avenir, February 13<sup>th</sup>, 2014

## Chapter 3: Presentation of the Vedecom Institute case

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The French government plan for the autonomous vehicle was aimed to make the French automotive industry as the pioneer of autonomous vehicle worldwide by offering competitive vehicles in terms of price and functionality until 2020.

From the technological point of view, the autonomous vehicle requires to be developed gradually, in other words, on one hand, from the beginning the French car manufacturers, suppliers, telecommunication providers and other technological actors are not able to support (i.e. design, production and exploitation) a totally autonomous vehicle and on the hand legislations do not permit the circulation of a totally autonomous vehicle in cities. In this regard, the experimentation of the autonomous vehicle is indispensable in a dedicated road that other vehicles do not circulate in it<sup>1</sup>. Five level automation levels have been defined by the automotive industry which ranges from totally human-control car (level 0) to totally automatic-control (level 4).

As described before, the choice of Satory as the experimentation zone is due to historical, economical and technical aspects; from the historical point of view, Satory's development has been accelerated since early 2000s when several active companies and research institutes (e.g. ifsttar, Renault Trucks Defense, Peugeot Citroen Sport) in the mobility and automotive industries implemented their companies in Satory. From the economical point of view, Satory belongs to the department of Yvelines whose economical ambition is to support and promote the automotive industry (the main economic activity in the department of Yvelines is the automotive industry and several car manufacturers and related industries are located in the department of Yvelines). From the technical point of view, Satory has vast unoccupied lands that will be used in future. EPPS has several urban development plans for Satory in terms of construction and absorbing population.

The autonomous vehicle project stands as a multi-actor innovation project since it is complex and requires the collaboration of several actors both from public and private sectors. The complexity of the autonomous vehicle project in Satory is due at least to two factors; first the "technical object" is not just a product (i.e. autonomous vehicle) but also includes several external complementary objects and also associated services. In other words the autonomous vehicle requires an ecosystem for its deployment. In contrast to conventional cars that are sold

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<sup>1</sup> Source : Lettre Vedecom #7, June 30th, 2014, Author : Jérôme Perrin

## Chapter 3: Presentation of the Vedecom Institute case

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to the customer through a B2C model, the autonomous vehicle exploitation requires the provision of complementary technologies during the use of vehicle.

This case description until now shows that how different actors have joined together over time and how they have formulated the research program and its strategic axes. Moreover it outlines that why different actors were required to join in different stages and how their integration have influenced and reoriented the research program. As a result the Satory project consists the experimentation phase of the innovation in which the choice of technology and also the location find their roots in the history of project over time. (This topic was studied in previous section).

We joined the project during the shaping phase of the innovation ecosystem. In this phase different actors did not have a common comprehension of the project and its objectives. Moreover, the result of the project was not clear and there was not any clear defined objective and value proposition. On the other hand there was not any clearly identified market. Therefore customers and market were not clearly identified, therefore there were no clear defined objective and measurement for the value proposition and the result of the project (Lenfle, 2008)

For obtaining an initial understanding, through the action research methodology, we started to investigate the public private ecosystem for urban passenger transport in Satory. We categorized the actors in three major subsets: public authorities, industrial companies and users.

Afterward we conducted semi-structured interviews with the directors of Chamber of Commerce and Industry Versailles-Yvelines and Paris-Saclay Development Authority (EPPS). These interviews had three important outcomes: first, they provided a comprehensive view about the actors involved in urban passenger transport offer in Satory. Second, they helped to the formalization of Vedecom as the leader of a consortium between industries of the automotive sector, infrastructure and services operators in the mobility ecosystem, academic research institutions, and urban communities consortium and its project and activities. Third, following the interviews with these two local authorities, they authorized Vedecom to contact with the directors of companies in the zone in order to conduct interviews with them.



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Afterward, we started to identify the enterprises located in Satory by interacting with the Chamber of Commerce and Industry Versailles-Yvelines. Five enterprises have been identified: Nexter, STAT, Ifsttar, Citroën Racing and Renault Trucks Defense. Consequently, we contacted the directors of these enterprises and requested each of them a one hour meeting.

The focus of the semi-structured interviews included first, to understand the managers' general insights and expectations from transport and their employees' mobility, second, to recognize if they have any plan for human resource increase, third, and to understand their main motivation from implementing their enterprises in Satory.

The semi-structured interviews with the directors of the enterprises in Satory provided several achievements: first, in parallel to these interviews, the path selection for the innovation experimentation was in progress (for more information see chapter 6), therefore, as the objectives of the project could not be forced to the stakeholders and the success of project is due to the involvement of stakeholders from the beginning, therefore these interviews provided a favorable environment in order to introduce the project and to create the first contacts. Second, the analysis of the interviews led to identify and understand the directors' point of view on transport issues as well as their general industrial plans for future developments. Third, the major result was that at the end of the interviews, directors committed to diffuse the Vedecom's transport survey amongst their employees and permitted the participation of some of their employees in creativity workshops. Transport survey and creativity workshops provided both quantitative and qualitative information about the users of different modes of transport in the zone.

For designing the transport survey (for more information see chapter 6 and annexes), we have had several internal meetings and we agreed to focus on the questions that can reveal information about the distribution of place of residence, place of work, worked days per week, flexibility of work day schedule, work displacement during the day, utilized mode of transport, travel time, distance from home to work, weekly delays and general insights and expectations from transport.

In parallel to the interviews and survey on "user" side, we continued the interviews with other public authorities and industrial partners. Two semi-structured interviews with Urban Community of Versailles Grand Parc (CAVGP), one with Paris-Saclay Development

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Authority (EPPS), two with Valeo, one with Renault and two with program directors in Vedecom were organized. These interviews provided a wide range of qualitative and quantitative data on technical and financial issues. As instance, the interviews with Valeo, confirmed that it will be so far to expect the experimentation of a totally autonomous vehicle, therefore a dedicated path will be required. The interview with Renault determined that the car manufacturing companies have the mass production view and search for economy of scale. In other words they prefer development projects rather than innovation projects and they are not interested to fabricate few vehicles for innovation experimentation with affordable prices.

In order to understand the business model of the innovation experimentation, we organized a debating and sharing information with Vedecom. According to my work and results and from prototyping a management device and its application for the reference scenario, we prepared a template of an ecosystem business model mapping. After a comprehensive presentation, the participants were able to act and discuss their opinions. This workshop assisted to identify the actors involved and their contributions (for more information see chapter 6). The offer system will include Vedecom, Founders (Renault, Peugeot, and Valeo), French National Research Agency (ANR), Paris-Saclay Development Authority (EPPS) and other public or industrial partners. Vedecom as the leader of consortium will accomplish the research on electric, autonomous and connected vehicles, and new infrastructure and services for shared mobility and energy. Moreover it leads the innovation experimentation phase. The founders including Renault, Peugeot and Valeo have governed the consortium because these three companies have invested more than 60% of the private sector part. Since 2014 and the establishment of ITE Vedecom, the French National Research Agency (ANR) as the mediator for attributing public funds to innovation projects within Future Investment Program (PIA) has covered 50% of the Vedecom's costs. This investment will last 10 years from 2014 on. The Paris-Saclay Development Authority (EPPS) is the coordinator of the development of Paris-Saclay cluster. Other public or industrial partners participate in some aspects of projects according to their interests with lower level of financial and non-financial contributions to the partnership.

Following to the data collection and analysis, my designed management device prototype (for more information see chapter 6) has been used. The results helped the decision makers from public authorities and industrial companies to understand better the business

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model; the process of using the device was performative while it prepared a favorable condition for understanding and communicating. On the other hand it assisted to evaluate the business model which resulted to public authorities support. As instance, my report has been used by Vedecom for absorbing public support. Therefore EPPS has engaged to contribute the amount of 15M€ for constructing civil infrastructure.

### **3.3. Challenges and motivations of the actors for innovation in automotive industry and transportation**

The establishment of the Vedecom Institute for experimenting the autonomous vehicle stands as a project that has evolved over time. In other words it did not exist with this dimension and characteristics from the beginning and it has been shaped gradually. Therefore since 2013 until 2015 that the interviews and meetings have taken place, the actors did not have the same understanding of the project, but each of them has had different motivations in supporting or joining the project.

#### **3.3.1. Economic factors**

However economic interests are pointed out by different actors from public or private sectors but they are different in nature and level.

The Chamber of Commerce and Industry Versailles-Yvelines supports the SMEs (Small Medium-sized Enterprises) because innovation contributes to the economic growth and SMEs can play an important role in innovation as they are flexible, creative and proactive. Moreover SMEs create new jobs regarding innovation.

The department of Yvelines is famous for locating major automotive companies. Moreover the automotive industry is the main source of job creation in west of Paris. Therefore the economic development of the department of Yvelines is in direct relation with automotive industry.

In narrower scale, for the CAVGP, Satory stands as a particular zone for developing automotive industry specifically regarding the innovation. Because Satory has one of the vehicle test tracks in France. Moreover several research institutes such as Ifsttar and several

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companies such as Nexter, Renault Trucks Defense and Peugeot Citroen Sport who work on specific vehicles are already in Satory.

### **3.3.2. Energy consumption, pollution and climate change**

Urbanization across the world led to high increase of urban population and urban sprawl. One of the serious consequences of the urban sprawl is the higher demand for mobility in long distances. Moving more people and cover longer travelling distances increases the costs of transportation infrastructure and generates more greenhouse gas emissions, air and noise pollution (Henning et al., 2015). Despite these severe consequences of urban sprawl, the automotive industry had benefited enormously from this demanding market in the second half of the past century. This situation started to change since the last years of the past century. Climate change and air pollution due to transport and particularly personal car use, have threatened the automotive industry; the environmental degradation forced the governments to strict the regulations.

Congestion and costs increase changed people's interest and economic crisis challenged the automotive industry.

Climate change is of the most challenging factors for automotive and transport industries. It has threatened the automotive industry and triggered several innovations regarding to the components of vehicles (e.g. engines) and also production processes (Penna and Geels, 2015).

The climate change was outlined by academics during the 1970s and 1980s with several uncertainties about its causes and consequences, therefore it became as a research topic for scientific conferences and journals (Corfee-Morlot et al., 2007). In this period, the car industry was interested in entering new market segments and increasing profit margins (Penna and Geels, 2015) and it did not understand the climate change problem (Rothenberg and Levy, 2012).

The United Nations Framework Convention on Climate Change (UNFCCC) at the 1992 Rio Earth Summit was a voluntary and non-binding agreement that determined the objective for stabilizing greenhouse gas (GHG) emissions. Therefore the climate change became also as a political issue and started to impose restrict regulations to the automotive industry (Aggeri

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et al., 2009). Consequently carmakers started to frame associations and originations for creating pressure on politicians (Penna and Geels, 2015). In parallel, reducing GHG emission became one of the main drivers for technology development, in this regard, car manufacturing companies focused on incremental innovations regarding internal combustion engines, fuel injection systems and new types of fuels (Aggeri et al., 2009; Van den Hoed, 2005). In this period innovation was incremental and car manufacturer performed little effort in implementing radical innovations including alternative powertrain technologies (Van den Hoed, 2005).

In 1997, through the Kyoto Protocol, many countries committed to reduce GHG emissions by an average of 5% below 1990 levels until 2012. Consequently the public attention increased and carmakers confirmed the climate change problem for improving their image through producing greener cars (Penna and Geels, 2015). In 1998, European carmakers signed a voluntary agreement with the European Commission in order to limit the emissions of new produced cars to 140g CO<sub>2</sub> per kilometer until 2008. Carmakers continued their efforts in incremental innovations while they also accelerated their efforts in innovating alternative powertrain technologies but without strong mass-production and mass-marketing plans (Doyle, 2000).

In this period, worldwide pressures on one hand, accelerated the efforts of the automotive industry concerning radical innovations (e.g. electric vehicles, hybrid electric vehicles) (Aggeri et al., 2009) and on the other hand, resulted to several partnerships or acquisitions between different carmakers all over the world (Penna and Geels, 2015) (e.g. Chrysler and Daimler in 1998, Hyundai and Kia in 1998, Renault and Nissan in 1999, Ford and Volvo in 1999, and GM and Saab in 2000).

Since 2005 to 2009 the pressure of climate change on automotive industry increased and carmakers attempted to incorporate sustainability issues with their marketing strategies and show their engagement with sustainable mobility through their annual reports (Shinkle and Spencer, 2012). Moreover, the technological innovation strategies that had cost problems and technical limitations such as fuel cells were abandoned, on the contrary hybrid or electric vehicles attracted more attention (Penna and Geels, 2015).

Since 2009, however carmakers continue both incremental and radical innovation strategies, but they do not completely commit to any of them, because technological

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innovations are diverse but they do not have a proven track in terms of success, therefore carmakers do not want to commit to any of them because of the uncertainty related with the diversity of technical solution is high (Penna and Geels, 2015).

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### Pressures on automotive industry due to the climate change

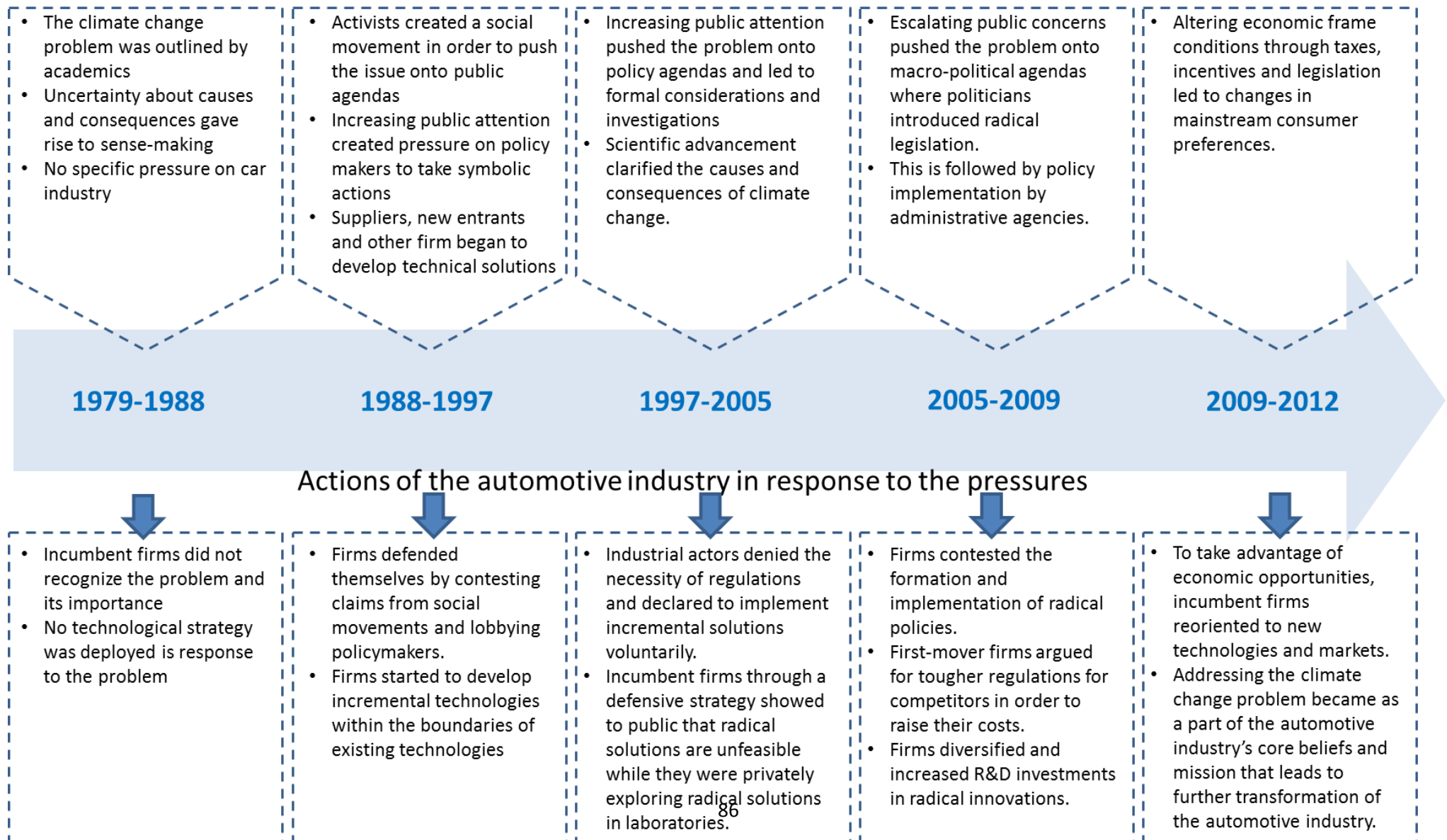


Figure 9 : The climate change effect on the automotive industry, adapted from (Penna and Geels, 2015)

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### **3.3.3. Customer' interest change**

Nowadays many public organizations and industrial companies are trying to identify consumer behavior for future developments and improvements regarding to green products and strategies (Knez et al., 2014).

Annual car usage costs including fuel, insurance, maintenance, parking, etc. have increased almost in all countries. In parallel in many big cities across the world strict regulations are applied to private car users in order to reduce congestion and air pollution. For example, in Teheran, the city center is prohibited to the circulation of private cars, moreover in a large area of the city, during the odd days, only the cars whose registration numbers end to odd numbers are eligible to circulate and it is same for even days. In Paris also it is been a few years that some same rules have been established because of air pollution increase. On the other hand big cities are more crowded than before and finding a parking place is harder than before. However, most personal car users are reluctant to abandon private car because of strong feeling of independence and living standard associated with personal car use (Knez et al., 2014), but the factors mentioned above, affect the car users and encourage them to other alternatives for types of transportation either public or semi-public offers (e.g. car rent, car sharing, carpooling, etc.).

Job creation, creation of wealth and economic development require that people be able to move. Therefore transportation and development are related. Particularly developed countries have experienced growth by increasing the private car use during the past century. Car use led to urban sprawl, energy consumption, travel time increase and pollution. All these effects have generated additional costs due to health problems, climate change and loss of time. Therefore different people, organizations, governments and even nations and generations are exposed to the consequences. This is why transportation requires being more sustainable while assuring at least all three pillars of sustainable development: economy, environment and society.

### **3.3.4. Emerging new actors**

The emergence of different modes of transport, between traditional public transport (i.e. metro, bus) and private transport (i.e. private car, motorcycle, and bicycle) has introduced



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new actors for transport offer and organization. Therefore the transport offer and management has become fragmented. As a result managing different organizations from public and private sectors and particularly their contributions and benefits have become challenging. Moreover providing and maintaining integrated transportation has become more complicated when different transport offers exist.

Carsharing and carpooling services are two examples of such a change; in 2009, Daimler introduced Car2Go, a point to point carsharing service equipped with 200 Smart cars in Ulm and Austin. In 2006, BlaBlaCar has been started as a 2.0 web platform for connecting drivers and passengers willing to travel between cities and share the costs of the journey. In 2011, Bollere launched Autolib, a point to point carsharing service in Paris and its close suburbs. Since 2000, Zipcar had offered the roundtrip carsharing service in different countries till 2013 when it was acquired by Avis. Or a more recent example is Auber who has benefited the expansion of internet for providing the customers to submit a trip request which is then routed to Uber drivers who use their own cars.

All these new actors, according to their geographical service coverage may impact both traditional public transport use and personal car purchase rate. Several incumbent car manufacturing companies felt the threat of these newcomers and they have attempted to enter the carsharing services, for instance Daimler through Car2Go and Renault through Twizy way (an unsuccessful and abandoned carsharing service in Saint-Quentin-en-Yvelines). On the other hand, the startups such as BlaBlaCar or Uber have preferred to profit from the expansion of internet and connected cellphone use in order to launch market platforms for connecting two different categories of customers. They use P2P (peer to peer) model in which they do not need to dispose the fleet of vehicles and they just act as intermediaries between two different categories of customers. For example Uber connects the customer who needs to move to the driver who uses its car and he is already registered in Uber's platform.

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Name	Firm	service
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<b>Car2Go</b>	Incumbent	B2C point to point carsharing
<b>Zipcar</b>	Startup	B2C roundtrip carsharing
<b>Autolib</b>	Incumbent and entrepreneur	B2C point to point carsharing
<b>BlaBlaCar</b>	Startup	P2P long distance carpooling
<b>Uber</b>	Startup	P2P taxi

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Table 9 : Examples of some newcomers in passenger mobility supply

### 3.4. Towards shared and mutually beneficial solutions and strategies

According to the interviews, public organizations and industrial companies share four issues regarding the innovation experimentation in Satory but with different interpretations, they all commit on innovation, they support collaborations and partnerships, the image, attractiveness and competitiveness are important for them and they attempt to promote the automotive and transportation industries. The summary of these issues are provided as below:

#### 3.4.1. Commitment on innovation

Innovation has attracted significant attention of both public and private sectors during recent years; private sector has rather the role of generator and implementer of the ideas while public sector has the role of supporter and facilitator.

The interview with the Chamber of Commerce and Industry Versailles-Yvelines revealed that innovation stands as a value creator mechanism and leads to growth. In this

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regard CCI emphasizes the importance of research and innovation. Actually the region of Ile-De-France has the strong position in Europe in terms of innovation and the Chamber of Commerce and Industry Versailles-Yvelines attempts to accompany and amplify the SMEs in their efforts on innovation. Accordingly the CCI attempts to assist the companies in different aspects and phases of the project. In this regard the CCI supports particularly the SMEs who are in line with the regional strategies for development and innovation and provides them the assistance for the issues such as facilitating the relations between SMEs and large companies.

The EPPS<sup>1</sup> has been established since 2009 as the leader of an OIN (Opérations d'Intérêt National) for creating a favorable environment and synergies among universities and industrial companies with the goal of shaping a cluster. Subsequently for EPPS, one of the major levers for shaping the cluster is to foster innovation particularly through a framework for close collaboration and interaction between universities and industrial companies. Moreover EPPS has the plan for construction 4000 housings at Satory west.

The department of Yvelines emphasizes the necessity for innovation particularly in automotive industry as one of the most important industries in the department which has created numerous jobs. Moreover the automotive industry is the origin of considerable number of patents.

Prior to the public authorities, the private sector has commenced the innovation by introducing new technologies. In recent years several technological innovations have been introduced by the automotive industry. Renault as a car manufacturer has developed and improved its electric vehicles and Valeo has developed several technologies for making the vehicle autonomous. As a result industrial companies innovate and they improve their innovations gradually. Moreover in some types of innovation they require to join other actors in order to make their innovations exploitable.

### **3.4.2. Supporting collaborations and partnerships**

According to the Chamber of Commerce and Industry Versailles-Yvelines, historically the actors did not have strong relationships; in this regard the CCI aims to facilitate the interrelations between the actors that may lead to further collaborations and partnerships.

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<sup>1</sup> Etablissement Public Paris-Saclay

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For the CAVGP, being a part in collaboration is important because it facilitates the relations with other local public authorities and industrial companies. Regarding the industrial companies, there are two dimensions, first the companies such as Renault, Peugeot, and Valeo who have a part in innovation project and companies such as Nexter, Renault Trucks Defense who will be affected by the project because of their locations. The collaboration with the first group as a public private partnership assists to foster the innovation and the cooperation with the second group helps to create a favorable environment for innovation exploitation.

### **3.4.3. Image, attractiveness and competitiveness**

One of the motivation factors for different actors in joining the innovation project is the image that they create during their collaboration and also when the innovation is exploited.

In recent years, the notion of sustainable development has attracted significant attention. Accordingly public organizations and private companies have started to add the dimensions of sustainable development to their activities and communicate their achievement through their reports. Subsequently they represent themselves as responsible organizations for sustainable development. Different organizations have different points of view, authority and performance concerning sustainability. Therefore for each any project that performs positively a task regarding the sustainability is attractive (e.g. air pollution reduction, job creation, economic growth, accessibility, GES reduction, etc.) and improves the image of the organization.

For the Chamber of Commerce and Industry Versailles-Yvelines, the competitiveness and image of the department among grand European regions are at prompt importance because the image is one of the factors that attract the companies to establish their businesses in a zone and contribute to the economic growth. According to CCI, however the region of Ile-De-France is famous for innovation in national level, but they lack a national and international visibility in comparison with other French departments or major European technological poles. In National level Toulouse represents the aeronautics industry of France and Grenoble is famous because of electric and electronic industries. Moreover recently the department of Essonne which is situated just beside the department of Yvelines has attracted numerous enterprises and universities.

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For the CAVGP, the innovation project improves the image of the urban community of Versailles in three manners; first, the project facilitates the collaboration of CAVGP with other public organizations and also industrial companies. In other words the collaboration reinforces the relationships and strengthens the image of the CAVGP as an effective local public authority. Second, engaging in an innovation project is a type of territorial marketing that makes the CAVGP distinguished among other French urban communities. Third, as the project concerns the innovation for urban passenger transportation, therefore offering a new mode of mobility will be attractive for the users.

The Department of Yvelines is the first department in Ile-De-France for R&D, particularly in the automobile sector. The main activity of several companies in the department of Yvelines is the automotive industry and the main French car manufacturers and suppliers are there (e.g. Renault, Peugeot, Valeo, etc.). These companies have suffered from the economic crisis of 2008. Therefore the department of Yvelines wants to maintain its image as the pioneer of the automotive industry in France despite the crisis of this industry. Moreover since 2006, two urban communities (i.e. Versailles and Saint-Quentin-en-Yvelines) of the department of Yvelines are within the OIN<sup>1</sup> Paris-Saclay.

According to the interviews with the directors of the companies at Satory, innovation experimentation may have some positive effects on their businesses; they may become more attractive for employees to work there, moreover the value of the lands may increase and their customers may have an additional alternative in terms of transportation for accessing to companies.

### **3.4.4.Promoting the automotive and transportation industries**

However it is normal that companies who are active in automotive and transportation industries continue their efforts in these industries (based on path dependency), but what is interesting is that almost all the interviewed local public actors have strategies for promoting the automotive and transportation industries.

The Chamber of Commerce and Industry Versailles-Yvelines revealed that the automotive and transportation industries and Satory's test tracks use for new vehicles are

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<sup>1</sup> Opération d'intérêt National

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important. In this regard they have some projects (i.e. project d'Incubateur Pépinière Hôtel d'Entreprises -IPHE) for facilitating the creation of new enterprises in these domains at Satory.

### **3.5. Discussion and conclusion**

The primary analysis of the case which has been provided in this chapter helped to understand better the case of the Vedecom Institute in order to define pertinent research questions applicable to the case.

Data collection for this case included several primary and secondary sources of information plus semi-directive interviews. As Vedecom institute did not have this name and mission from the beginning, therefore the data collection aimed to discover the roots of the creation of the Vedecom institute. Moreover the IEED tender documents were studied. In parallel, internal and external communication reports of the Vedecom institute were looked up. Furthermore this part of research was enriched by two semi-directive interviews with General Managers in the periods of 2012-2014 and 2014-2015 at the Vedecom Institute.

The trend of the Vedecom institute dates back to 1999, when INRETS (National research institute for transport and its safety) LCPC (Central laboratory for bridges and roads) decided to create a new joint research laboratory LIVIC (Laboratory for vehicle, infrastructure and driver interactions) at Satory. LIVIC started its research on three projects including: PREDIT (research program for innovation in land transport), ARCOS (research project for safe driving) and LAVIA (research project on speed limiting).

While the road safety became the priority for the French government in 2002, INRETS were designated to do a feasibility study concerning the test tracks in Satory, their development and use for research on road safety. INRETS cooperated with LIVIC on this project which was named VESTA (Versailles advance safety technologies).

The VESTA project developed according to the tender for competitive clusters which was launched by French government in 2004. With the support of Valeo (OEM), the Department of Yvelines and the municipality of Versailles, the VESTA project was prepared to bid the tender. Each of these supporters had their own advantages; for example Valeo was interested to expand its research partners, furthermore for the Department of Yvelines, the

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automotive industry was the major industry in the territory and the Department of Yvelines had already made the French car manufacturer companies to install in its territory, in addition, for the municipality of Versailles, Satory was a potential land that would contribute to economic development.

VESTA project required to add urban mobility to its mission in order to become acceptable. The full concentration of VESTA on automobile industry was a barrier to its acceptance as a competitive cluster according to the strong influence of the “Greens, Vertes”. Therefore Veolia (a French company active in public transport in that time) and UVSQ (University of Versailles Saint Quentin en Yvelines) came on board the project. Furthermore the name changed to VESTAPOLIS to show its interest in urban issues.

VESTAPOLIS was made official as a competitive cluster, but a little after it was requested by the French government to fusion with another competitive cluster named Normandy Motor Valley. The result of this fusion was the Mov’eoTec competitive cluster with the mission of working on the “vehicle of future”. The four axes of research were: energy, road safety, mobility services and mechatronics. These four research field allowed the four major industrial companies of the cluster to have a better agreement and balance among them. Renault was engaged in energy, Valeo in mechatronics, PSA in road safety and Veolia Transports in mobility services.

Mov’eo competitive cluster initiated the Mov’eoTec foundation to benefit the LRU law<sup>1</sup> (the liberty and responsibilities of universities). This law simplified the creation of public interest foundations by universities. So the Mov’eoTec Foundation was created by UVSQ<sup>2</sup> (University of Versailles and Saint Quentin en Yvelines). The LRU law facilitated the financial contribution of enterprises in research projects. This law has also several benefits for the donors; first one is about its fiscal advantage, it means that the donors profit from tax diminution because of their financial contribution to the foundations with public interest. The second advantage is that the donors have the right to govern the foundation.

The Mov’eoTec foundation was created on May 2010 by UVSQ (University of Versailles Saint Quentin en Yvelines). The director was from Valeo and the main subject of

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<sup>1</sup> Libertés et Responsabilités des Universités

<sup>2</sup> Université de Versailles-Saint-Quentin-en-Yvelines

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the foundation was working on sustainable solutions for transport. The priority of the research was facilitating the emergence of carbon-free, sustainable and communicating vehicles.

The founders of the Mov'eoTec foundation were: UVSQ, CETIM, ESIGELEC, ESTACA, IFP EN, IFSTTAR, Peugeot Citroën Automobiles SA, Renault SAS, Valeo and Safran.

The Mov'eoTec foundation had the objective to elaborate the Vedecom IEED project. The project was about creating a center for research on electromobility. Vedecom was the result of the decision of three main founders of Mov'eoTec foundation (Renault, Peugeot, and Valeo). Vedecom had the objective to recruit 300 researchers in three years and 400 in six years with at least 500 M€ in 10 years. Three axes for research projects were: Electrification the vehicles, Driverless and connected vehicles, Mobility and shared energies. In 2014, the Vedecom Institute, after winning the French government tender on “institutes for energetic transition”, benefited public funds from (ANR) National association for research.

According to the primary analysis of the Vedecom institute, interactions among the actors and evolution path of the projects has been identified: in this regard several happenings led to the establishment of the Vedecom institute and subsequently the experimentation of the autonomous vehicle in Satory. Among them the creation of the research program on transportation issues, the French government's call for competitiveness clusters tender, the establishment of the Mov'eoTec competitiveness cluster, the French government call for IEED projects and establishment of the Vedecom institute and profiting from the ANR's funds for shaping the innovation experimentation in Satory stand as the most directive events.

According to the research in the field and interviews with the actors involved, their challenges and motivations for innovation in automotive industry and transportation have been classified in four main classifications including economic factors, energy consumption, pollution and climate change, customer's interest change and emerging new actors.

Subsequently actors have moved towards mutually beneficial solutions and strategies by committing on innovation, supporting collaborations and partnerships, constructing image, attractiveness and competitiveness in order to promoting the automotive and transportation industries.



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**Part II: Reviewing the literature and identifying the research gaps for designing a conceptual framework:  
The business model of a public private ecosystem**

# 4. Literature overview and research gaps

## 4.1. Introduction

During the past fifteen years numerous scientific articles and books were published regarding to the business model concept. Furthermore several scientific journals dedicated special issues to the business model concept. All these acts manifest the high interest of researchers to this subject and their commitment to answer the questions and to consolidate the body of literature; however various contributions from different fields of research have led to heterogeneous definitions for business model.

Business model concept has attracted the attention of both academics and practitioners in recent years. Since the late of 1990s, the number of articles dealing with the business model concept has increased and several scientific journals such as Long Range Planning have dedicated special issues to business model concept. Moreover, in recent years the business model, itself has become one of the main topics of recognized international management conferences such as EGOS<sup>1</sup> and AIMS<sup>2</sup>. All these manifestations in terms of academic journals and conferences alongside the vast use of the term of “business model” in managers’ and companies’ jargon imply to the significant importance of the business model concept both for academics and practitioners for addressing research gaps in management literature and finding new solutions for real problems within the organizations.

In this section, the business model concept will be investigated from three perspectives; first, diversity of the business model definitions are analyzed. Second, different trends for business model concept including e-commerce, organizational, strategic, technology and innovation are described. Third, different business model components such as value, revenue, customer, etc. are explained.

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<sup>1</sup> European Group for Organizational Studies

<sup>2</sup> Association Internationale de Management Stratégique

## Chapter 4: Literature overview and research gaps

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This comprehensive overview of business model concept, its major trends and main components assists to identify the research gaps with the aim of constructing a conceptual framework.

### 4.2. Analysis of the business model definitions

Researchers from different fields of research (e.g. strategic management, technology and innovation management, organization theory) have contributed to the business model literature, this has resulted various definitions of the term and non-unified comprehension of the concept. Inconsistent use of the term “business model” led to non-existence of a general accepted definition of the concept (Wirtz et al., 2015; Zott et al., 2011). Beside the term “business model” some researchers have used some other equivalents such as “business concept”, “economic model”, “business concept” and “revenue model” (Magretta, 2002). Ghaziani and Ventresca realized a research to find the use of the term “business model” in management articles from 1975 to 2000. Their work was continued until 2009 by Zott, Amit and Massa. According to these two complementary researches the “business model” term has been used increasingly since 1995 (Ghaziani and Ventresca, 2005; Zott et al., 2011) and its extensive use may have been stimulated by the expansion of internet and the growth of emerging markets (Amit and Zott, 2001). However the literature still lacks of a consolidate and clear definition for business model, but this verifies that the business model is a potential big idea of general usefulness (Gladwin et al., 1995) that is passing through its emergence phase (Zott et al., 2011).

There may be two reasons for various business model definitions; as mentioned before, on one hand, scholars from different fields such as strategic management, organization theory, technology and innovation management and e-commerce have contributed to the business model concept, and therefore according to their scientific field background, they have had different point of views (Wirtz et al., 2015; Zott et al., 2011). On the other hand they have used the business model concept to address different research questions in diverse contexts, so they may have attempted to define the business model in the manner that fits the objectives of their researches and studies (Zott et al., 2011).

However different definitions for the business model concept have been emerged in different fields, but all of them distinguish it from the firm, industry, product, network,

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service, value proposition or revenue model. So the business model stands as a new unit of analysis which bridges or spans conventional units of analysis for understanding how the firm and its partners do business and how they create and capture value (Zott et al., 2011).

Among different articles that deal with the business model concept, some of the scholars define clearly their impressions of business model, some of them do not provide an explicit definition and they shape their research based on the definitions of other scholars (Zott et al., 2011).

The definitions for business model reveal that scholars have employed different approaches for defining the business model; either they attempt to define the business model based on its components or according to their respective research domains they shape their definitions.

### **4.3. Discussing the business model trends**

Researchers from different fields such as information management, strategy and organizational theory worked on the business model concept which has led to the creation of different trends in business model literature.

Zott et al, suggest that business model has been employed mainly in three subjects: first, electronic business and information technology, second strategic issues and third innovation and technology management (Zott et al., 2011). However Wirtz et al., (2015) agree with Zott et al., (2011) on strategy and technology oriented trends but they distinguish organization theory oriented trend while they consider the electronic business in the hearth of technology trend.

Classification the articles on business model according to different trends is more difficult in recent years while the boundaries between different trends become overlapped and blurred (Wirtz et al., 2015). As instance, however Demil and Lecocq, (2010) situate their contribution to the business model literature through strategic management perspective, but explicitly they also take into account the organizational aspect of business model and define it as the position of the firm within the boundaries of its value network. Another instance is Osterwalder, (2004) definition, he constructs the business model canvas on ICT projects and deals with several organizational issues such as resources and partners.

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### Electronic-commerce trend

The business model gained greater attention with the development of electronic commerce in early 2000s. The business model became an integrated presentation of the organization instead of being an operative plan for establishing an information system (Wirtz et al., 2015). The terms e-commerce, e-business, e-market and internet-based business may refer to the firms that do business electronically with their partners, suppliers and clients via internet (Mahadevan, 2000). According to the literature review, conducted by Zott et al., (2011), the quarter of studies that define business model are related to e-commerce. Moreover the concept of business model has been used extensively in the emerging e-business research and several business model components were investigated accordingly (Hedman and Kalling, 2002).

The emergence and development of internet were fundamental for e-commerce and associated business models; internet expansion and informatics cost diminution have opened new insights for value creation and value proposition and provided new mechanisms for exchanges and transactions (Amit and Zott, 2001; Zott et al., 2011).

Two aspects have stimulated the research on business model in the e-commerce context; first, how the ways of doing business are based on internet, and, second, how the firms act in their respective ecosystems (Zott et al., 2011). Consequences of the business model concept in e-commerce appear mostly in pricing systems (Gunther McGrath, 2010; Tapscott et al., 2000) and revenue mechanisms developments.

Scholars who have contributed to the business model concept from the e-commerce perspective, outlined several aspects for business model such as value (e.g. customer value, value proposition,...), cost-revenue structure, channels and network relationships (Zott et al., 2011). They attempted to explain new business archetypes enabled and triggered by internet technologies (Zott et al., 2011) and proposed different classifications and taxonomies (Tapscott et al., 2000; Timmers, 1998; Weill and Vitale, 2001).

From 2000 to 2002, business model research and articles were almost focused on the e-business contexts, but from 2002 on, published articles on business model are majorly strategy-oriented (Wirtz et al., 2015).

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### **Technology and innovation management trend**

From the innovation and technology management viewpoint, there are two arguments about the interaction between the business model and technological innovation; either technological innovation influences the business model or a good business model leads to technological innovation success. First viewpoint emphasizes that the technological innovation may change the business model of the company and its operational and commercial activities (Calia et al., 2007). The second viewpoint considers that the business model assists the company to unlock the potential value embedded in its new technology and convert it to market outcomes (Zott et al., 2011). Technology by itself has no single objective value. The economic value of a technology remains latent until it is commercialized in some way via a business model (Chesbrough, 2010). However, business model is indispensable for capturing value from innovation, but different business models for a same technological innovation do not result the same outcomes (Chesbrough, 2010). Therefore the business model helps to convert the technology or innovation into market outcomes.

### **Organization trend**

However researchers from organization theory have perceived the business model as a theoretical concept that represents a company's organizational structure or architecture, but organization-oriented articles dealing with business models are fewer than other trends. According to Wirtz et al., (2015), few scholars have studied the business model in the organization-oriented context, and they mix it with other orientations. As instance Osterwalder, (2004) provides a company-internal view alongside other aspects such as cost-revenue and customer segmentation. In organization-oriented studies, the business model is considered as a tool for the abstraction of the company that provides a picture of the company's competitive situation (Wirtz et al., 2015).

In recent organization-oriented studies on the concept of business model, the heterogeneity of definitions for business model has been addressed, in other words the organizational viewpoint is used to overcome the variety of definitions for business model and to abstract various business model components (Saebi and Foss, 2015). In this view, business models may serve as devices for designing and structuring organizations (Saebi and Foss, 2015) or as measures for organizational variables configuration (Winter and Szulanski, 2001). Therefore investigating the business model from organizational perspective reveals three facts

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about the organization: first, the organization's internal and external activities with its partners and stakeholders in order to create and capture the value, second, the organizational units who perform activities and their interconnections, third, the mechanisms for the governance of different units involved (Saebi and Foss, 2015).

### **Strategic management trend**

Since 2002 academics from strategic management have increased their contribution to the business model literature by publishing articles. They influenced business model literature from the strategic management perspective and gave importance to strategic components of the business model (Chesbrough and Rosenbloom, 2002; Hamel, 2000; Wirtz, 2000). The importance of strategic aspects such as value creation, competitive advantage and performance influenced scholars to study the business model concept through strategic management perspective (Zott et al., 2011).

However strategic management and business model intersect but they are not the same (Wirtz et al., 2015; Zott et al., 2011); Strategic management, traditionally emphasizes on the competition and competitive advantage, while business model concept gives the impression that it concentrates on partnership, cooperation and joint value creation (Zott et al., 2011). In this view, the business model is not strategy but it may be the direct result of strategy (Casadesus Masanell and Ricart, 2010) or may play an important role in a firm's strategy (Zott et al., 2011). Therefore the business model may stand as a reflection of the firm's realized strategy (Casadesus Masanell and Ricart, 2010) or explain how the activities of the firm lead to executing its strategy (Richardson, 2008). The business model may be stand as a source of competitive advantage of the firm (Markides and Charitou, 2004) and helps the firm to compete among its rivals (Casadesus Masanell and Ricart, 2010). The business model may act as a unifying construct for the competitive advantage of the firm in order to mobilize and use its resources for providing better value for the customers and making money instead (Afuah and Tucci, 2001). Consequently business model may represent as a linking layer between strategy and operative implementation (Al-Debei and Avison, 2010; Solaimani, 2014; Wirtz et al., 2015) that contributes to the implementation of the strategy and facilitates the analysis, testing and validation of a firm's strategic choices (Shafer et al., 2005).

Several scholars have transposed different aspects of strategic management to business model through conceptual or empirical studies; as a conceptual work, Afuah, (2004)

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conceptualizes the business model as a set of determinant components of the firm's profitability. As an empirical work, Zott and Amit, (2007) focus on entrepreneurial firms and design its business model around a set of boundary-spanning transactions with partners. So they bridge the business model design and the firm performance for explaining the potential of the business model for value creation and reciprocally the firm's capability to capture value. They continue also their work for studying the impact of interaction between the firm's business model and product market strategy on the firm's performance (Zott and Amit, 2008). According to their studies, efficiency and novelty are important and the business models coupled with novelty, differentiation, cost leadership and early entry to the market have significant effect on the firm's performance (Zott and Amit, 2008, 2007). Patzelt et al., (2008) conducted another empirical study for types of business model within biotechnological firms and the effect of the top management composition on the organizational performance.

Most of the authors view the business model from the strategic point of view and attempt to integrate the strategic implications such as corporate strategy, mission, vision and possible strategic development paths to the business model concept (Wirtz et al., 2015). From the strategic point of view, the company and its partners are usually subjected to external pressures and regulations (Penna and Geels, 2015), moreover willing to run discovery-driven experimentations (Gunther McGrath, 2010) require applying the business model concept for explaining the value creation mechanisms and determining sources of competitive advantage. Therefore outcomes and consequences of business model in strategy include several issues such as value creation, competitive advantage and firm performance increase (Zott et al., 2011).

### **4.4. Categorizing the business model components**

Among the scholars who have provided a definition for business model, some of them have attempted to define the business model based on its components (Amit and Zott, 2001; Chesbrough and Rosenbloom, 2002; Demil and Lecocq, 2010; Magretta, 2002; Osterwalder, 2004; Shafer et al., 2005; Zott and Amit, 2010). As numerous authors from different disciplines such as strategy, innovation and organization have contributed to the business model literature, therefore different components are considered for the business model. Some authors consider the business model as a set of few components (Hamel, 2000) while some



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others attempt to take into account more components (Chesbrough, 2010; Osterwalder, 2004; Wirtz, 2000).

However scholars propose heterogeneous list of components for business model but the most mentioned components are the terms or combinations related to resources, competences, customer, partnerships, value and financial aspects (Wirtz et al., 2015). In this regard it would be pertinent to have an overview of the definitions and interpretations for these components in business model literature; in following section the most stated components in business model literature are discussed.

### **Resources and competences**

The aspects of “resources” and “competences” have attracted the attention of several authors, and both material and immaterial resources and competences have been pointed out. One of the main components of the RCOV framework proposed by Demil and Lecocq, (2010) refers to resources. They base their definition of business model on a framework consisting resources, competences, organizational structure and propositions for value delivery. Resources, either physical (e.g. equipment, products, stock, etc.) or human (labor force, etc.) may be provided externally or produced internally.

For Afuah, (2009), creating and capturing value requires tangible and/or intangible resources; tangible resources may be physical (e.g. plants, equipment, etc.) or financial (e.g. Cash). On the other hand, intangible resources represent nonfinancial and nonphysical resources (e.g. copyrights, patents, brand, research findings, trade secrets, relationships with customers and suppliers).

Afuah, (2009) considers the competences as organizational resources which may include the know-how and knowledge generated in the organization as well as the processes, culture and routines that are created and established within the organization.

Demil and Lecocq, (2010) define the aspect of the competences within the business model as the abilities and knowledge which are developed by managers for improving, recombining and changing the services that they can offer according to their resources.

### **Partnerships**

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Partnership has attracted significant attention from management science scholars and there exists a large body of literature on related issues to partnership. In parallel partnership has been also pointed out by some scholars dealing with the business model concept. In management literature, partnership has been discussed also within the issues related to alliances, cooperation and co-development. Zott and Amit, (2010) believe that the firm is able to create value in concert with its partners, in this regard the firm establish different business models according to its resources and capabilities as well as its partners. Osterwalder, (2004) dedicates explicitly one of the nine bricks of his proposition on the business model to the key partners and defines the partnership as a voluntarily initiated cooperative agreement between two or more organizations for conducting an activity or project cooperatively by coordinating essential resources and competences.

For Chesbrough, the business model describes the position of the firm among its value network including its suppliers and customers (Chesbrough, 2010). Demil and Lecocq, (2010) discuss that the “organizational structure” includes the network of relations that the organization establishes with its external stakeholders (i.e. customers, suppliers, competitors, etc.) for exploiting its resources and doing activities. They conceptualize the partnership component through organizational structure which involves the activities established with cooperation with other organizations. So the organizational structure of a business model implies to the value chain or network of activities that the firm and its external stakeholders such as suppliers and regulators belong to.

### **Value**

The notion of “value” has attracted significant attention of numerous scholars as a component of a business model; For Demil and Lecocq, (2010), value propositions are the products and services that a company delivers to its customers. Moreover the firm needs to reflect about the issue that to whom the value proposition will be marketed and how it will be delivered (Demil and Lecocq, 2010). The recipients of the value propositions may include end users, suppliers, competitors, sponsors and complementors (Demil and Lecocq, 2010).

For Chesbrough, the business model articulates the value proposition to the users, determines the value structure for creating and distributing the offer and evaluates needed complementary assets for supporting the position of the firm (Chesbrough, 2010).

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The point of view of Zott and Amit, (2010) on value creation and capture appears to have a larger vision on firm and its partners while they involve different interdependent activities of the firm with its partners in its business model, so the firm creates value jointly with its partners and attempts to capture its share of value. Moreover they identify four sources for value creation including novelty, lock-in, complementarities and efficiency. They emphasize on the centrality of value in the business model literature according to its high occurrence in various business model definitions by scholars from different fields of e-business, strategy, technology and innovation (Zott et al., 2011).

Bocken et al., (2014) base themselves on the Osterwalder's work on business model (Osterwalder, 2004) and abstract his framework to three components for business model that all imply to value: value proposition, value creation and delivery and value capture. For them value proposition includes products and/or service for customer segments that are offered through customer relationships. Value creation and delivery refer to key activities, resources, channels, partners and technology. For value capture they include just cost structure and value streams.

### **Customer**

Customer, customer segmentation, customer interface and channels are the issues that have attracted attention as a component or aspect of business model; Magretta, (2002) defines the business model based on customer, therefore the business model of a company should determine who are the customers, what is valuable for them, what they require and how the company may make money according to the answers of these questions.

According to customer-related issues, Osterwalder, (2004) considers three elements: customer segments, customer relationships and channels. He pointed out that understanding the relations between a company's value proposition and customers-related issues are important while today's e-business is more complicated than before according to wide spreading of new facilities to access customers and interact with them. Customer relationship determines the way a firm goes to market, how it reaches and interacts with its customers. Customer segments refer to the company's target customers to whom the value proposition is addressed. Target customers may be either businesses (BtoB) or end-users (BtoC) according to the value proposition of the firm and its business model. Moreover, determining the target

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customers for the value proposition assists the firm to decide about through which channels it prefers to reach its customers.

Chesbrough and Rosenbloom, (2002) also consider that one of the functionalities of the firm's business model is to identify a market segment, in this regard the firm will be able to understand to whom and why the technology (value proposition) is useful and what revenue streams are expected according to the customer segment.

Inspired by the multisided markets concept, Demil and Lecocq, (2010) involve a wider range of customers to their definition of business model and consider various kinds of customers such as end users, suppliers, competitors, sponsors and complementors.

### **Cost and revenue**

Financial issues of the business model including cost and revenues have been pointed out by several authors; for instance, Mahadevan, (2000) defines the business model as a set of three streams including value, revenue and logistics, so for him the revenue stream stands as a critical component of business model. Chesbrough and Rosenbloom, (2002) and Chesbrough, (2010) expect that the business model has to provide an estimation about the cost structure, revenue generation mechanism and profit potential for a given value proposition to a target customer .

Demil and Lecocq, (2010) define the RCOV framework for business model that consists of Resources & Competences, internal and external Organization and Value propositions; in this regard they consider the volume and structure of costs as a subset of Organization and the volume and structure of revenues as a subset of value propositions. For them, the revenue that the business model generates because of its value proposition includes also rents, royalties, subsidies, interests and asset handovers. On the other hand, value proposition require several activities for combining, integrating and developing resources that generate costs.

## **4.5. Concluding the reflections on business model concept and identifying the research gaps**

According to the literature review, the business model concept has been defined by various scholars from different fields of research including strategic management, electronic

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commerce, organization management, technology and innovation management. Subsequently different sets of components have been considered with the most references to components such as resources, value, competences, partnerships, customer, cost and revenue.

The literature review reveals three main research gaps: first, the business model concept has not developed in line with multi actor concepts. Second, most of the scholars who consider a set of components for the business model, they do not suggest a similar set of components. Third, the business model dynamics has not been studied properly.

### **4.5.1. Incompatible development of the business model concept alongside multi-actor concepts**

In parallel to the expansion of research on the business model concept in recent two decades, several concepts that deal with multi-actor contexts have been developed. Multi-actor contexts include a wide range of concepts such as business ecosystem (Moore, 1993), innovation ecosystems (Fautrero et al., 2009; Fernandez et al., 2006) value network (Allee, 2000), platforms (Gawer and Cusumano, 2002), open innovation (Chesbrough, 2003), co-innovation (Maniak, 2009; Segrestin, 2003), networked-enterprises and public-private partnerships.

The business model literature is almost firm-centric and there are few system-level viewpoints. Accordingly research efforts on the business model are quite far from research efforts on multi-actor concepts.

### **4.5.2. Dispersed considerations for the business model components**

Numerous contributions from different fields of research have resulted to dispersed considerations for the business model components. Accordingly scholars have not been agreed on a set of components for the business model. The lack of a definition for the business model components not only limits the creation of pertinent research questions but also blocks finding appropriate approaches for dealing the research question.

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### **4.5.3. Inadequate responsiveness to the business model dynamics**

Dynamics of the business model has not attracted enough attention from scholars while it requires to be studied both in terms of the dynamics among the components of the business model and also the evolution of the business model over time.

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### **5. Designing a conceptual framework for the business model of a public private ecosystem**

#### **5.1. Introduction**

Constructing the conceptual framework for this dissertation is influenced by several factors; first factor refers to the context of this thesis. It deals with the innovation ecosystem of urban passenger transportation that involves several actors from public and private sectors as well as the users. Second factor refers to the research gaps outlined from the literature. According to the literature review on multi-actor concepts, such as platforms, co-innovation, open innovation and public private partnership, it is understood that the research on business model could not be developed and enriched just by focusing on one firm. Multi actor contexts represent inter-organizational networks or societal systems that do not focus on one firm but shape a system. For constructing the conceptual framework, it is essential to clarify the underlying multi-actor infrastructure. Beyond the requirement for determining the underlying infrastructure, the business model components need to be defined. The last but not the least important issue would be having an understanding for business model dynamics.

#### **5.2. Business ecosystem and its value network as the underlying multi-actor structure**

As the firm and its business environment interact permanently, focusing on the firm's business model and detaching it from its business environment makes just a non-appropriate abstract. In other words, no business strategy or business model can be completely calibrated from its environment (Teece, 2010). In this regard, studying the business model requires a holistic and system-level perspective.

Several concepts help to go over a firm-level perspective and join different actors. Among multi-actors concepts it seems that the business ecosystem concept provides a better structure for understanding the value creation and capture mechanisms through a system-level perspective.

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The notion of business ecosystem concept not only provides a panorama of all the actors involved (i.e. firms, users, public authorities, etc.), but also supports an evolving context (i.e. business ecosystem evolution over time).

On one hand innovation requires a favorable ecosystem for its deployment (Iansiti and Levien, 2004a) and on the other hand an innovation with a pertinent business model may make more value (Chesbrough, 2010), therefore innovation deployment not only requires a business model but also it requires a pertinent business ecosystem.

The business ecosystem has several layers: the obvious layer includes all the stakeholders with whom the firm has relations such as suppliers, partners and customers (Chanal, 2011a; Chesbrough, 2010; Zott and Amit, 2010). On the contrary the hidden layer consists of actors who may not be interrelated to the firm directly, therefore their identification is more complicated and their influences are not negligible. Usually managers search for expansion and investment opportunities within their same old business ecosystem that is not helpful and effective for the firm in long term (Moore, 1996). In other words, the firm is interacting with its business ecosystem and not just with the actors with whom it has clear relationships such as suppliers and customers. Hidden actors may include competitors, society and public organizations. However they may not have direct relations with the firm but they reorient the business model of the firm. In this regard the firm requires being vigilant in order to maintain its position and tune its business model in accordance with changes in its business environment.

As instance, the automotive industry has been forced to add new business models to its portfolio of business model during the past two decades. Traditionally the automotive industry sells personal cars to its customers but recently several car manufacturing companies have introduced new business models such as selling functionality instead of ownership in carsharing services. This may be due to the shortcomings of public transport offers (e.g. insufficient public transport coverage in suburbs), the emergence of new actors (e.g. Uber, Car2go) and public policies (subsidies for electric vehicles). For example carpooling services as emergent new actors, following vast development in IT, have threatened the automotive industry by encouraging customers to share their vehicles.



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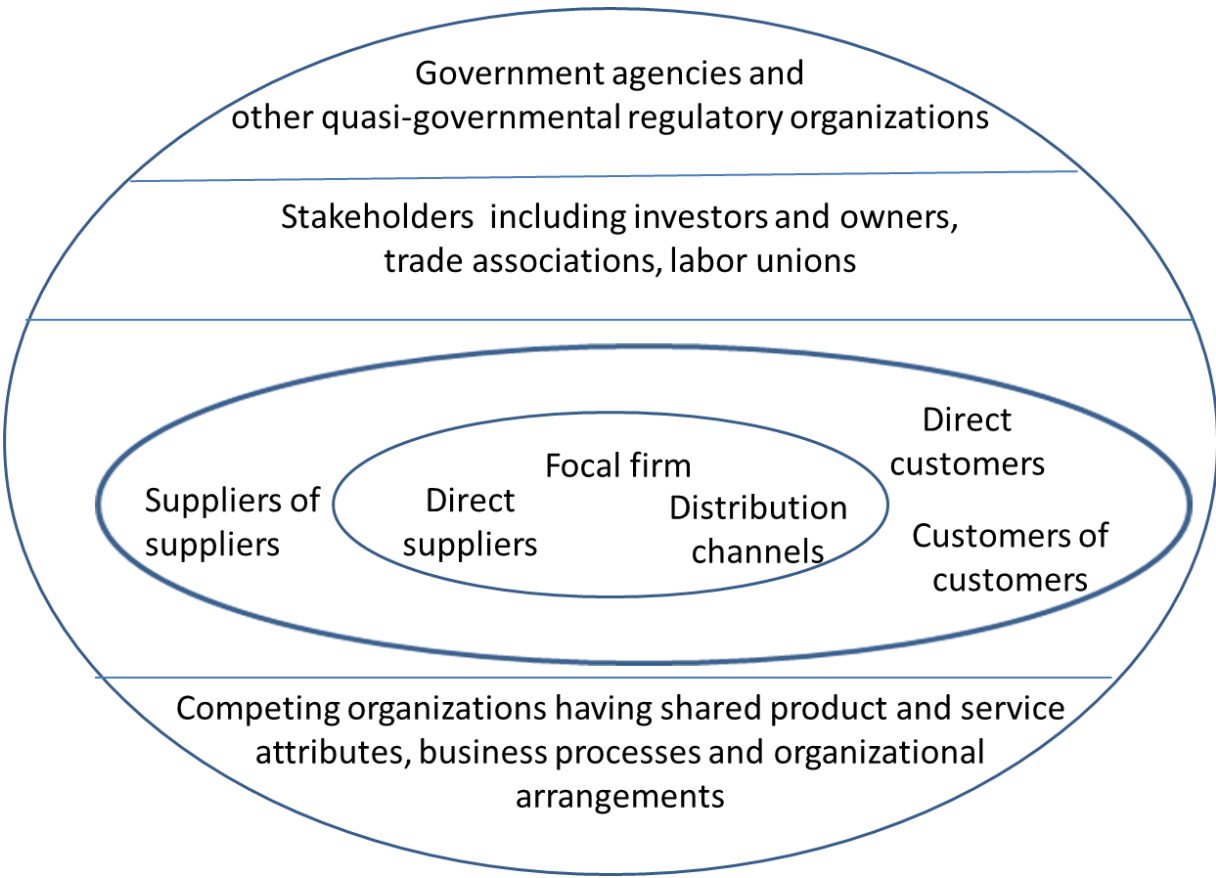


Figure 10: A typical scheme of the business ecosystem, adapted from (Moore, 1996)

However the business ecosystem concept provides a comprehensive perspective of all the actors involved, but it does not provide any mechanism to understand the interlinking and relations among the actors. According to the literature on business model concept, there are several conceptualization for the business model that suggest some kind of relation among different actors; as instance Zott and Amit, (2010) see the relations within the activity system including several actors such as suppliers and customers. Chesbrough and Rosenbloom, (2002) consider a value chain for creating and distributing value. Timmers, (1998) assumes the business model as architecture for the product, service, revenue and information flows.

However several scholars pointed out the existence of several flows and relations within the business model but they did not suggest explicitly a framework for decoding these kinds

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of flows and relations. I think that transposing the value network concept (Allee, 2000; Brandenburger and Nalebuff, 1995) to the business model concept fills this gap satisfyingly.



Figure 11: A scheme of the value network, adopted from (Allee, 2000, p:3)

Allee, (2000) assumes that a value network generates economic value through complex dynamic exchanges between one or more enterprises, customers, suppliers, strategic partners and the community.

Complex dynamic interactions among the actors include both tangible and intangible values. Tangible values like products and services are exchanged for money and they generate the monetary flows. Tangible deliverables and exchanges are transactions that are contractual or mandated. They are normally expected and if they are not delivered, any payment will be occurred (Allee, 2011). On the contrary intangible values are those who go beyond the actual offer and that are not accounted for in traditional financial measures. Intangible values such as certain kinds of knowledge or information exchanges, sense of community, customer loyalty, image enhancements or co-branding opportunities build relationships, keep things running smoothly and make actors engaged in the activity (Allee, 2011, 2000). These intangible values are able to be converted into intangible assets for organizations.

The concept of value network is helpful for considering different value exchanges among the actors; in other words it provides a frame for considering different value propositions that may exist simultaneously within the business ecosystem and influence each other. For example, the urban passenger transport in a zone is a combination of public and

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personal transport. This perspective includes also the competitors and provides a holistic view of the business ecosystem.

The value network concept has been used by Chanal (2011b) in order to explain the interactions and flows among potentially involved actors. However her contribution stands as a noticeable use of the value network concept for the business model, but there remains still shortcomings and limitations to overcome in order to make it appropriate for the business model of ecosystem. The author proposed a methodology to map the various actors (companies, public organizations, customers) who play a role in the final value proposition. This approach zooms-out and gives the overall picture of a complex offer, which is necessary to understand the ecosystem in order to prepare for changes and rivalries (Lavoisy et al., 2011). Its financial flow aspect also allows visualizing the linkages between actors, but it does not provide an understanding of the overall contribution and gain of actors and subsequently the overall economic viability of the project.

This dissertation proposes to transpose the value network concept to the business ecosystem concept in order to shape the underlying infrastructure for the business model in the multi actor context. This proposition is the result of the literature review alongside the action research.

### **5.3. Business model components**

Building on the insights from previous chapters, I think the business model concept requires being adapted to multi-actor contexts. Existing definitions of the business model are almost firm-centric and it is the same for suggested components. As described, the business ecosystem concept appears pertinent as the underlying structure and provides a system-level perspective. It can become more appropriate by transposing the value network concept that unblocks the value flows among the actors. According to the defined structure for business model, I would like to suggest three main components for the business model of ecosystem: offer and demand systems as well as value structure.

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### **5.3.1. Offer and demand systems' configurations**

The context of this dissertation is the public private partnership for innovation; therefore its business model could not be abstracted just to a product which is offered to a customer. Two reasons are:

First the product and/or service which are being created (e.g. autonomous vehicle and its mobility) are too complex to be realized by one firm individually. In fact the innovation does not stand alone and requires the collaboration of several actors within an ecosystem of interdependent innovations (Adner and Kapoor, 2010). As instance the Airbus's A380 airplane stands as a complex innovation which mobilized designing and manufacturing capacities of Airbus and its suppliers for subassemblies and components. For making the A380 useable and functional, some other actors such as airports were required also to innovate.

Second, innovating complex products is expensive and expecting to gain direct profit from selling it to the final customers is thus far. It means that who uses a product and/or service is not necessarily who pays for it. The market platforms are the examples that emphasize this view.

According to these reasons, it seems that it is necessary to move from the "firm" toward the "offer system" and from the "customer" to the "demand system".

Concerning the offer system, Roehrich and Llerena (2011) categorize three types of actors: the actors who innovate, the actors who produce and the actors who offer. By this categorization, they assume that the innovator may not be the producer and the producer may not be necessarily the actor who offers the product and/or service. In another point of view, Boons and Ludeke-Freund (2013) see the offer system from the supply chain management perspective and assume that the supply chain includes suppliers who are responsible to their own and the focal firm's stakeholders. For Adner and Kapoor (2010), the offer system involves not only the suppliers and the focal firm but also the complementors. All these scholars see the offer system from its industrial side and they do not assume any actor from public sector. It seems that the offer system should include also public actors while several value propositions such as roads, public transport, hospitals, power plants and schools are

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public or semi-public infrastructure facilities that involve public organizations or authorities among their offer systems. Therefore the offer system includes all actors from both public and private sectors who have a role in innovation such as designing, producing, offering, supporting, promoting and etc.

Several products and/or services have been offered to the users who are not necessarily the payers. As instance non-for-sale newspapers as a market platform make profit from advertising and offer a free newspaper to users (Eisenmann et al., 2006; Gawer, 2014). The market platform concept invites explicitly to distinguish between user and payer. Roehrich and Llerena (2011) complete the demand system configuration by adding the actor “who needs” to different roles within the demand system.

### **5.3.2. Value structure**

The notion of value stands as a complex issue and has been studied from different perspectives. Scholars from different management science fields such as marketing and strategy have contributed to clarify the notion of value. From the marketing management point of view, different types of value for customers have attracted more attention. Strategic management literature considers also several indirect effects of value such as developing specific competences. The business model literature assumes different aspects for value, as instance value proposition and value creation have been emphasized. In fact, in business model literature, the term “value” has been used to explain different meanings. Moreover numerous combinations with the term “value” have been created in business model literature to explain different sides and implications of the notion. A variety of combinations include value proposition, value delivery, value creation, value appropriation, value structure, etc.

Not only there are different definitions for the notion of value but also there are different perspectives and scopes for understanding it; some authors view the value only for the customer while some others expect value for the firm. Beyond the firm-level perspective, there are really few instances for considering value for different stakeholders.

Another disagreement among the scholars on the notion of value refers to what really value stands for; in other words there is not a common agreement on taking into account all types of value including tangibles and intangibles. It seems that tangible values including

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product, services and money are at the focus of scholars while intangible values are more or less neglected.

According to these disagreements about the notion of value, it appears that clarifying this notion of value from different aspects may help to construct the “value structure” component of business model. In this regard both tangible and intangible values for customer, firm and ecosystem levels require to be considered.

The notion of value for customers has been studied from marketing and strategic management perspectives; from the marketing management literature the BtoC marketing had been the traditional logic for conceptualizing the value creation of the producer versus consumer. In this view, the consumer stands as a passive target with no contribution to the value creation (Vargo and Lusch, 2011). In this regard the consumer is considered as the recipient of values offered by business.

From the strategic management point of view, Porter, (1985) considers the value as the amount of money that costumers (buyers) are willing to pay for a product or service; therefore in his definition he does not assume any kind of intangible values or benefits.

Porter, (1985) divides a company’s processes into primary and support processes. As proposed by him, the business processes may be a linear chain of activities, forming a straight line of input/output. Porter, (1985) classifies the company’s activities into primary processes (i.e., activities that are involved in the physical creation of the product or service, e.g., in/outbound logistics, operations, marketing and sales, delivery, after sale servicing), and support processes (i.e., activities that are involved in providing the inputs and infrastructure that allow primary activities to take place (e.g., procurement, human resources, technology development and firm infrastructure).

The value chain concept (Porter, 1985) is embedded in industrial age production line model, where value is created through the value chain, this concept has been gradually outmoded by the value network or value web and reconfiguration of the business from value chain to the more fluid structure of value network (Allee, 2000). The value chain concept covers nearly just tangible values and simply decomposes the chain in order to map the

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activity and it does not integrate completely the stakeholders' intervention in the value creation processes (Maucuer, 2013).

Within the marketing management literature, it appears that Holbrook's typology of consumer value is one of the most complete ones that cover both tangible and intangible values for the consumer. He assumes the value as a trade-off of the benefits that the customer receives in place of the sacrifices for a particular good or service (Holbrook, 1995). This typology identifies eight different kinds of values consisting efficiency (e.g. convenience), excellence (e.g. quality), play (e.g. fun), aesthetics (e.g. beauty), status (e.g. success, impression or management), esteem (e.g. reputation, materialism or possessions), ethics (e.g. justice, virtue or morality) and spirituality (e.g. faith, ecstasy or sacredness). The consumers may attain these values through consumption. The different types of consumer value are categorized according to three dimensions; whether the value is extrinsic or intrinsic, self or other oriented and active or reactive. An extrinsic value is instrumentally derived rather than through the act of consumption as an end itself; on the contrary an intrinsic value sees a consumption experience as an end-in-itself. The self-oriented value is derived from product or service and their effect on the customer and other-oriented value is derived from the reaction of others to the customer's ownership of product or use of service. Active value results from the physical or mental manipulation of some product or experience; by contrast, reactive value entails a more distanced admiration or appreciation of the relevant object.

Afuah and Tucci suggest that the firm should understand its product-market position and its value configuration; customer value as a component of product-market position deals about that customers must find some value in the technological innovation, the customer value would be in the form of low cost or differential attributes as perceived by customers (Afuah and Tucci, 2003).

Osterwalder distinguishes four values for customer: use, risk, effort and price. The value of use is produced through use and the assumed customer value matches perceived customer value during the consumption of product or service (e.g. driving a car). The value of risk is produced by reducing the customer's risks (e.g. car insurance). The value of effort means that the offer should make the customers' life as easy as possible. Each value proposition to the customer (product and/or service) has a price which belongs to one of these categories: free,

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economy, market and high-end. Sometimes companies offer a value to the customer without asking them to pay for it. The price would be in economy level where a company offers a price below than at least one of its main competitors otherwise the price would be in market level or high-end level which are usually found in luxury products or innovative products that still allow charging a premium (Osterwalder, 2004).

In bridging the value network concept with BtoC marketing concept, an opposition arises; as mentioned before, in marketing management literature, within the BtoC concept the consumer is considered as the target for value without contribution to value, on the other hand the value network concept provides two categories of value: tangibles and intangibles. Tangible values basically include products, services and money while intangible values include a wide range of non-monetized values. In this regard through transposing the value network concept to BtoC marketing concept, the passive role of consumer as the recipient of the value is under question.

Value structure can be studied from different aspects for firm-level perspective; on one hand the value creation and capture of the firm can be studied through BtoC model and on the other hand through BtoB model.

From the BtoC view, as discussed, regarding to value perspective for the consumer, economic actor provides a product and/or service, which may include also some intangible values, to the consumer. And the consumer pays for the product and/or service. Moreover the consumer may create also some intangible values for the firm. As instance, existing customers stand as valuable assets for the company (Reichheld, 1996).

The firm's interaction with other firms has been studied in BtoB marketing mainstream; in fact, nowadays many companies offer complex product systems rather than a simple product. The car manufacturing or airplane manufacturing companies are examples of companies who offer complex products. In this regard the product is not produced by only one firm but by an economic system including several suppliers, distributors (Vargo and Lusch, 2011) and complementors. This view of the business led to emergence of the supply chain concept that included also business logistics and customer service. By emerging information technology the supply chain management concept has been developed for



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explaining flow of materials and information both within and across firms (Mentzer, 2001; Tayur and Ganeshan, 1999). Accordingly BtoB marketing model has taken broader application.

Marketing management scholars conventionally have focused on customer or firm level perspectives through studying the BtoC model. It is about a decade that they have started to study the BtoB model which implies to their will to shift from single-actor perspective to the broader perspective. Business marketing scholars have shifted from considering the exchanges in terms of products and/or services to concepts of value (Lindgreen and Wynstra, 2005; Vargo and Lusch, 2011). In this regard, in the business relation context, cooperation is undertaken for realizing joint outputs while the interaction between supplier and customer is still critical (Lindgreen et al., 2012). This serves for a service view of value creation based on co-creation of value by different actors, their engagements and inter-linked resources. In this regard all economic and social actors (e.g. businesses, customers, etc.) through a systemic interplay and interrelated system of reciprocal provisions integrate their resources for co-creating value and providing services (Vargo and Lusch, 2011). For example, innovation in automotive industry (i.e. totally new attributes added to the car or improved attributes of the car) create several values other than only financial value (Maniak, 2010). Value is a multi-dimensional concept and all dimensions of value should be understood, in this regard innovation may create several values other than only financial value. In this regard improving or adding a feature or specific attribute could increase the value of product, so the car manufacturing company can make profit from it through mass production. Moreover adding innovative features contribute to the enhancement of the brand and may create direct profits for the firm or can add sales volumes.

According to Vargo and Lusch, (2011) having a wider perspective on value, brings into account not only the firm and customer but also the networks of resource-providing actors and resources. They introduce the service-for-service exchange and outline that actors interact in society in order to co-create value. Value co-creation holds the actors including economic units together. Therefore they resume that society is the result of the necessity of mutual value creation through mutual service provision (Vargo and Lusch, 2011, p:184).

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From the ecosystem level view, the development of the whole economic network is the central concern versus the firm level perspective in which the firm's growth is the central concern (Moore, 1996).

In the firm-level view the cooperation is limited to direct suppliers and customers of the firm in order to maintain existing industry and market, but having an ecosystem-level perspective supports expecting to include other actors for searching new ideas and shaping new communities for innovation (Moore, 1996), this is in line with open innovation (Chesbrough, 2003) and profiting from innovation (Teece, 1986). In other words ecosystem-level view helps the firms broaden their boundaries in order to import new ideas as intangible values from outside or export their knowledge, know-how and innovative ideas for making money as tangible value.

As described in this section, different scholars from different management science disciplines have different perspectives of the notion of "value". According to the context of this dissertation, the "value structure" component of the business model of ecosystem requires to be defined as a dynamic value exchange among different actors of the ecosystem. Accordingly value exchange includes tangible values as well as intangible values. Moreover value exchange goes beyond a simple transaction between any two actors; in this regard system-level perspective facilitates considering the value exchange within the business ecosystem. In other words value creation and capture are not only taken in to account as the transaction among any two given actors but also are considered as a transaction with the entire ecosystem.

### **5.4. Business model dynamics**

Most of the contributions to the business model literature have a static view while it appears that it is necessary to pass to the dynamic view for business models. This need has been confirmed recently by few scholars (Casadesus Masanell and Ricart, 2010; Cavalcante et al., 2011; Demil and Lecocq, 2010; Voelpel et al., 2004; Wirtz et al., 2015).

Demil and Lecocq, (2010) define the business model as a framework consisting, resources, competences, organizational structure and value propositions. They call it RCOV

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framework and discuss that there are interactions among the business model components; the organization accumulate resources over time that constantly react with each other and with other components. These reactions over time create unique combinations within the firm and shape particular capabilities of the firm that contribute to its differentiation from other companies (Demil and Lecocq, 2010). Consequently, the organization's management may articulate accumulated resources and capabilities for proposing new products and services to the markets.

Some authors bridge the business model dynamics with innovation; as instance, Voelpel et al., (2004) state that only the disruptive or radical innovation leads to innovating the business model. Casadesus Masanell and Ricart, (2010) point out that firms are forced to innovate their business models because of external drivers such as globalization, deregulation and technological change, therefore they require always to analyze their competitive environment and develop competitive advantages.

However there are some few temptations for integrating a dynamic perspective to the business model concept in recent years (Casadesus Masanell and Ricart, 2010; Cavalcante et al., 2011; Demil and Lecocq, 2010; Wirtz et al., 2015) but existing literature has mostly taken a static perspective regarding the business model (Linder et al., 2010; Wirtz et al., 2015). And mechanisms of business model innovation are less deliberated. The interaction between business model components pointed out by Demil and Lecocq, (2010) appears as an interesting issue, but it is conceptualized only within the RCOV framework. This research gap requires to be filled by applying a system-level perspective to business model, consequently the interactions between the components need to be studied and underlying mechanisms necessitate to be identified.

Innovation ecosystems are complex and uncertain, they require several actors from public authorities, industrial companies and customers to come on board the project and collaborate together, while they may have not enough information about the project, their contributions and their potential advantages. Particularly the formation stage of innovation ecosystem necessitates different management principles from routine product development projects. An ideal business ecosystem and its associated business model are not established

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from the beginning, but they shape gradually. Therefore it is interesting to understand the dynamics of an innovation ecosystem over time.

In this dissertation, the business model dynamics is conceptualized in two attitudes: first, it outlines the lateral dynamics and interactions among the components of business model and second it portrays the longitudinal dynamics of the business model over time. The first attitude incorporates the effectuation concept (Sarasvathy, 2001) with the components of the business model and tries to define the dynamics among the components in order to explain the proactive business model innovation (see chapter 5). Second it depicts the longitudinal dynamics of the business model over time by taking attention to the specifications of exploration projects (Lenfle, 2008) and value creation and capture mechanisms within the business ecosystem. The business ecosystem involves all the actors from public and private sectors as well as the users and is pertinent for being used in explaining the longitudinal dynamics of the business model over time (see chapter 7).

### **5.5. Conceptualizing the business model of ecosystem, its components and dynamics**

As discussed in this chapter and also previous chapters, through the action research methodology, the need for adopting a multi-actor concept has been identified. Therefore following the literature review the business ecosystem concept has been selected as the underlying structure for the business model of ecosystem. The business ecosystem concept assists to have a system-level perspective for business model and consequently its value structure. The business ecosystem concept provides a comprehensive perspective of all the actors involved. In order to understand the interlinking and relations among the actors the value network concept has been transposed to the business ecosystem concept. Subsequently the business ecosystem and its value network configure a pertinent structure for the business model of ecosystem. The notion of business ecosystem concept not only provides a panorama of all the actors involved (i.e. firms, users, public authorities, etc.), but also supports an evolving context (i.e. business ecosystem evolution over time). The value structure in the broad sense includes value creation and value capture. Therefore any actor from offer and/or demand systems may create some types of values and capture some other types of values.

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In this dissertation, the business model of ecosystem is conceptualized as set of three main components: the offer system, the demand system and the value structure. Moreover two kinds of dynamics are considered: first, the dynamics among the components of the business model and second (lateral dynamics), the dynamics of the ecosystem over time (longitudinal dynamics). Figure 12 shows the designed conceptual framework for the business model of ecosystem.

Conceptualizing the business model of ecosystem assist to better formulating the research questions based on the context of the research and literature gaps.

The dynamics among the business model components will be discussed in chapter 5. In this chapter the research question is formulated as “what are the mechanisms of business model innovation?” In this regard it distinguishes two different approaches for the business model innovation: reactive and proactive. In reactive business model innovation, the demand system determines the offer system while in proactive business model innovation the offer system determines the demand system. Therefore chapter 5 deals with the components of business model and their dynamics. Particularly it introduces the mechanisms for proactive business model innovation through applying the effectuation concept.

Chapter 6 depicts the value structure of the business model of ecosystem and particularly deals with the cost-revenue structure. It aims to respond to the question “How to evaluate the business model of a public private ecosystem?” In this regard it focuses on the financial flows among the actors of the ecosystem and proposes a method for evaluating the business model of ecosystem.

Chapter 7 deals with the question “ what is the dynamics of an innovation ecosystem over time?” and portrays the longitudinal dynamics of business model by focusing on the life cycle of business model and taking into account all the tangible and intangible values created and captured by different actors through the innovation experimentation in Satory.

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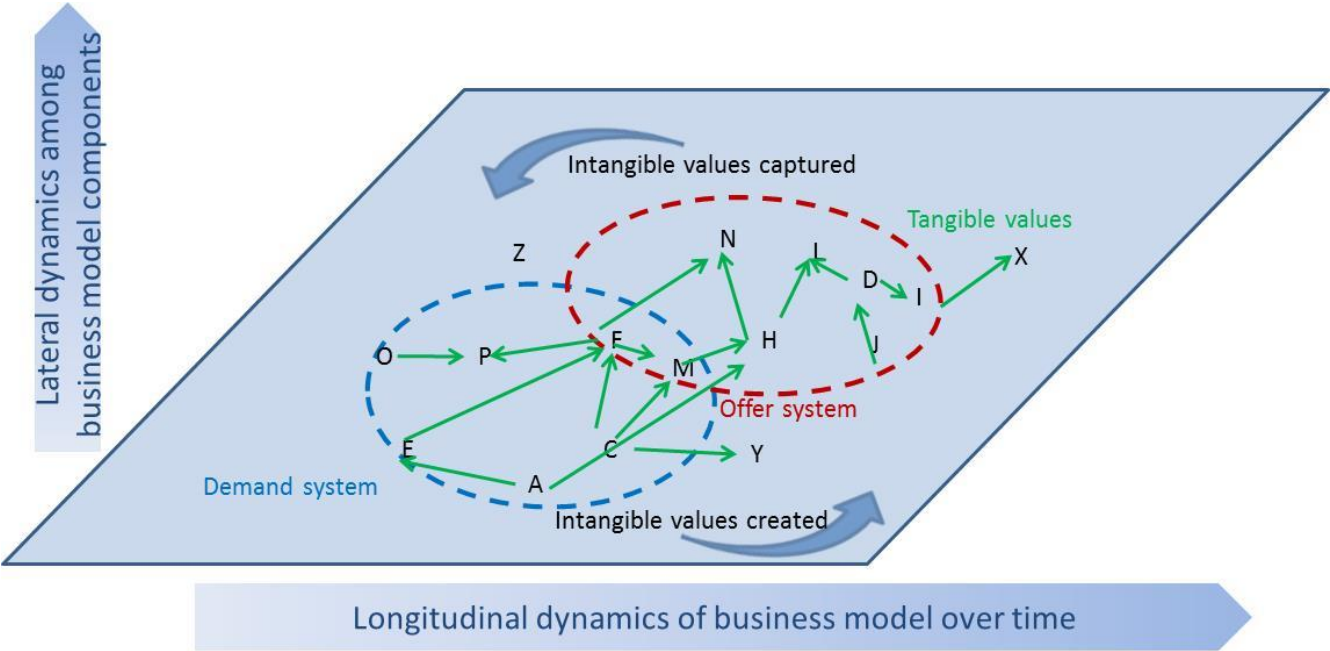


Figure 12: The conceptual design for the business model of the innovation ecosystem

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**Part III: Discussing the results: business model  
innovation mechanisms, a management tool design  
and the business model dynamics**

## **Chapter 6: Business model innovation through effectual processes**

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# **6. Business model innovation through effectual processes**

## **6.1. Introduction**

Business model and business model innovation have attracted significant attention in recent decade. Business model as a coherent set of business variables surrounding a given technology, proved to be very useful in gathering different variables (value proposition, partners, resources, revenue structures, etc.) in a consistent way. Business model innovation provides a dynamic perspective to business model, its components and their interactions. Despite the considerable importance of business model innovation, underlying processes are less deliberated while business model concept itself is largely under exploration, consequently there are few evidences and theoretical propositions for business model innovation processes.

In parallel, the concept of effectuation has been introduced to the entrepreneurship literature, mainly focusing on the entrepreneur's behavior for launching a business. Sarasvathy introduced the concept of effectuation as a decision process of expert entrepreneurs. The effectuation logic – contrasting with the causal logic – explains how entrepreneurs launch a new business and modify their identity, resources, competences, expertise and partners (Sarasvathy, 2008, 2001). The effectuation logic differs from causation logic that concerns about taking a strategic goal as given and choosing the means in order to achieve this goal. The effectuation processes relies on a set of available means and reflection about the possible effects (Sarasvathy, 2001).

Surprisingly, these two bodies of literature remained largely independent from each other. In this part, I discuss about the application of causation and effectuation logics in business model innovation, and respectively I define reactive and proactive approaches for business model innovation. Reactive business model innovation is a common approach which is adopted by most of the managers in response to threats or opportunities raised from external or internal factors. This approach is used by managers in established businesses to maintain the competitive advantage. However maintaining and developing established



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businesses of the firm may contribute to its competitive advantage, but innovation is another lever to do so. Moreover uncertainty and lack of information come with innovation; therefore causation logic is somehow incapable to foster innovation particularly in early stages. On the contrary the effectuation logic assists the managers to deal more efficiently with uncertainty in innovation. Therefore this part of dissertation is dedicated to discuss the relevance of transposing the effectuation logic to business model innovation. Particularly the transposition of effectuation logic to the modules of offer system of business model including resources, competences and partnering is investigated. The dynamics of partnering among the actors to exploit resources and competences is crucial to create new business models.

The main theoretical background of this part of research is the effectuation concept; according to the literature of the effectuation concept, in this part of research its definition and dimensions are explained. The effectuation concept which is introduced to entrepreneurship literature in early 2000s refers to study of the behavior of expert entrepreneurs. Different contributions to the effectuation concept reveals different dimensions of this concept including the available means, entrepreneurial expertise, reorienting the contingencies, accepting the affordable loss, dealing with the uncertainty and gradual evolution possibility.

In this part of the dissertation, two cases are studied; first the Bollore group and second the Vedecom Institute. As the element of time is central to this research, therefore the methodology in this part is process case study research. Process case studies study a series of interrelated events over time and attempt to explain how and why things emerge, develop, grow and terminate over time. The Bollore group as the first case is studied; the research focuses particularly Bollore's industrial businesses during a period of 15 years. The company has developed its businesses from manufacturer of rough goods to the provider of electric vehicle car sharing service and energy solutions. The Bollore group was a pertinent case, since its business model dramatically evolved in a 15-year timeframe from the thin film producing industry to an electricity and mobility service operator. The second case concerns the autonomous vehicle project within the Vedecom institute and finds out the roots and development path of the business model of this research project. The evolution of the business model of this case is also interesting as nowadays it is known as the autonomous vehicle project while it was founded first working on safety issues in transportation.

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In this part of the dissertation, the objective is to find out the dynamics and underlying mechanisms for the business model innovation. If the business model includes the offer and demand systems and value structure, therefore different types of articulations among these elements lead to different approaches for the business model innovation. So two different approaches for business model innovation are defined, first one is the reactive business model innovation, this approach is used by managers to overcome the influencing factors that influence their businesses. The second one is the proactive business model innovation that is adopted to foster the innovation in uncertain conditions. Reactive approach is based on the causation logic while the effectuation logic assures appropriate conformity to proactive business model innovation. Effectual processes may be used as a framework for business model innovation in established companies who have also entrepreneurial attitude to enhance their business model portfolio, to enter in totally different businesses and to enact new markets. Effectuation logic facilitates to interpret the dynamics of the offer system of the business model, particularly its application to three basic modules of offer system including resources, competences and partnering, explains how a company modifies its business model overtime. This chapter brings effectuation logic and applies it to the business model innovation, in order to provide meaningful contribution to this body of literature. In parallel it assists the innovation managers to reshape their approaches in order to perform more efficiently in uncertain situation of some projects that have high level of innovativeness.

### **6.2. Theoretical background**

The theoretical background of this chapter refers to the effectuation concept which is introduced to entrepreneurship literature since early 2000s. Effectuation reasoning explains the creation of new effects by using available means (Sarasvathy, 2001). As the global context of the dissertation is the innovation, this body of literature attracted me to investigate it more.

#### **6.2.1. Effectuation logic in entrepreneurship literature**

Effectuation reasoning (Sarasvathy, 2001) is one of the several theoretical perspectives that has emerged in recent two decades to describe the logic and behavior underlying the entrepreneurial process (Fisher, 2012). Effectuation stands as the logic of entrepreneurial expertise, a dynamic and interactive process of creating new artifacts in the world

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(Sarasvathy, 2008). The effectuation in contrast to causation was derived from Simon's work on the science of the artificial (Simon, 1996) by Sarasvathy. Effectuation lies on the concept of enactment (Weick, 1979); in organizational life, people try to shape and create the environment they face (Weick, 1995) though managers construct, rearrange, single out, and demolish many objective features of their surroundings, and literally create their own constraints (Fernandez and Vian, 2012; Weick, 1979).

This new theoretical perspective has principally sought to describe the differences between the traditional approach to entrepreneurship, called the causal reasoning by Sarasvathy (Sarasvathy, 2001) to an alternative approach.

Despite of the potential effectiveness of effectuation in entrepreneurship literature, it has not grown appropriately. Most of the articles with reference to effectuation concept were written by Sarasvathy or her contribution as the co-author, but among the rest articles written by other scholars, some of them acknowledge the effectuation while others do not (Arend et al., 2015).

Fisher approves the effectuation as a theoretical perspective in entrepreneurship which explains individual behavior for the creation and development of new ventures (Fisher, 2012). Coviello and Joseph, (2012) acknowledge the effectuation as an explanation of success in new product development. On the other hand, however Perry et al., (2012) acknowledge effectuation as a pragmatic shift in the way that entrepreneurship is explained, but they emphasize on the necessity for testing it empirically. Moreover they question the effectuation because it challenges the routines and it is difficult to develop consistent and observable behavioral variables from a cognition-based theory.

Arend et al., (2015) believes that the effectuation has several basic criteria for theory building and there is value in the effectuation reasoning to open new insights in entrepreneurship, but it lacks testing and critical analysis.

### **6.2.2. Effectuation reasoning versus causation reasoning**

Effectuation processes take a set of means as given in order to reach possible effects that might be created with that set of means (Sarasvathy, 2001). Sarasvathy argue that

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entrepreneurs use effectual reasoning and tend to find ways to reach the market with minimum expenditure of resources such as time, effort, and money versus strategic managers who use causal reasoning and analyze the market and choose target segments with the highest potential return (Sarasvathy, 2001). In effectual reasoning goals are not predetermined nor clearly specified, goals emerge through the process, they reframe the initial set of opportunities that the firm seeks to realize and they reshape and transform the environment in which the organization operates (Dew et al., 2008).

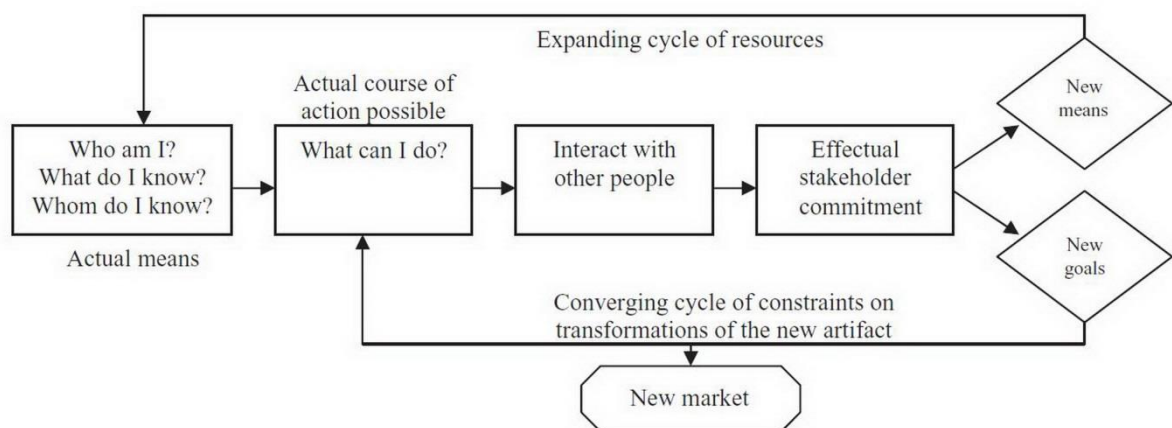


Figure 13 : The dynamic model of effectuation, source : (Sarasvathy, 2008, p:101)

Entrepreneurs act not only within market environments, but also sometimes end up enacting new markets not predictable ex ante (Dew et al., 2008). Effectuation logic is tied to strategy and include a selection of alternatives based on loss affordability, flexibility, and experimentation, therefore the entrepreneur is the developer of opportunity by experimenting and changing direction as new information becomes available (Sarasvathy, 2008).

According to the effectuation theoretical perspective in entrepreneurship, entrepreneurs focus primarily on the resources they have at their disposal and ignore market requirements while uncovering an opportunity, furthermore they ignore anticipating long-term returns and focus primarily on what they are willing to lose in making decisions, particularly when they aim to pursue an opportunity, they refuse to complete the resource limitations and avoid long-term planning and objectives (Fisher, 2012).

Entrepreneurs start with means in contrast to start with end goals, they are ready for an affordable loss instead of expecting return when evaluating options; they leverage

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relationships instead of competitive analysis when assessing relationship with other individuals and organizations; and they exploit contingencies instead of avoiding them (Sarasvathy, 2008).

When the entrepreneurs start with means, it describes that how they make important decisions by focusing on the resources under their control rather than focusing on a predefined end goal (Sarasvathy, 2008). They make decisions based on what they are willing to lose and accept to dedicate a specific amount of resources that may be lost (Chandler et al., 2011), though if they fail, they will fail early or at lower levels of investment in contrast to causation processes (Fisher, 2012). They leverage strategic relationships by building partnerships rather than doing systematic competitive analysis as a strategy formulation, therefore they focus on whom they can work with rather than compete with. They welcome contingencies and unexpected events and turn them into profitable opportunities (Sarasvathy, 2008).

Successful early entrants into a new industry are more likely to use effectuation processes rather than causation processes; they uncover and exploit opportunities in new markets where uncertainty is in maximum level (Sarasvathy, 2001).

Effectuation explains the enactment of experimental and iterative learning that enable entrepreneurs to discover information about the future as time passes (Sarasvathy, 2001) . Effectuation leads to the examination of the means available to the entrepreneur (Fisher, 2012) therefore the entrepreneurs perform the activities and allow goals to emerge as the resources, competences and partners evolve over time.

### **6.2.3. Effectuation multidimensional construct**

Effectuation reasoning provides a multidimensional construct: the first dimension is about the means that the entrepreneur has at his disposal including his traits, tastes, abilities, education, training, expertise, and experience, his social and professional network.

The second dimension is the entrepreneur's ability to turn the unexpected into the profitable. The third dimension concerns about reorienting the contingencies. The fourth dimension is accepting affordable loss instead of expecting for profits and returns. The fifth

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dimension is the possibility to deal with the uncertainty and the last dimension is about the potential gradual evolution. These dimensions are discussed as below:

### **6.2.3.1. The entrepreneur's available means**

According to the definition of effectuation by Sarasvathy, “effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means” (Sarasvathy, 2001; p:245). At individual entrepreneur level, means include three different categories that entrepreneur has at his disposal: first his traits, tastes and abilities, second his education, training, expertise, and experience, third his social and professional network. Sarasvathy reformulated these categories in three simple questions: who am I? What do I know? And whom do I know? (Sarasvathy, 2001).

When an entrepreneur questions himself “Who am I?”, “What do I know?”, and “Whom do I know?” the answers assist the entrepreneur to reflect about “What can I do?” (Sarasvathy, 2001). This question leads to create new effects according to the entrepreneur's available means.

Hereafter the available means of the entrepreneur will be discussed:

#### **6.2.3.1.1. Entrepreneur's reflection on his traits, tastes and abilities**

When an entrepreneur reflects about the question “who am I?” he considers all his traits, tastes and abilities. He focuses primarily on the resources that it has at his immediate disposal, ignores market needs in uncovering an opportunity, refuses to enact the resource limitations dictated by the environment and commits only limited amounts of resources to the venture at the time (Fisher, 2012). Consequently in the firm-level perspective when an entrepreneur firm reflects about “who I am?” it considers all its human, physical, capital and financial resources (Barney, 1991; Demil et al., 2014). For example a car manufacturing company has different production workshops, has financial assets and benefices its work labor including managers, workers, accountants and engineers.

#### **6.2.3.1.2. Entrepreneur's education, expertise and experience**

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Each entrepreneur has his education, expertise and experience; all these stand as a part of the entrepreneur's available means.

Previous knowledge, experience (Fisher, 2012) and expertise are crucial to opportunity recognition in entrepreneurship. Entrepreneurs identify different entrepreneurial opportunities due to their knowledge and prior experience (Fisher, 2012; Grégoire et al., 2010; Shane, 2000). They exploit their prior knowledge to create preinventive structures that interact with the constraints of the activity to develop creative solutions (Fisher, 2012; Perry et al., 2012).

Entrepreneurs take action and engage actively with problems or opportunities (Fisher, 2012), they are the experts who learn by doing and doing (Greeno and Simon, 1988), this emphasizes on the importance of experimentation in the discovery, development (Gunther McGrath, 2010) and gathering experience.

In the firm-level perspective, the question of “what do I know?” may reflect the know-how, knowledge, expertise and experience of the firm in a specific domain. For example a car manufacturing company has different types of know-how, knowledge, expertise and experience in relevance to producing a car.

However experience is important for the firm to move towards new businesses but controversially extensive experience does not lead to superior performance, it may make experienced entrepreneur firms to infer too much from too little information and misinterpretation evidence that confirms prior beliefs (Dew et al., 2009a).

### **6.2.3.1.3. Entrepreneur's personal or professional network**

Pre-commitments have several benefits for the entrepreneur; Pre-commitments and strategic alliances stand as mechanisms to control the future and to overcome the uncertainty (Sarasvathy, 2001), they reduce uncertainty by providing new information (Arend et al., 2015). Pre-commitments provide more resources and expand capabilities for new businesses, products and services and minimize the cost of experimentations and maintain flexibility (Chandler et al., 2011). Moreover pre-commitments are provisions of resources that are shaped before the entrepreneur's offer (Arend et al., 2015). In the firm-level perspective, partnering refers to cooperative paradigm in contrast to competitive paradigm, it allows the

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firm to gain access to new resources it would otherwise has needed to either develop by itself or purchase, therefore the principal advantage of collaborative agreements and partnering lies in the broader portfolio of resources and competences by the partners (Yunus et al., 2010).

Entrepreneurs act before elaborating a comprehensive plan. The interaction between the entrepreneur and its potential stakeholders or partners assists him to get closer to new possible fields. Moreover this interaction facilitates the entrepreneur to identify new partners to get on board the project. In particular when a firm or an entrepreneur follows effectual logic, partnership process does not concern just selecting the stakeholders strategically but the stakeholders themselves show their interests to collaborate with the partners (Dew and Sarasvathy, 2002). Consequently when a new partner integrates the project, all available means are enriched. This enrichment of the means within the network of partners helps to co-create new effects.

### **6.2.3.2. Entrepreneurial expertise**

Entrepreneur's expertise and entrepreneurial expertise are different. According to the definition of the Merriam Webster dictionary, the word "expertise" means "special skill on knowledge". So the entrepreneur's expertise, in general refers to his skills or knowledge. This is what Sarasvathy consider it as the second category of the available means of the entrepreneur and reformulate it with the question "what do I know?" On the other hand according to the Sarasvathy's definition of the term "entrepreneurial expertise" (Sarasvathy, 2001), it refers to the entrepreneur's ability to turn the unexpected into the profitable. Entrepreneurial expertise is a cognitive factor in entrepreneurship and stands as the entrepreneur's character.

Sarasvathy suggests that entrepreneurs use effectual logic to redraw the problem space and reconstitute existing realities in order to create new opportunities (Sarasvathy, 2001). It is in contrast to the causal framing of the problems that involves the discovery and exploitation of present opportunities within a given problem space (Wiltbank et al., 2006).

Expertise is contextual (Dew et al., 2009a; Ericsson and Smith, 1991), it means that a person may be unrivaled in a domain and not at all capable in another domain. This is why the research on expertise examines the experts in their respective contexts. An expert is someone



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who has attained superior performance in a specific domain (Ericsson, 2006); therefore an expert entrepreneur is someone who creates new venture, product or market

As simple experience is not sufficient for the entrepreneur firm to exert expert performance though it accomplish deliberate practice (Ericsson and Simon, 1993) through high effort on the activities that are highly relevant to performance within a specific domain. Deliberate practice has an essential role to play in the development of entrepreneurial expertise (Dew et al., 2009a).

Possession of appropriate cognitive scripts (Mitchell et al., 2000) and having reached to reliable superior performance in a particular domain represent the expertise (Dew et al., 2009a). Expertise, is associated with deep ability and knowledge derived from extensive practice and experience based on engagement in the relevant domain (Dew et al., 2009a). Expertise leads to perceive different solutions to different problems, though different sets of alternatives or actions would be envisioned (Dew et al., 2009a).

In summary the expertise of the entrepreneur refers to his special skill or knowledge in a domain but it is his entrepreneurial expertise that makes him entrepreneur. In other words entrepreneurial expertise is a characteristic of the entrepreneur that assists him to reorient his available means and create new effects. In the firm level perspective, entrepreneurial expertise signifies the same thing, since there are the firms that create new effects versus the firms that stick to what they are used to do.

### **6.2.3.3. Reorienting the contingencies**

Contingencies are unexpected influences on the process, they are unanticipated happenings that are impossible to plan for (Sarasvathy, 2001). The contingencies are neither obstacle that the entrepreneur has to overcome, nor they are inconveniences that entrepreneur has to adapt to, but they are emerging assets (Harmeling, 2011). The entrepreneurs who adopt the effectuation reasoning, they welcome contingencies instead of avoiding them and exploit contingencies and unexpected events, afterward they turn them into profitable opportunities (Sarasvathy, 2008). They are optimist that contingencies and unexpected surprises may have positive impacts and let them arrive at unexpected outcomes (Fisher, 2012). Moreover the effectuation reasoning make the entrepreneurs capable to leverage contingencies into new

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opportunities in order to realize new actions and shifting strategy as needed (Dew et al., 2008; Read and Sarasvathy, 2005). Reorienting the contingencies requires imaginative rethinking of possibilities and evolutionary transformation of opportunities for creating new effects. Moreover benefiting from contingencies necessitates the capability and willingness to change when confronting new happening and surprises (Read et al., 2009). The entrepreneur makes decisions according to his available means and recent contingencies; therefore he is able to move towards the creation of new effects that do not yet exist.

### **6.2.3.4. Accepting affordable loss**

In addition to the common difficulties for creation new business or venture, another important factor is uncertainty. The more the business is innovative, the more is the level of uncertainty. One of the levers to overcome the uncertainty is to accept to act but to determine the affordable loss first. An entrepreneur or a firm shall estimate what they are ready to put at risk and determine what they are willing to lose (Dew et al., 2009b).

The affordable loss principle helps the entrepreneur or managers in established firms, at least start something new which would end up to a new business, new product development, new service or new subsidiary. Strategically affordable loss principle facilitates the action while action is not threatening. On the other hand it simplifies the start point, since reflecting about maximizing return requires having enormous knowledge of all aspects of the business. Expecting and planning for high return is in line with causation logic and it is not applicable when the uncertainty level is high. What is needed in uncertain situations is having the encouragement to commence but not threatening whole and this is what achievable through following the affordable loss principle.

### **6.2.3.5. Dealing with uncertainty**

The effectuation concept was first emerged through a study about investigating the behavior of entrepreneurs in the process of creating new businesses or ventures. The process of creating of a new venture is characterized by high levels of uncertainty.

Uncertainty in entrepreneurship means that the demand is unclear and unprovoked while in parallel the optimal choices of technologies and resources are unknowable and

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undetermined (Arend et al., 2015; Sarasvathy, 2001). Moreover in uncertain contexts, it is difficult to identify the competitors because the market related elements are not defined comprehensively (Arend et al., 2015). The entrepreneur usually confronts the uncertainty and the limited amount of resources (Arend et al., 2015). The high uncertainty and ambiguity prevent any prediction of the future; however the entrepreneurs may make some reasonable expectations of the immediate effects of available means in short term.

Several studies show a positive impact of effectuation in uncertain contexts (Read et al., 2009). Effectuation versus causation assists to create a framework for constructing processes in uncertain contexts. Effectuation begins within a specific context where the environment involves a high level on uncertainty (Perry et al., 2012). The good news is that the context does not remain always uncertain; effectuation as an experimental learning process reduces ambiguity and uncertainty over time thanks to the actions taken (Arend et al., 2015). Taking action before waiting to analyze comprehensively the demand side, creates new information that reveals latent possibilities (Chesbrough, 2010). Another strength point of effectuation is establishing alliances and partnerships that facilitate to overcome the uncertainty.

### **6.2.3.6. Gradual evolution possibility**

The effectuation processes creates new effects and artifacts. These new effects themselves feed new cycles of entrepreneurship. They may be reinjected by the entrepreneur to create new effects. In other words, each cycle of effectuation processes evolve the identity of the entrepreneur, his knowledge, experience and his network. For instance, as soon as new information becomes available, means are updated, so the perception of the entrepreneur about who he is, what he knows and whom he knows change. Such change influence the next round of the process where the dynamic nature of aspirations provides new alternatives (Dew et al., 2008).

## **6.3. Business model innovation**

Business model innovation has received considerable attention both in management literature and industry, moreover it is increasingly suggested that business model innovation is crucial for business success (Bocken et al., 2014; Chesbrough, 2007). Companies need to

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transform their business models facing to hard competition and maintain their sustainable competitive advantages for the long-term (Gambardella and McGahan, 2010). The firm's ability to continually innovate and to think and act entrepreneurially is considered as an important source for its competitive advantage (Morris et al., 2002). It is notable that competitive threats may come from outside the traditional industry boundaries of the firm (Amit and Zott, 2012), and managers must be capable to envision the competition through business model innovation.

Business model innovation similar to business model is defined in different manners by academics. Not only the definitions are diverse but also they are quite rough. They do not provide a framework or describe a mechanism for business model innovation.

Some definitions for business model innovation are as below:

- Business model innovation offers a potential approach for evolution through re-conceptualizing the purpose of the firm, the value creating logic, and rethinking perceptions of value (Bocken et al., 2014).
- Business model innovation does not concern just changing the product and service offerings for the customer, it concerns also about the way for doing the business. It is easier for competitors to copy the innovations concerning products, services or processes, so business model innovation has to concern about transforming entire activity system, therefore it might be more difficult for the competitors to replicate it (Amit and Zott, 2012).
- Business model innovation goes beyond the innovation just for value proposition and developing individual technologies, it concerns about shifting towards creating new systems (Johnson and Suskewicz, 2009).
- Business model innovation is not just about technology, it should include innovating value creation and capture (Chesbrough, 2007).

Despite extensive literature on the business model innovation (Amit and Zott, 2012; Chesbrough, 2007; Sosna et al., 2010), there is still inadequate understanding of how incumbent and entrepreneurial firms contribute to business model innovation and evolution and what are the underlying processes? Moreover what actually constitutes a business model

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innovation is rather ambiguous. The literature generally frames business model innovation in the context of identifying new sources for value proposition for the customer (Demil and Lecocq, 2010; Osterwalder, 2004), however it is essential to go beyond this perspective and reflect about business model innovation by exploring underlying processes and the interactions between the components of business model.

Chesbrough, (2010) has discussed the subject of business model innovation and its barriers in his article in the special issue of Long Range Planning journal in 2010; however companies invest a lot for exploring new ideas and technologies but they often have little ability to innovate their business model. In other word economic value of a technological innovation is related to its business model. According to these barriers to business model innovation, he particularly pointed out that the effectuation processes beside experimentation and organizational change may assist to overcome the barriers to business model innovation. Entrepreneurs when adopts effectual reasoning, they take actions instead of analyzing their environment so much, because taking actions generates new information that discloses latent opportunities and possibilities. Adopting the effectual attitude assists additionally to business model experimentation. Even the experimentation fails but failure itself reveals new approaches and knowledge which may be served to further actions.

Demil et al. through a chapter in “Encyclopédie de la stratégie” discuss that effectuation reasoning has several characteristics that correspond to the business model elaboration and function (Demil et al., 2014). First, in effectuation logic, the world is being constructing and it is not a given to be understood or analyzed. Therefore the task is building the world instead of discovering it. The second characteristic is that the effectuation logic does not deal with determining a goal and reaching it from the beginning, on the contrary the entrepreneur uses the means at hand to propose new offers to the market.

However Chesbrough and Demil et al. pointed out the importance of effectuation logic and its application to business model, there is not any article that investigates this subject profoundly. It might be due to the emerging nature of the business model concept itself, the dispersion of definitions for business model, the disagreement on business model components and their interactions as well as the lack of studies in business model dynamics. Therefore this

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part of research may provide evidences for transposing the effectuation logic to business model innovation.

If we consider the business model as a set of offer system, demand system and value structure, so it may exist different types of business model innovation according to different articulation manners among business model components.

Reality is that the business model literature is constructed on moving from the demand system toward the offer system; in one of the evidences it is argued that a new business model may emerge by asking the following three questions: who are the firm's target customers? What does the customer value? And how does the firm create that value? (Govindarajan and Gupta, 2001). In another similar view, the business model concerns the answers to following questions: What value does the company create for customers and partners? What does the firm sell? How and through what configuration is value created? How does the company earn money?(Stahler, 2002). All these questions imply that the business model is largely considered as a structure in which the demand system is already identified. Therefore fixed objectives according to demand system lead to structuring the offer system. However this view may be useful in several contexts but it is incapable and insufficient in dealing with innovation.

### **6.3.1.Reactive and proactive business model innovation approaches**

For defining a framework for business model innovation, it would be pertinent to take into account external and internal factors since business model may either evolve in response to external and internal factors or these factors facilitate the emergence of new business models. In other words each firm requires renewing its business model in order to face and overcome challenges and maintain its competitive advantage. The firm may be reactive or proactive in renewing its business model (Figure 14). As it is shown in figure 14, the evolution of the business model from the A situation to A' situation may be done through reactive or proactive approaches.

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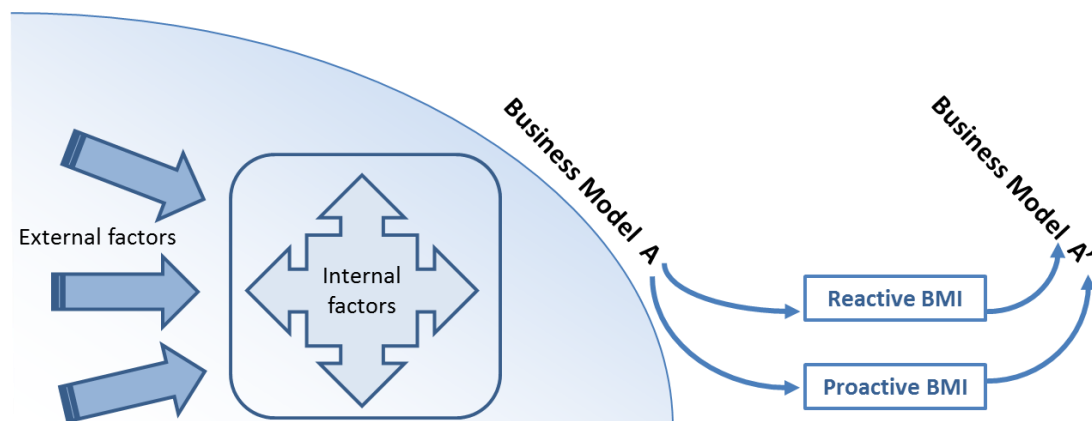


Figure 14 : Business model innovation mechanisms

Demil and Lococq define the external factors as changes in the environment of the firm which may disrupt the firm's usual functioning and internal factors as the consequences of dynamic interactions among the components of business model (Demil and Lecocq, 2010). To complete this definition external factors include threats and opportunities and internal factors concern weaknesses and strengths.

Each firm may be threatened by external factors; for example it may lose its market share because of newcomers. When an external factor influences the business of the firm and its competitive advantage, the firm aims to find a solution. The solution can be anticipated and pre-determined that involves a process to reach a desired effect. In other words a particular effect is the given and the process includes setting and selecting pertinent means in order to reach the effect. The process is based on causation logic which is tied to planned strategy.

In addition to the threats, that the firm is confronted to, there are also opportunities that emerge in the firm's environment. The strategy of the firm to profit at most from these opportunities may lie also on causation logic. Causation reasoning is tied to planned strategy and its related tasks such as opportunity recognition and business plan development, though a firm who adopts causal logic, it bases itself on existing markets and looks for opportunities in the existing markets in which it competes to maintain its position.

Internal factors including strengths and weaknesses may influence the strategy of the firm differently. The firm may adopt a causation reasoning or effectuation reasoning.

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Causation reasoning is selected when the firm fixes its objectives and according to its objectives it tries to mobilize its strengths. In contrast to the causation reasoning, the firm may adopt effectuation reasoning. In this approach the firm creates new effects according to its available means. When the firm uses effectuation reasoning, it acts not only within its market environment, but also sometimes ends up enacting new markets not predictable ex ante. Effectuation logic includes a selection of alternatives based on loss affordability, flexibility, and experimentation, though the firm is the developer of opportunity by experimenting and changing direction as new information becomes available.

When the firm is within causation logic to overcome the threats, it benefits from the opportunities and mobilizes its strengths; it fixes the objectives and tries to achieve them by selecting appropriate means. The reasoning direction is from the demand side towards the offer side and the business model innovation strategy is reactive. It means that the firm does some changes in its business model components in order to reach the expected results. On the other hand when the firm adopts effectuation logic, it focuses on what it and its network have at hand to create new effects.

An established and incumbent company in a domain has to pay more attention to growth and fundamental innovation, to innovation both in its core processes and its overall business model (Moore, 1996), therefore it implies to not only being strategist but also being entrepreneur in order to regain the leadership and develop competitive advantages.

Two approaches were identified for the business model innovation; the first one refers to what firms usually do in response to the factors that challenge their strategies such as market share, competitive advantage, sales and profits. They use causation logic to overcome these challenges, in other words they adopt causation logic to rework on their business model components. I call it “reactive business model innovation”. Particularly the logic for dealing the business model components in reactive business model innovation is starting from the demand side toward offer side. For instance, the fact that the firm is aware that its market share or sale are decreasing, implies that the demand system is completely clear and the firm exactly knows what it is searching for and according to the objective it mobilizes its resources and competences.



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By contrast, the firms who intend to innovate, they inhabit uncertain situation. They do not know exactly what and where their product and/or service will end up. The lack of information and data make it difficult to makeup a pertinent offer system. The more the firm attempts to identify the demand side, the more the innovation is stopped. To overcome this problem it seems that adopting the effectuation logic may unlock the movement toward innovation. I call this type of interaction among business model components, the “proactive business model innovation”.

### **6.3.2. Effectuation reasoning conformity to proactive business model innovation**

#### **6.3.2.1. Offer system of the business model**

As described in the conceptual framework of this dissertation, the offer system is one of the components of business model. The offer system is a set of actors who have different roles including the role of innovator, manufacturer or provider of the service in the business ecosystem. Each actor, based on its history has different resources at hand. The resources include human, financial and capital resources. In addition to the resources each actor has its own competences (i.e. know-how, experience and expertise). Moreover among these actors some kind of collaboration and partnership either is existing or being shaping.

Effectuation reasoning is applicable to interpret the offer system of the business model. The first question that Sarasvathy pointed out that expert entrepreneurs ask themselves is “who am I?” (Sarasvathy, 2001). This question corresponds to the constitution of the offer system. The leader or administrative organization of several entities may ask itself this question in order to deliberate it resources at hand. The second question dedicated by Sarasvathy as “what do I know?” matches with the competences of the actors. And finally the question “who do I know?” refers to any type of partnership and commitment among the actors.

It should be mentioned that in my conceptual framework, the business model has an offer system; therefore it does not concern just one actor. So in transposing the effectuation

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logic questions to the business model, whole resources and competences of different existing and potential future actors may be considered.

### **6.3.2.1.1. Resources within the offer system**

In this dissertation the business model is defined as a set actors belonging to the offer and demand system who have value exchanges among them. Therefore when dealing with the “resources”, it must be understood as a sub dimension of the offer system. The “who am I” dimension in effectuation corresponds to the “offer system” at first and in particular it refers to the “resources” as a sub dimension of the offer system.

Some scholars have pointed out the notion of “resources” in business model literature (Demil and Lecocq, 2010; Osterwalder, 2004).

Considering the resources as one of the aspects of offer system in the business model persuades understating it through effectuation.

When an entrepreneur firm reflects about “who am I?” (Sarasvathy, 2001) it considers all its human, physical, capital and financial resources (Barney, 1991; Demil et al., 2014). It focuses primarily on the resources it has at hand, ignores market needs in uncovering an opportunity, refuses to enact the resource limitations dictated by the environment and commits only limited amounts of resources to the venture at a time (Fisher, 2012).

The resources accumulated over the organization’s history will be continually reacting with each other, and with other constituent parts of the firm’s structure (Demil et al., 2014) so the revision of human, physical, financial and capital resources not only play a crucial role in extracting value from their use but also contribute to create more innovative combinations. Therefore resources support the organization’s usual activities and its accumulated knowledge. Moreover resources are able to trigger entrepreneurial actions including exploiting new combinations, creating new opportunities and motivating new ventures (Demil and Lecocq, 2010).

### **6.3.2.1.2. Competencies of the actors of the offer system**

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The “what do I know” dimension in effectuation corresponds to the “offer system” at first and in particular it refers to the “competencies” as a sub dimension of the offer system. Entrepreneurs take action and engage actively with problems or opportunities (Fisher, 2012), they are the experts who learn by doing and doing (Greeno and Simon, 1988), this emphasizes on the importance of experimentation in the discovery, development (Gunther McGrath, 2010) and gathering experience. However experience is important for the firm to move towards new businesses but extensive experience does not lead to superior performance, it may make experienced entrepreneur firms to infer too much from too little information and misinterpretation evidence that confirms prior beliefs (Dew et al., 2009a).

### **6.3.2.1.3. Configuration of the offer system by commitments and partnering**

Companies today inhabit ecosystems that extend beyond the boundaries of their own industries and they may depend on other businesses (Iansiti and Levien, 2004b). Moreover value is not created by firms acting autonomously, it is creating through the collaboration of different parties through informal arrangements or formal alliances (Bocken et al., 2014).

Therefore “partnering” stands as an important aspect in the offer system of business model. Questioning “Whom do I know?” in the effectuation logic may be applicable for business model innovation. The partners of the firm are internal or external; internal partners are all those actors that are under the direct control of the firm and external partners constitute the value network (Demil et al., 2014). Though partners are ranging from suppliers, distributors, subcontractors, complementors, public authorities or even the customers (Demil et al., 2014). The relationships develop among different actors due to their specialization in different skill areas, historical links and personal relationships among people (Zahra and Nambisan, 2012).

While the components of business model interact with each other, therefore the role of the entrepreneur firm is to rationalize on externalization or internalization of required activities for value proposition based on existing resources and competences (Demil et al., 2014); it is in line also with having an eye on the resources and competences of the partners in order to recognize the synergies.

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Partnerships influence positively the outputs in highly innovative circumstances (Brettel et al., 2012), they facilitate the identification of new technologies and may make some opportunities for acquisition other resources and competences, this implies to business model dynamics where having only own resources does not lead to the development of the firm, having the intelligence and capacity for acquisition and mobilization new resources and competences that belong to partners are the key factors for further value propositions (Demil et al., 2014).

Business ecosystems are susceptible to change, adaptation and evolution overtime, though the entrepreneur firm works on reshaping the business ecosystem mostly to its advantage by partnering with others in order to share the resources and competences (Zahra and Nambisan, 2012). Developing something new and making difference encourage firms to create new ecosystem by partnering and collaborating with others (Moore, 1996). All firms are belong to a value network composing of their partners; So when something new is introduced, the partners' roles are not predefined, therefore the entrepreneur firm manages the attribution of new roles to the partners (Demil et al., 2014). The entrepreneur firm provides strong network leadership, clarifies the innovation architecture, provides incentives to co-evolve, aligns diverse objectives and activities of the actors within the business ecosystem (Moore, 1996; Zahra and Nambisan, 2012).

Business models often generate virtuous cycles and such virtuous cycles can develop valuable resources and capabilities. The entrepreneur firm connects unconnected parties to each other through itself, so the network centrality around the entrepreneur firm is enhanced (Hu, 2014) and the position of the firm is strengthened. This individual entrepreneurial firm's position relative to others, its high-frequency and high-strength interactions with other partners, enhances its capability to reach others' resources and competences, generates virtuous cycles for further evolutions and innovations (Casadesus Masanell and Ricart, 2010).

Since the firm is aware about the value of understanding, managing and exploiting these linkages (Zahra and Nambisan, 2012), it is able to explain "whom I know?" and innovate its business model through effectual processes.

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### **6.3.2.2. Demand system of the business model**

Demand system is one the main components of the business model. As discussed before, the business model concept is constructed on the identified demand system. In other words when talking about business model several stereotype questions come on mind such as: who is the customer? What are the channels to reach the customer? What are the pricing strategies according to different customer segments? But the question here is that if these kinds of questions are pertinent to designing the business model for an innovation or more precisely for business model innovation? In fact the answer is no at first. Innovation either in technology or in business model is highly uncertain and all of its aspects cannot be anticipated in advance. One of the important aspects of innovation is that the characteristic of the demand system is not predictable completely in the start of the project. Effectuation reasoning provides a pertinent framework especially for innovation projects. Innovation projects are generally inhabit high level uncertainty (Lenfle, 2008; Tatikonda and Rosenthal, 2000). In innovation projects identifying and targeting the customer is not evident from the beginning. Even one of the barriers in innovation projects is that the managers are not used to work in uncertain conditions. They try more and more to predict, to show that there is a demand while they do not know exactly what they are going offer. The effectuation logic assists to enact the objective. In other words in the context of innovation, the demand system dimension of the business model is not completely identified. Therefore applying the effectuation reasoning may help to overcome the uncertainty and ambiguities by gathering information through experimentation and moving from the offer system toward the demand system. As the project progresses overtime, more information become available, therefore identifying and targeting the demand system become easier. So effectuation logic helps to initiate the project and avoid any unusual effort or barrier making attempts.

### **6.3.2.3. Value creation and capture structure**

Value structure is fundamental business models; value structure includes all value created and captured among the actors. Created or captured values may be tangible or intangible (Allee, 2000). Tangible values involve products, services and financial flows. Effectuation logic helps to reflect about the value creation particularly concerning the product and services. The “what can I do” question of the effectuation concept that succeeds three

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primary questions of the effectuation logic (i.e. who am I? what do I know? And whom do I know?) imply to the value proposition of the business model. Moreover the value proposition created according to the effectuation logic is the result of offer system's dynamics. In other words the dynamics of the offer system leads to new effect that would be translated to new value proposition and it is not the value proposition that configures the offer system. Furthermore the cost-revenue structure is the subset of the value structure of the business model. When applying the effectuation logic the business model is constructed by accepting the affordable loss in contrast to realizing a comprehensive optimistic business plan to determine the expected returns.

### **6.3.3. Dealing with business model components in reactive and proactive approaches**

According to the discussed subjects in this chapter, the business model includes three main categories: the offer system, the demand system and the value structure. The offer system is a set of actors who have resources (i.e. human, physical, financial and capital) and competences (Know-how, expertise, knowledge and experience). The demand system also is a set of different actors who use, who need and who pay. Among the actors of both systems, there exists a value structure including the cost-revenue structure.

Since different interactions among the business model components may create different approaches for business model innovation, it would be valuable to reformulate the questions in these two different approaches.

In reactive business model innovation which is based on the causation logic, the direction of movement is from the demand system to the offer system. The demand system and its characteristics are identified and targeted. So there is at least a clear objective that the firm attempts to reach. Determined value structure defines the resources, competences and stakeholders and their interactions. The project's objectives define the configuration of the offer system including who is needed to come on board the project? What resources should be mobilized to achieve the objectives? With whom should be the alliances or partnership established? What strategic competences of the network of actors are needed to reach the objectives? And what are the expected returns according to the business plan?

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The proactive business model innovation adopts the effectuation reasoning and the direction is from the offer system to the demand system. Generally who comes on board affects the project objectives and the articulation between resources, stakeholders and competences determines the value structure. Proactive business model innovation is an effective approach to deal with uncertainty in innovation projects where the demand system is not clear and the objective is to enact new effect such as new market. Therefore the offer system is configured by reflecting about what effects would be created based on the resources, competences and stakeholders? How to mobilize resources and competence even the less important and strategic? What is the affordable loss threshold for the actors of offer system that allow them to initiate?

All these questions in two separate categories help to make decision in different situations such as development projects, overcoming the threats, profiting from opportunities and particularly innovating and enacting new effects.

Components of business model	Reactive BMI	Proactive BMI
<b>Offer system (innovator, producer, provider, financier)</b>	Project's objectives determine who comes on board.	Who comes on board determines project objectives.
<b>Resources (human, physical, financial, capital)</b>	What resources should be mobilized to achieve the objectives?	What effects would be created based on the resources, competences and stakeholders?
<b>Partnering</b>	Strategic alliances are formed to reach the goals	Pre-commitments, alliances and partnerships lead to enact the effect together
<b>Competences (Know-how, expertise, knowledge, experience)</b>	Goals are defined more emphasizing on strategic competences of the firm	All the competences even the less important are considered to imagine new effects

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<b>Demand system (customer, user, payer)</b>	Demand system and its characteristics are identified and targeted	The demand system is not clear and the objective is to enact new effect such as new market
<b>Value creation and capture</b>	Determined value structure defines the resources, competences and stakeholders and their interactions	The articulation between resources, stakeholders and competences determines the value structure.
<b>Cost and revenue structure</b>	Business plan elaboration should ensure the expected returns	Affordable loss is accepted to start the business

Table 10: Reactive and proactive approaches for business model innovation

## 6.3.4. Visualization of the effectual business model innovation

The case of the Bollore group shows that the effectuation reasoning assists the company to innovate its business model. The specific situation of the group as an incumbent firm in several domains did not prevent it from innovation; on the contrary it assists the company to profit from its expertise and knowledge to innovate. They developed plastic film technology based on their thin paper technology. The plastic film technology led to manufacture LMP batteries and electric battery technology were used to develop supercapacitors and particularly electric vehicle. Already manufactured electric vehicle was a strong point for Bollore to win the tender; few years before the Autolib tender, Bollore has developed effectual reasoning versus its competitors who adopted causal reasoning. Its competitors focused on estimation the potential demand and revenue for a new transport mode as accurately as possible by transferring as much as possible the knowledge that was already available for existing modes. In other words they attempted to base themselves on existing modes, which is inapplicable for a new transport mode that does not yet exist in reality. Moreover they had not some technical thing in their hands and according to their studies in that time it was difficult to find a car manufacturer capable to produce 3000 electric vehicles according to the specifications of the tender. It means their reasoning was completely causal, they had the tender in front of them without ability for proposing something new. On the other hand the Bollore group had at hand at least the technology of LMP batteries and consequently a compatible model of



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electric vehicle for the tender. Therefore before the tender the effectual reasoning of the group allowed it to develop an innovation alongside its other businesses. Bollore was proactive in its business model innovation and established pertinent offer systems in each stage that assisted to create innovative value propositions. After winning the tender the group adopted causal reasoning in order to provide all technical and managerial aspects for launching Autolib in Paris. They mobilized some internal competences within their sub-division IER to provide self-service kiosks for subscription, car rental, charging stations, geo-tracking solution, and on-board information system. IER needed to integrate cars with an intelligent system so that they could communicate at any time with remote applications and GPS services, so IER chose a solution based on Windows Embedded and started to collaborate with Microsoft to ensure the quality and robustness of the platform.

Concerning the second case, which is about a research program on innovation, it is observed that the axe of research is not something highly determined and stable but it is evolutionary. The research program was started by two public research institutions around three rough projects including the innovation in land transport, driving safety and speed control. These three projects were converged to one axe concerning advanced transport safety and attracted several industrial companies and local public authorities such as car manufacturing companies, OEMs, Department and municipality. This network of actors with their specific resources and competences made the research program ready to reply to the French government tender for competitive clusters. The initiation to reply the tender made other actors to come on board the project such as education institutions and private actors. Therefore the competitive cluster was a set of actors from public and private sectors who provided jointly a wide range of resources and competences including research expertise on transport and safety issues, political support, public transport knowledge and experience, automotive industry know-how and experience.

French government support for financing the innovation projects made the Mov'eo competitive cluster to move towards establishing a foundation. For establishing the foundation an education and research institution was needed that it was already existed among the actors of the competitive cluster. After the establishment of the Mov'eoTec foundation with the main research program named "Vedecom", the path to respond to the tender for IEED institutes was smoothed. So Vedecom was become official institute for energy

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transition in 2014 with 3 main axes for its research program: electrification the vehicles, connectivity and delegating the driving, mobility and shared energy. This new status of Vedecom allowed it not only to benefit from its public and private partners in terms of resources and competences but also to profit from public funds up to 50% of its expenses and investment in a period of ten years.

In summary, investigating the both cases indicates that a technological innovation or a research program have started by the effectuation logic. They developed gradually by the effectuation logic till they became enough meaningful, mature and consolidate, afterward the network of actors were able to respond to call for tenders. Winning the tenders fixes several objectives for the actors that make them to use the causation logic in order to reach the objectives.

The case studies also show that the business model innovation is not a subject of superior foresight *ex ante* but it requires significant trial and error, and some *ex-post* adaptations.

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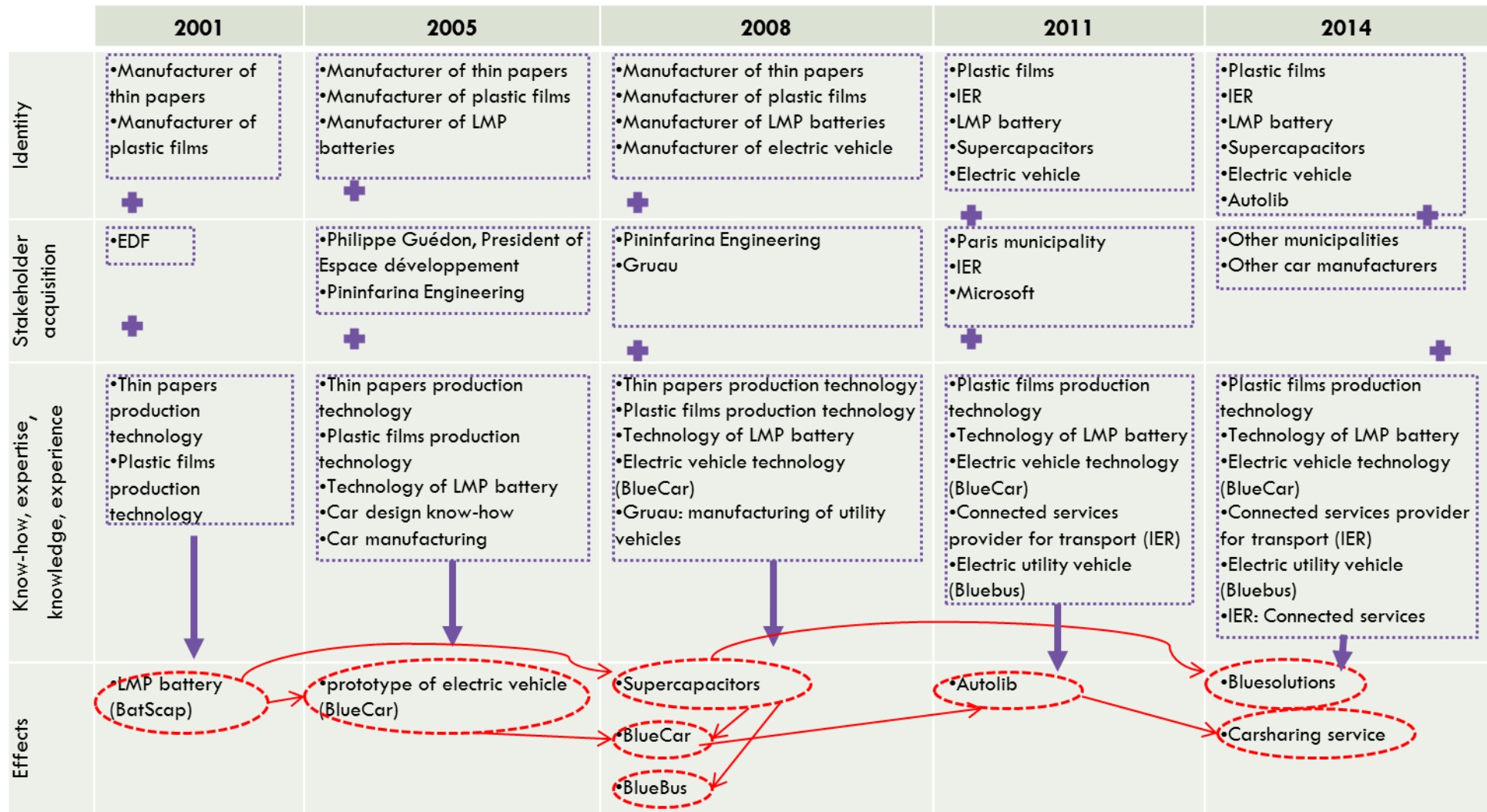


Figure 15 : Business model innovation through effectual processes, the case of the electric carsharing

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	1999	2002	2004	2005	2006	2010	2014	2018
Identity	•INRETS - Public research institute	•INRETS - Public research institute	•VESTA project	•VESTAPOLIS project	•VESTAPOLIS competitive cluster	•Mov'eoTec competitive cluster	•MoveoTec foundation	•ITE VEDECOM
Stakeholder acquisition	•LCPC - Public research institute	•LIVIC – Joint research institute between INRETS and LCPC	•VALEO – French automotive supplier •Department of Yvelines •Versailles municipality •Renault •Peugeot	•UVSQ – a French university •Veolia Transport	•Normandy Motor Valley competitive cluster	•UVSQ – a French university	•ANR (National Agency for Research)	• ANR •Public and private partners of consortium
Know-how, expertise, knowledge, experience	•Research on transport and safety	•Research on transport and safety	•Research on transport and safety •Political support •Automotive equipment know-how	•Research on transport and safety •Political support •Automotive equipment know-how •Public transport experience	•Research on transport and safety •Political support •Automotive and its equipment know-how •Public transport experience	•Research on transport and safety •Political support •Automotive and its equipment know-how •Public transport experience	•Research on transport and safety •Political support •Automotive and its equipment know-how •Public transport experience •Public funds	•Research on transport •Political support •Automotive and its equipment know-how •Public transport experience •Public funds • Dedicated path for experimentation
Effects	•New joint research institute "LIVIC " Research projects: - Innovation in land transport - Safe driving - Speed limiting	•New joint research project "VESTA Research project: Advance transport safety	•Initiating to reply the French government's tender for competitive cluster	•Replying to the French government's tender for competitive cluster with "VESTAPOLIS"	•Mov'eoTec competitive cluster Research axes: - Energy - mechatronics - road safety - mobility services	Creation of the Mov'eoTec Foundation with the project named VEDECOM	VEDECOM Institute with three research axes: - Electrification the vehicles, - connectivity and delegated driving - Mobility and shared energy	- Innovation experimentation in Satory (autonomous vehicle experimentation in a dedicated path)

Figure 16 : Business model innovation through effectual processes, the case of the autonomous vehicle

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### **6.4. Discussion and conclusion**

This part of research contributes theoretically both to the entrepreneurship literature and more specifically to the business model literature. Moreover several managerial implications are resulted from this part of research.

#### **6.4.1. Theoretical contributions**

Innovation is recognized as a fundamental lever for competitive advantage. But many companies encounter difficulties to move toward innovation. For many of them innovation is summarized in new products, while innovation is not just about technology anymore. Business model stands as a more comprehensive unit of analysis for innovation, since it includes several fundamental components such as offer and demand systems as well as value structure that have different interactions. Different possibilities for the interactions among the business model components lead to different approaches for business model innovation.

Theoretical contributions of this part of research can be viewed from several lenses; first from the effectuation concept and second from the business model innovation concept. This research showed that the effectuation concept may be used in explaining the mechanism of business model innovation in uncertain situations. Reciprocally the use of the effectuation concept in another concept not belonging to the entrepreneurship literature helps to its stabilization and generalization.

##### **6.4.1.1. Transposing the effectuation logic to business model innovation**

Transposing the effectuation logic to business model innovation and examining its conformity stand as a theoretical contribution of this part of dissertation. However Chesbrough, (2010) and Demil et al., (2014) have pointed out the importance of effectuation reasoning in overcoming the barriers to business model innovation, but there is not yet any empirical examination of this logic in business model innovation. The materials of this research including two case studies provided useful data to understand the effectuation logic in business model innovation.

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More specifically, transposing the effectuation logic to business model innovation helps to describe and formulate the movement direction from the offer systems to the demand system. This contribution unlocks one of the main ambiguities in innovation projects: the non-fully-defined effect (i.e. product and/or service) or as “common unknown<sup>1</sup>”. Effectuation logic helps the innovation managers to take first steps and start the road toward new effects including new products, new services and new markets.

### **6.4.1.2. Effectuation theory stabilization and generalization**

This research through two different cases shows that the effectuation concept can also be applied outside the entrepreneurship literature. The case of Bollore indicates that the effectuation concept is applied by an incumbent firm to develop technological innovations. The case of Vedecom shows that how a research program on innovation developed gradually, how different actors integrated the program on different stages and how they influenced the outcomes and how new research areas and their associated business model emerged.

This part of dissertation takes effectuation theory from its origin which is the entrepreneurship literature and transposes it to the business model literature. One of the barriers to the acceptance of effectuation as a theory is that it remains just in entrepreneurship literature (Arend et al., 2015). Therefore this research contributes to increase the acceptance of effectuation as a theory since this research transposes the effectuation concept to the business model concept and contributes to its further generalization.

### **6.4.2. Managerial implications**

In addition to academic contributions of this part of research, several managerial contributions are also envisioned. However effectuation logic is beneficial for the managers in innovation projects, but a combination of reactive and proactive approaches for business model innovation is needed to assure the global competitive advantage. Moreover the effectuation logic helps the firm to go over the traditional boundaries of their respective industries and enhance their business models by working with new partners in order to

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<sup>1</sup> « Common unknown » is a compound term that introduced by Berthet in her dissertation to design agriculture ecosystems when its evolution is not predictable completely (Berthet, 2013).

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provide new value propositions. This enhancement in the level of the offer system and offering new joint value propositions facilitate public private partnerships for innovation and decrease efficiently the imitability.

### **6.4.2.1. Assisting managers for business model innovation in uncertain situations**

Effectuation relies on the logic of control in contrast to causation that relies on the logic of prediction. Prediction and uncertainty are two controversial subjects, it is almost impossible to predict perfectly in uncertain situations, even trying to make better predictions worsen the situation. As future is uncertain, it cannot be identified nor modelled. Furthermore, not only the future is always uncertain but also all uncertainties are not the same. On the other hand the context of innovation projects are more complicated; the more the innovation level is high, the uncertainty is more. Therefore dealing with innovation projects that are uncertain with a pure predictive approach is not pertinent. Effectuation reasoning provides a framework for proactive business model innovation in contrast to causation logic that provides a reactive business model innovation through anticipation, foresight and prediction.

In summary, reactive business model innovation is a way to survive existing business model by doing some changes in business model components while exactly knowing what would be the expected results. In other words reactive business model innovation is useful when existing business model is threatened by risks and threats (e.g. emergence of new business models, new entrants, losing market share, etc.). If not impossible but it is difficult for managers to forecast entirely emerging opportunities across an economic sector and anticipate their consequences. These causation measures are not useful in uncertain conditions but experimentation through effectuation is related to measures of uncertainty. Therefore effectual reasoning accompanies the managers in uncertain situations and innovation projects to discover new opportunities and perform new actions.

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### **6.4.2.2. A combination of reactive and proactive approaches for business model innovation**

A same company should be equipped with both causal and effectual reasonings for its business model innovation at different times depending on what the circumstances necessitate. Effectual reasoning can be used to initiate the early stages of business model innovation and once the market is clearly identified and defined, firm can apply the traditional causal reasoning to capture market share and grow the company. Moreover effectuation reasoning is more efficient in innovative projects with high level of uncertainty and causal reasoning is appropriate in development projects with low level of innovativeness. I applied the term “proactive” for business model innovation when there is the effectuation logic behind and the term “reactive” when there is causation logic behind. Evolving the business model through effectuation processes deserves determining the affordable loss which the firm or the offer system is ready to take in order to avoid producing a major threat for the firm. If the firm aims exactly to capture a particular market, it can use causal reasoning and market research techniques to formulate strategies for market penetration (Sarasvathy, 2001). In the case of technological innovation, where almost market does not exist, proactive business model innovation is applicable. Markets are not static or pre-existing but also being continually “performed” and shaped by multiple actors (Kjellberg and Helgesson, 2007) who co-create new markets or renew existing market (Vargo et al., 2015). Both causal and effectual logics are constructive for business model innovation in big companies. None of them is able to survive the company alone. In one hand causation logic is necessary for business model innovation in order to respond external factors which influence the company and its viability and on the other hand the effectuation logic is pertinent for business model innovation within incumbent firms to keep track with emerging opportunities, to facilitate the innovation and to enact new effects. Companies should be able not only to operate and exploit current business models but also to envision those of the future. The combination of reactive and proactive business model innovation approaches assists the firm or the offer system to strategize instead of fixing strategies. Strategizing is an on-going action (Dameron and Torset, 2009), in other words causation logic leads to fix strategies while the evolutionary characteristics of the effectuation logic and its effectiveness in uncertain situations provide a favorable circumstance for strategizing.



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### **6.4.2.3. Enhancing the business model**

As technology and business model regularly interact, therefore technology development requires business model innovation that enables and fosters the innovation (Baden-Fuller and Haefliger, 2013). On the other hand due to several difficulties relative to technological innovation (e.g. high cost of ownership, penetration to the market, etc.) firms are envisioned to a new challenge in their business models: adding services to their technological innovation. Services stand as strategic complement for introducing manufactured products to the market (Visnjic Kastalli and Van Looy, 2013). The “servitisation” is essential to shift the firm’s business model from offering the manufactured products to providing a bundle of products and services (Bocken et al., 2014; Tukker, 2004). Therefore the firm is delivering the functionality or pay-per-use rather than selling the ownership, customers pay for the use of the service and the firm or its partners are in charge of the costs of ownership. In the first case study of this chapter, it is observed that how Bollore redefined the business model for its electric vehicles through effectual processes and shifted to a product and service business model and introduced the electric vehicle car sharing service in metropolitan level. Furthermore the case of Vedecom Institute shows that the automotive industry has to widen its traditional boundaries and partners involved, it requires to integrate other actors more implicated in mobility services alongside providing political and financial support of public authorities. This case stands as a good evidence for displaying the importance of the offer system configuration and its effect on business model enhancement.

### **6.4.2.4. Taking into account all available means for creating new effects**

Strategic thinking usually focuses on competitive advantage and applies causation logic; therefore when questioning resources, often just strategic resources and competences are counted, however these key strategic resources and competences are important but they do not represent all. The effectual logic assist the entrepreneur firm to take into consideration all its resources and competences even the less important in order to create new effects.

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### **6.4.2.5. New framework for Public-Private Partnership**

Traditionally, public private partnerships concern domains that have a public interest such as education, health, energy and transportation. The main objectives are therefore providing a public facility by collaboration with the private sector and sharing financial contributions and risks. Almost all the public private partnerships pass through tenders with strict administrative and technical specifications. However this type of tenders may be pertinent in PPPs for development where the objectives of the project are clear, but this type of tenders are weak and inadequate in PPPs for innovation. Engaging in innovation is inevitable for economic development, both for the government and industrial companies, but moving towards innovation necessitates dealing with uncertainty. The effectuation reasoning provides a framework to deal with uncertainty, and reinforces the industrial companies to develop new ideas and influence public authorities' priorities. Therefore the PPP becomes collaboration between public authorities and private actors where they are able to create and to innovate mutually.

### **6.4.2.6. Decreasing the imitability of innovation**

One of the main challenges for innovation is reducing its imitability. Once a product and/or service are introduced, other competitors are able to copy the innovation. Therefore innovation requires a supportive mechanism. Proactive business model innovation provides a favorable environment for protecting the innovation for more time through shaping a unique offer system. In other words pre-commitments, alliances and partnerships constructed through effectuation reasoning engage different actors to mutually enact a new market while none of them were able to do so individually. Furthermore the offer system has more inertia that it will not be affected by rivals easily. The effectuation process when applied to business model innovation establishes strong interrelations among the actors that retain them in the business and enriches the resources and competences of the offer system. Therefore for rivals imitation becomes more difficult because it is not just about a technology or service but it is about a business model.

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### **7. Designing a management tool for the business model of the public private ecosystem**

#### **7.1. Introduction**

Urban passenger transport stands as a public-private ecosystem whose business model involves several actors from public and private sectors as well as the users who have various interrelations and transactions. Despite the growing development of the business model concept in recent decade, most of its applications take firm-level perspective, while investigating public-private ecosystems necessitates the system-level view for integrating sustainability issues. However research on sustainable innovations have deepened the understanding of the ways in using new technologies and social practices for more sustainability (Boons and Ludeke-Freund, 2013), but decision makers require understanding the business model of the current situation before starting any project. The business model of a public-private ecosystem requires a system-level perspective. According to chapter 4 of this dissertation in which the business model of a public private ecosystem has been conceptualized, the business model is a set of offer and demand systems as well as value structure. Value structure itself refers to all tangible (e.g. product, service and cost-revenue structure) and intangible value exchanges. For instance, urban passenger transport as a public-private ecosystem is a combination of public transport offers and private transport facilities. Moreover different actors from public and private sectors as well as the users shape the offer and demand systems that generate financial transactions.

The concept of business model has been developing fast in recent decade (Wirtz et al., 2015). Its application by scholars and practitioners from diverse domains has led to scattered definitions (Wirtz et al., 2015; Zott et al., 2011) Besides this heterogeneity, most of the definitions share the firm-level perspective. Few scholars pointed out the necessity of system-level perspective for business models (Bocken et al., 2014, 2013; Zott and Amit, 2010). Particularly in projects for urban passenger transport, sustainability issues are stressed, though having the system-level perspective is indispensable. According to the conceptual framework,

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the concept of business ecosystem provides a comprehensive approach for having system-level perspective for business model (Moore, 1993). The concept of business ecosystem provides an appropriate underlying structure for investigating the business model in multi-actor contexts including the actors from public and private sectors as well as the users.

Moreover to the lack of system-level perspective for business model, this concept also lacks appropriate demonstrations. However few existing mapping tools for business modeling (Allee, 2011; Bocken et al., 2013; Osterwalder, 2004) are useful to demonstrate the business model in some aspects and contexts, but they cannot assist decision-makers from public authorities and industrial companies to interpret, evaluate and reconceptualize the business model for evaluating the existing situation, simulating and initiating the innovation project. In other words mapping tools are useful to illustrate a representation of a business model by characterizing and communicating it, but they are not supportive for the managers to make decisions as they do not provide any interpretation (Chesbrough, 2010).

This part of the research proposes how to go beyond the firm-level perspective and how to develop new tools to support both demonstration and evaluation of the business model for a public-private ecosystem.

In the next section, a brief literature review of the business model concept is provided. It revealed several shortcomings regarding its demonstration, scope of analysis and evaluation. Subsequently, the analysis of literature and identifying the research gaps led to frame the research question. Afterward the research methodology and materials are described. Moreover cases are explained completely. It should be mentioned that the problematic has been identified through the action research methodology and a case study has been conducted in order to build and run a prototype of the management tool. Afterward, the prototype has been used through the action research methodology. Data collection and analysis methods are described for each stage of the research and at the end, the theoretical contributions and managerial implications are discussed.

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### **7.2. Highlighting inadequacies of previous studies**

Business model as structured management tool (Wirtz et al., 2015) and new approach in strategy (Demil et al., 2014) rapidly grew in the past 15 years. Business model includes a diverse list of components which all are supposed to make sense together in a coherent business perspective. Scholars from various fields of research (e.g. e-commerce, strategy and organization theory) contributed to the literature of the business model concept (Wirtz et al., 2015), therefore different definitions have been attributed to business model which partially overlap, and generate different interpretations even if we find persistent components (Zott et al., 2011). Business model concept as a research area is still under study and many fundamental questions in this context remain unanswered (Wirtz et al., 2015).

Most of the scholars who have contributed to the business model literature have a firm-level view. Business model stands as a construct which connects technological characteristics and potentials as inputs to economic outputs through customers and markets (Chesbrough and Rosenbloom, 2002). Therefore business model concerns about cost and revenue structure, market segmentation, value network, competitive strategy formulation and value proposition (Chesbrough, 2010). It articulates the logic, the data, and other evidences to support a value proposition for the customer, and a viable structure of revenues and costs for the firm itself (Teece, 2010). A business model is a simplified and aggregated representation of the relevant activities of the firm (i.e. value creation architecture, strategy and market) that describes how marketable products and/or services are produced within the company (Wirtz et al., 2015).

There is an extensive literature on business models and there exists considerable attention on business model innovation. Innovation is a dominant topic in the business model literature for creating competitive advantage and renewing organizations (Boons and Ludeke-Freund, 2013). The literature generally frames business model innovation in the context of identifying new sources for value proposition for the customer (Zott et al., 2011) and gives emphasis to its importance for business success (Bocken et al., 2014; Chesbrough, 2007). Business model innovation offers a potential approach for evolution through re-conceptualizing the purpose, the value creating logic, and rethinking perceptions of value (Bocken et al., 2014). Business model innovation goes beyond the innovation just for value proposition and developing individual technologies, it concerns about shifting towards

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creating new systems (Johnson and Suskewicz, 2009), therefore it does not concern just changing the product and service offerings for the customer, it concerns also about the way for doing the business and transforming entire activity system (Amit and Zott, 2012). Consequently any innovation project in product or service changes the business model of the public-private ecosystem.

Existing literature on business model innovation has three major limitations; first one is about the lack of appropriate tools for its demonstration, the second one refers to its scope of analysis often concentrated on a firm and the third one is about its separation from project management and subsequently the absence of feasibility study and evaluation.

### **7.2.1. Business model demonstration**

Business model design is mostly studied as how business models can be demonstrated through ontologies, visualizations (Wirtz et al., 2015) and mappings. According to the literature, business model demonstration is limited to few mapping tools; The business model canvas (Osterwalder, 2004), value network analysis (Allee, 2011, 2000) and value mapping tool (Bocken et al., 2013) are examples for such business model mapping approaches.

The business model canvas clearly focuses on a focal firm, trying to build a coherence among various bricks of the offer under study (Osterwalder and Pigneur, 2010). The qualitative characteristic of the nine brick business model canvas provides a business model schema, but the lack of quantitative characteristic makes it difficult to understand the viability of the business. Furthermore zooming-in on a business role of the firm makes the model applicable mainly for small size start-ups. The value network analysis (Allee, 2011, 2000) provides an approach to understand the value exchanges among the actors and might assist in business modeling. Value exchanges visualize linkages between actors but they do not explicit the overall contributions and gains for the actors involved in the business. The value mapping tool (Bocken et al., 2015, 2013) attempts to describe different sorts of values (value captured, missed, destroyed and opportunities) for different stakeholders (Network actors, customers, environment and society) while it is completely qualitative and non-interpretative.

In summary, however mapping tools are useful for communicating, illustrating a representation of both current and prospective business models, explaining the business model

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and generating new data and information, but they cannot support the managers to take actions (Chesbrough, 2010). On the other hand, the qualitative characteristic of business model mapping and the lack of quantitative data make it difficult to understand overall financial state of the business. So we are supposed to reflect about how to develop new tools to support both demonstration and evaluation of the business model.

### **7.2.2.Scope of analysis in business models**

Firm-level scope of analysis in business models stands as a limitation. Particularly studies of sustainable innovation bring into focus the relevance of relationships with other actors (Boons and Ludeke-Freund, 2013). Environmental and economic benefits of industrial symbiosis are achievable only within a system consisting of business actors (Tsvetkova and Gustafsson, 2012). Adopting a system-level perspective assists to integrating sustainability dimensions to the business and shared value creation (Bocken et al., 2015; Westerlund, 2013) by involving other stakeholders in business model and deeper consideration of their business processes and benefits (Tsvetkova and Gustafsson, 2012).

Given the importance of system-level view for the business model, it is surprising that scholars (with a few exceptions) have paid little attention to this topic. Therefore evidences for system-level view in business model literature are few; According to Demil et al. (2014), business model investigates the interaction between the organization and its environment in order to create and capture value (Demil et al., 2014). Zott and Amit (2010) define a firm's business model as a system of interdependent activities that transcends the focal firm and spans its boundaries, in their point of view activity system is a set of interdependent organizational activities centered on a focal firm, including those conducted by the focal firm, its partners, vendors or customers, etc. that enables the firm, in concert with its partners, to create and share the value (Zott and Amit, 2010).

However there are few evidences for system-level perspective on business model literature, but they emphasize on its importance without proposing a framework. The real world business in which the firms, public authorities and customers are not isolated but interconnected, raise the question that how to go beyond the firm-level perspective for the business model?

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It seems widening the scope of analysis from firm-level to system-level through the business ecosystem concept will fill this gap. Business ecosystem outlines an overview of all interacting organizations from public and private sectors as well as the users within an activity (Moore, 1996). At the private sector side, most companies today inhabit ecosystems that extend beyond the boundaries of their own industries and they may depend on others for their effectiveness, survival (Iansiti and Levien, 2004b) and creating value which no individual firm can create alone (Ander, 2006). At the public sector side, the delivery of public infrastructure facilities such as transportation, hospitals and schools is carried by partnership with private sector (Thomas Ng et al., 2012). However companies, governments and civil-society organizations need to combine their resources in order to jointly address a problem (Stadtler, 2012), but their success depends on implementing a project which is more cost effective than existent solutions (Thomas Ng et al., 2012). In the system-level scope, cost effective project may address sustainability issues while having a holistic view is needed to integrate social and environmental goals in order to ensure balancing and aligning heterogeneous interests of different actors (Bocken et al., 2015). For integrating sustainability to business models, wider group of stakeholders should be considered by passing company's boundaries (Stubbs and Cocklin, 2008; Szekely and Strebel, 2013). However public-private ecosystems challenge with complexity and sustainability issues, the decision-makers from public authorities and industrial actors are not equipped with appropriate tools to make decisions. This issue motivated me to reflect about designing the Ecosystem Business Model tool in order to evaluate the business model of the public-private ecosystem.

### **7.2.3. Business model evaluation**

However evaluation and feasibility study are established subjects in project management literature (Cano, 1992; Halawa et al., 2013; Shen et al., 2010) but they have not attracted enough attention in business model literature.

Evaluation and feasibility study are important before undertaking any project and affect directly the success of project (Shen et al., 2010). Evaluation and feasibility study provide an analysis of the potential impact of a proposed project or program that assists decision-makers in determining whether or not to implement a particular project or program (Halawa et al., 2013).



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However business models like projects require evaluation and feasibility study but they are often too prospective with no evaluation and documentation for the reference situation.

Environmental aspect is one the issues that has attracted less attention both in project management and business model literatures. However evaluation and feasibility study are established subjects in project management literature but they focus almost on economic and financial issues, therefore environmental issues have attracted less attention in feasibility studies (Jorgensen, 2008). In parallel, business model scholars also have failed to link the sustainability issues with business model (Boons and Ludeke-Freund, 2013). As a result, the business models not only require integrating features regarding the feasibility study and evaluation but also those related to environmental impact analysis.

Accordingly, the business model literature requires to develop the methods for testing the feasibility and profitability of business models for two reasons: first, the business model has the capacity to be used for the feasibility study of an innovative project because it represents the business and its worth to its particular audience including potential partners and attract their interest through repertoires of proof and persuasion (Doganova and Eyquem-Renault, 2009). Second, as companies attempt to acquire more competitive advantages while they have several responsibilities vis-à-vis their stakeholders, society and environment (Wirtz et al., 2015) they need to evaluate their business models in order to identify the impacts of their actions.

### **7.2.4. Stating the objective**

According to the insights from literature, the business model concept with some developments would become a pertinent tool for initiating, evaluating and simulating sustainable innovation projects in public-private ecosystems. Sustainable innovation projects require a system-level perspective with all the stakeholders involved. Project feasibility study needs to shift from traditional approach to new approach that embraces the principles of sustainability (Shen et al., 2010) where environmental and economic benefits are achievable within an ecosystem consisting of business actors (Tsvetkova and Gustafsson, 2012). Subsequently I conceptualize the business model of ecosystem as a pertinent tool in multi-actor contexts such as transportation. Value proposition in transportation is a mix of public

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and private facilities which influence each other. Therefore the business model of a public-private ecosystem is a set of offer system, demand system and value structure. Offer system includes public and private actors who have a role in producing, innovating, offering and financing offers. Demand system involves all actors who need, pay and use offers (Roehrich and Llerena, 2011). Value structure is the process of creating and capturing tangible or intangible values. Cost-revenue structure as a subset of value structure reflects economic costs and benefits among the actors involved in the business model. This chapter particularly deals with the cost-revenue structure (i.e. according to the conceptual framework of this dissertation financial flows stand as tangible value exchanges among the actors).

As mentioned above, the literature on business model has important shortcomings regarding multi actor projects, evaluation mechanisms and even demonstration. This research has been started following the request of Vedecom, in this regard, the action research methodology has been selected, consequently the research question of this part of dissertation has been shaped as “How to evaluate the business model of a public private ecosystem?” in order to assist Vedecom in one of its real problems and also fill existing gap in literature.

### **7.3. Explaining the framework for designing the management tool**

As soon as Vedecom institute became the leader of a public-private consortium, it submitted its real preoccupations as research projects to its academic partners. Vedecom - a French public-private partnership for sustainable mobility - is a consortium between industries of the automotive sector, infrastructure and services operators in the mobility ecosystem, academic research institutions, and urban communities.

Therefore from the beginning, Telecom ParisTech as the research lab in management sciences was asked to provide managerial contributions and tools. As a result, in order to gain an initial understanding of how to evaluate the business model of a public-private ecosystem, I adopted the action-research methodology to investigate the public-private ecosystem for urban passenger transport in Satory. Action-research methodology in management science takes place in the real world and concerns real problems, though it includes iterative cycles of

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identifying a problem, planning, acting and evaluating where theory and practice are methodologically related in a process of knowledge creation (David, 2012). The methodology employed in this research bridged theoretical gaps by investigating problems encountered by practitioners (Shani et al., 2008). It enabled mutual learning between academics and practitioners through creating new scientific model and producing actionable knowledge (David and Hatchuel, 2008).

However action research methodology is useful to conduct a research for an organization, but it may be not exhaustive enough to cover the research question as fast as possible. In fact when management science and management practice collaborate through action research, the researcher expect the organization to provide and/or facilitate the access to the field for data collection. On the other hand the organization needs rapid and applicable answers to its factual questions. If the organization is mature enough, therefore it is probable that useful data has already generated within the organization through its interactions and activities over time. Therefore the researcher is able to conduct the research quicker and if new data is needed, it can be generated more rapidly thanks to existing channels. Indeed, when the organization is new itself and has the will to work on innovation, the situation is complicated for the researcher. The new organization has not enough experience and interactions; therefore there is no documentation and established channels with its partners or customers. Moreover as the organization is new, problems and preoccupations are numerous, so the organization requires to be nourished. Therefore the researcher may need to use some complementary research methods such as case study research alongside the action research in order to provide useful and rapid solutions for practice. This may facilitates the research to be conducted more appropriately during its life cycle in order to provide applicable solutions for practice and contributing to management science literature. Accordingly this research was financed by Vedecom, who introduces itself through its official website (i.e. [www.Vedecom.fr](http://www.Vedecom.fr)) a French public-private partnership based on an “unprecedented” collaboration between industries of the automotive sector, infrastructure, service operators, academic research institutions and local communities. Moreover Vedecom explains that its mission is becoming a European leader for “innovation” in the fields of electric vehicles, autonomous vehicles, connected vehicles, new infrastructure and services for shared mobility and energy. These phrases describe clearly that the organization (i.e. Vedecom) is newly

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established and seeks to innovate in complex contexts. Therefore conducting a management research was really challenging and needed high consciousness in order to achieve useful results for practice and equally enriching management science literature.

Figure 17 illustrates the research framework; as discussed, action research methodology required to be conducted alongside the case study methodology for prototyping the tool and utilizing it in a concurrent real project. Autolib carsharing service in Paris and its close suburbs was selected as the case study, while the experimentation of autonomous vehicle in Satory was the field in which the action research has taken place. Accordingly data collection consists of two different projects and includes several methods such as semi-structured interviews, consulting reports and articles, survey and sharing information and debating workshops. Data analysis of the Autolib carsharing service led to create a prototype for demonstrating and evaluating the business model of ecosystem. These primary results have been validated through academic and professional meetings between Telecom ParisTech and Vedecom Institute. Therefore its use for the Satory project has been approved. After having identified the actors involved, I realized semi-structured interviews with public authorities and industrial companies. Moreover a transport survey of users was launched. The qualitative data was analyzed and led to construct a prototype of business model including mapping, and matrix. Additionally the transport survey provided quantitative data which its analysis served to feed the matrix. Using the tool not only provided some concrete results for decision-making and business model innovation but also demonstrated its applicability as a tool for investigating the business model of a public-private ecosystem.

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Literature review	Methodology	Data collection	Data analysis and outcomes
Literature review of business model concept, its definitions, components, scope of analysis and demonstration	Case study	<ul style="list-style-type: none"> <li>Consulting annual reports, newspapers' articles, conference articles and media communications</li> <li>Online reports of public organizations and handbooks</li> </ul>	<ul style="list-style-type: none"> <li>Qualitative data analysis</li> <li>Prototyping a management tool for the business model of ecosystem</li> <li>Running the tool and its validation</li> </ul>
	Action research	<ul style="list-style-type: none"> <li>Semi-structured interviews with public authorities and industrial companies</li> <li>Online reports of public organizations and handbooks</li> <li>Transport survey of users</li> <li>Sharing information and debating workshop</li> </ul>	<ul style="list-style-type: none"> <li>Qualitative data analysis based on data collection processes</li> <li>Running the tool and providing several theoretical and managerial implications</li> </ul>

Figure 17 : Research framework for designing the management tool

## 7.4. Prototyping a management tool for a public private partnership for carsharing

This part will discuss the process of prototyping the management device through a case study of electric car sharing service in Paris. Carsharing stands as an example of the sharing economies in which underutilized resources can be used collaboratively in creative and new ways (Cohen and Kietzmann, 2014) and their underutilized value can be recaptured by

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sharing ownership (Bocken et al., 2014). High initial costs of car ownership and users' interest change (i.e. having access to mobility rather than car ownership) have stimulated the emergence of carsharing services (Bohnsack et al., 2014).

Carsharing has become a transportation mode since two decades ago and was presented in different cities all over the world (Dowling and Kent, 2015). Many carsharing services have implemented around the world with or without government support for responding to the increasing demand for mobility, moreover recent advancements in information and communication technologies have facilitated, reinforced and expanded carsharing services (Cohen and Kietzmann, 2014). Rapid urbanization during the past two decades challenged the governments' capacity and capability in offering appropriate public transport to users. Congestion and pollution have increased enormously in big cities while the governments were not able to implement costly and time-consuming public transport projects. Therefore the private sector was encouraged to address public transport's shortcomings and develop new offers (Cohen and Kietzmann, 2014). Private sector have influenced public transport policy and attempted to influence it by promoting the economic growth as a societal goal and transport privatization (Dowling and Kent, 2015).

Carsharing has been introduced with new business models as a shared mobility instance. Shared mobility instances such as carsharing, bikesharing and carpooling aim to share vehicles (e.g. car, bike) among members (i.e. users) instead of selling them to users (Cohen and Kietzmann, 2014). Carsharing may be one of the outcomes of moving toward sustainable modes of transport through users' behavior change (Dowling and Kent, 2015) and may decrease car ownership rate, car use frequency (Kent, 2013), inner-city traffic, congestion (Cohen and Kietzmann, 2014) and environmental footprint of urban transportation (Martin et al., 2010). Carsharing offers the functionality instead of ownership to the user. In other words the user benefits from the product and/or service (i.e. car and mobility) without having to own the car (Bocken et al., 2014).

According to the conceptual framework of this dissertation, the business model is a combination of offer and demand systems plus value structure. Therefore carsharing services can be classified to two main categories according to the configuration of their offer systems: Business-to-Customer and Peer-to-Peer carsharing services.

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In BtoC carsharing or Business-to-Customer carsharing service, an organization (e.g. a private company or public organization) invests for the service, in other words the firm offers turnkey solutions in which users pay for the time and/or distance that they use the vehicle, therefore users may not pay for energy, maintenance, insurance or parking in designated spaces. Users may use their smart phones and membership cards. BtoC carsharing services are either roundtrip or point to point (Cohen and Kietzmann, 2014). In roundtrip model (e.g. Zipcar), the user has to return the vehicle to the same location where it was picked up. In point-to-point or one-way model the user may use the vehicle and return it in already dedicated stations (e.g. Autolib) or leave it wherever in the zone of service (e.g. unsuccessful and abandoned TwizyWay service in Saint-Quentin-en-Yvelines).

BtoC carsharing services are usually high capital intensive businesses since they require significant numbers of cars and strong mobile and net technologies for supporting the service including transactions, reservations, geolocalization and car access (Cohen and Kietzmann, 2014). Consequently carsharing companies attempt to achieve local governments' support for covering a part of dispenses usually related to parking, tolls and specific lanes (Cohen and Kietzmann, 2014). However local governments engage and invest in partnerships with private companies for offering carsharing service, their cities benefit from reduction of congestion and pollution.

In PtoP carsharing or Peer-to-Peer carsharing, no firm invests in vehicles but provides some form of intermediation including web and/or mobile services in order to connect the owners of the cars (e.g. Relay Rides, Flight Car) (Cohen and Kietzmann, 2014).

Autolib is an electric carsharing service which was inaugurated in Paris in 2011. Bolloré not only manufactures the vehicles (Bluecars) but also operates the Autolib. The tender of Autolib was officially announced by mayor of Paris in 2009. The tender specifically demanded for a carsharing service equipped by 3000 electric vehicles distributed in 1000 stations in Paris and close suburbs to Paris. Bolloré won the tender on October 2010 among its five competitors.

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### **7.4.1.Data collection and analysis**

Data collection started with searching about the Autolib in carsharing service in different sources of information. First, the archive of the “Le Figaro” newspaper was used for searching the keywords like “Bollore” and “Autolib” within all the articles between 2006 and 2013. Moreover all annual reports of the Bollore group between 2001 and 2013 were consulted. These searches provided a history about the Autolib and I completed it with three semi-structured interviews: with a project manager of Autolib tender in another competitor bidder and two with engineers in French car manufacturer companies. All of these data was useful to understand the context of the project and more specifically the actors involved.

Autolib stands as a multi-actor innovation project; according to the collected data (based on 2013), Autolib is a BtoC carsharing service that its offer system is a combination of several actors from public and private sectors.

Bollore group on behalf of its industrial partners provides a complete package including electric vehicles, charging systems and information system. Electric vehicles are manufactured by Bollore and an Italian car designer, Pininfarina. Electric vehicles are equipped with batteries manufactured by Batscap (joint-venture between Bollore and EDF). Managing the overall system, providing recharge and access appliances are done by IER (a subsidiary of Bollore) with the support of Microsoft. On the other hand, urban communities of Paris and close suburbs provide special spaces as parking locations as well as some financial contributions and subsidies.

Autolib carsharing service aims to offer functionality (i.e. mobility) instead of ownership (i.e. car ownership) to its users. Therefore, users can use Autolib for their occasional or permanent requirements.

According to the Autolib contract, Paris and its close suburbs were engaged to provide dedicated stations for the Autolib service and in return Autolib was in charge to pay the amount of 700€ per each parking annually. According to the data obtained from the website of Paris and its close cities ([www.paris.fr](http://www.paris.fr)) , in 2013, parking fare for residents of each district in Paris was 3.25€ per week. Moreover the parking fare for visitors was relevant to the location of the parking in Paris. In other words in 2013, Paris was divided to three areas with



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three different parking fares for visitors. In the heart of Paris, the rate was 3.6€ per hour, in the second area the rate was 2.4 € per hour and in the cheapest area was 1.2 € per hour. Parking fare for the visitors in cities close to Paris was 1€ per hour. Hypothesis for evaluation includes: first, occupation rate of each parking place in Paris is 85% and in suburbs is 70%, second, annually working days are 260, third, in Paris 30% the parking is occupied by the residents versus 70% by visitors, fourth, according to the contract Paris provided 60% parking stations versus close cities who provided 40%, and finally, according to the surface of three price areas in Paris, 30% of the visitors park their vehicles in the most expensive area, 30% in the medium price area and 40% in the less expensive area.

According to the data and hypothesis, in 2013, Paris lost 6.43M€ of its benefits from parking rents. Moreover near cities to Paris, all together lost 2.18M€ of their benefits from parking rents. On the contrary what they gained according to the reimbursement of Autolib for parking stations is 840000€ for suburbs and 1.26M€ for Paris.

The French government subsidized each electric vehicle with the amount of 7000€, so for 3000 electric vehicles that are used in Autolib service, the government funded the amount of 21M€. Moreover the city of Paris subsidized the Autolib with 50M€ and invested 30M€ for equipping the stations. In parallel, urban communities of suburb cities jointly subsidized 70M€ and invested 20M€ for equipping the stations.

From January 2011 to October 2012, the European Bank of Investment gave two loans to Autolib, first one with the value of 130M€ and the second with the value of 70M€. If the payback period was 12 years with 5% interests annually, therefore Autolib was engaged to payback 17.9M€ annually.

Bollore announced that its investment on the project was 200M€ and annually operational costs were 80M€.

In 2013, Autolib fixed the amount of 120€ for annual subscription and 25€ for monthly subscription. In addition to fixed subscriptions either annually or monthly, using the vehicle also was subject to additional charge for subscribers. Autolib predicted that one third of its revenue will come from the annually or monthly subscriptions and two third from the charges for use. According to this information and assuming that half of the subscriptions were

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annually and the rest half were monthly, therefore Autolib expected the revenues with the amount of 50.4M€ annually. Autolib was engaged to give 10% of its income to urban communities of Paris and suburbs.

Using carsharing service in a city decreases personal car use, accordingly the environmental impacts of conventional car use decrease; particularly when the fleet is composed by electric vehicles, generation of greenhouse gas emissions, air pollution and noise pollution decline more. Exploitation of 3000 electric vehicles through the Autolib carsharing service in Paris and its close suburbs resulted to approximately 12.25 M€ saving for the French government annually. According to the reports of ADEME and INSEE, in 2012, each car has circulated 12666 kilometers annually and averagely emitted 127 grCO<sub>2</sub>/km. Moreover in dense urban areas (i.e. more than 420 inhabitant/km<sup>2</sup>), each vehicle that circulates one hundred kilometer costs 2.9 euros for the government just for air pollution (Boiteux, 2001). Furthermore using the car in cities costs at least 0.76ct€/km during the day and 1.39ct€/km during the night (Maibach et al., 2008). Therefore if each car substitutes 7.5 personal cars, therefore savings related to externalities include 1.45M€ according to less GHG generation, 8.3 M€ due to less air pollution and 2.5 because of less noise pollution.

Contributor	Financial flow	Amount
<b>Government</b>	Subsidy - Government>>Autolib	7000€/car
<b>Suburb urban communities</b>	Opportunity costs(loose of 1200 car parking rent)	2.2m€/year
	Subsidy- Suburb urban communities>>Autolib	70m€
	Autolib stations equipment costs – Suburb urban communities>>Autolib	20m€
<b>Paris</b>	Opportunity costs(loose of 1800 car parking rent)	6.5m€/year
	Subsidy – Paris municipality>>Autolib	50m€
	Autolib stations equipment costs- Paris municipality>>Autolib	30m€
<b>Autolib</b>	R&D costs- Bolllore>>Autolib	200m€
	Operational costs	80m€/year
	Loan repayment>>BEI	17.9m€/year

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	Autolib>>Urban communities	700€/parking/year
	Autolib>>Urban communities	10% income
<b>Users</b>	Membership and use costs - Users>>Autolib	50.4m€/year

**Table 11 : Financial contributions of different actors in Autolib carsharing service**

<b>Beneficiary</b>	<b>Financial flow</b>	<b>Amount</b>
<b>Government</b>	Negative externalities cost decrease (GHG)	1.45m€/year
	Negative externalities cost decrease (pollution)	8.27m€/year
	Negative externalities cost decrease (noise)	2.53m€/year
<b>Suburb urban communities</b>	Autolib>>Urban communities	700€/parking/year
	Autolib>>Urban communities	10% income
<b>Paris</b>	Autolib>>Paris	700€/parking/year
	Autolib>>Paris	10% income
<b>Autolib</b>	Users>>Autolib	50m€/year
<b>Users</b>	Costs of car ownership reduction	112.5m€/year

**Table 12 : Financial benefices of different actors in Autolib carsharing service**

## 7.4.2. Prototyping a management tool for the business model

The objective of this section was to make a prototype for the business model of a public private ecosystem. According to the data collection and analysis of this case, actors are categorized in three major subsets: public authorities, industrial companies and users. Public authorities include Paris and its close suburbs urban communities, French government and European bank for investment. In private sector side, Bolloré through Autolib represents its industrial partners including IER, Pininfarina and Batscap. Users are private car users who adopt Autolib service instead of using a personal car.

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<p><b>Offer system</b></p>	<p>Autolib is a B2C carsharing service that its offer system includes several actors from public and private sectors. The municipalities of Paris and its near suburbs not only launched the Autolib tender in 2010 but also collaborated with Autolib and attributed parking places and financial aid.</p> <p>Electric vehicles are provided by Bollere and Pininfarina. Batteries are provided by a JV between Batscap (a subsidiary of Bollere) and EDF. The French Government subsidizes the EVs.</p> <p>Information system and its infrastructure are provided by IER (a subsidiary of Bollere) and Microsoft.</p>
<p><b>Demand system</b></p>	<p>Individual users who use Autolib for their occasional or permanent needs in terms of urban mobility.</p>
<p><b>Value structure</b></p>	<p><b>(Tangible value exchanges)</b></p> <p><b>Service</b> Autolib offers to its users a Point to Point carsharing service that satisfies users’ needs in terms of mobility without having to own the car.</p> <p><b>Product</b> Bollere provides electric vehicles, batteries, information system, charging infrastructure, etc.</p> <p>The municipalities of Paris and its near suburbs have attributed parking places.</p> <p><b>Financial</b> Bollere has invested for R&amp;D.</p> <p>The French government has subsidized the EVs.</p> <p>Municipalities have subsidized Autolib and contributed to the parking equipment costs.</p> <p>Municipalities have lost parking income from attributed spaces to Autolib.</p> <p>Autolib pays the operational costs and loan repayment. Autolib pays annually 700€ per place and 10% income to municipalities.</p> <p>Substitution of personal cars by carsharing assists the Government to save on externalities.</p> <p>Users pay Autolib through their subscription and usage.</p> <p>Users save on car ownership costs by choosing Autolib.</p>

**Table 13 : Autolib carsharing business model specifications**

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Figure 18 visualizes the business model of the Autolib carsharing service. Particularly it shows the financial relations among the actors. This mapping helps to identify the actors and their contributions and gains. Accordingly this data is used for feeding the matrix (Table 14).

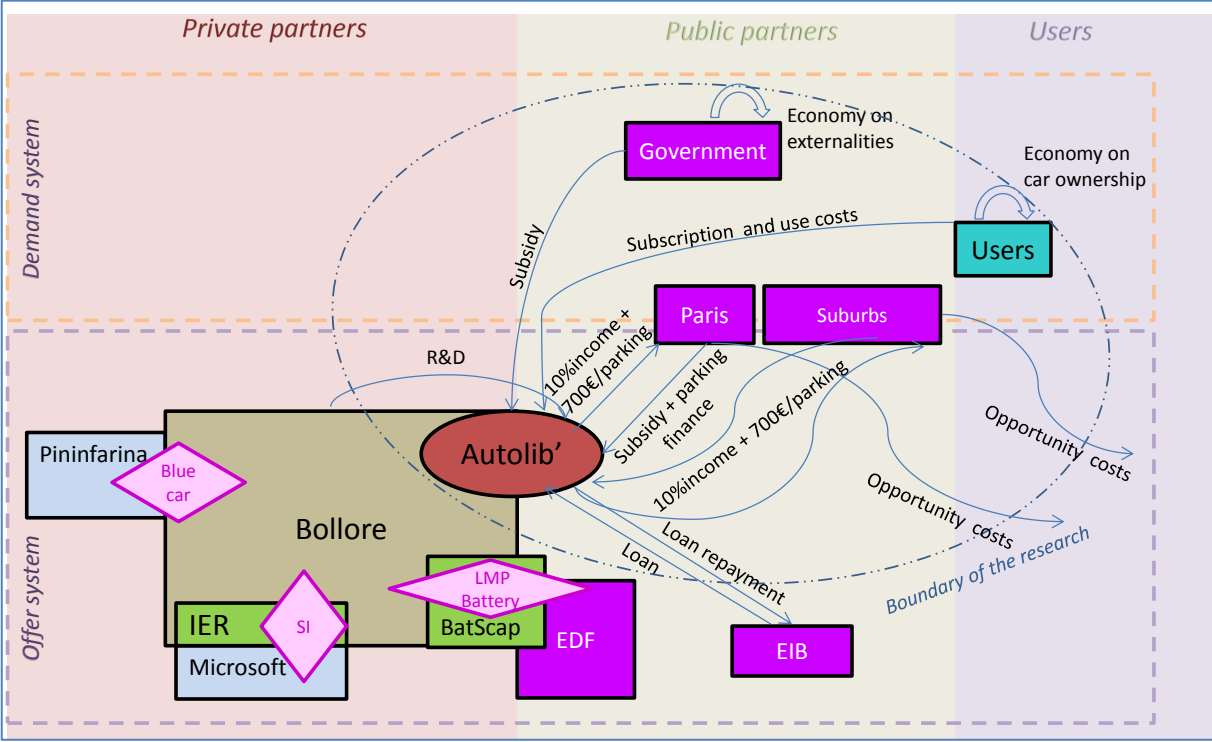


Figure 18: Business model of the Autolib carsharing service

In order to use the matrix, the boundary of research was determined as shown in the figure 18. Therefore, in accordance with the boundary of the research, five actors are involved in the matrix: Autolib, Paris, suburbs’ urban communities, the French government and the users. As each actor is sometimes beneficiary and sometime contributor, the matrix helps to take into account this characteristic of financial flows. In other words the matrix facilitates to understand all the flows among the actors and the flows that exit the boundaries of ecosystem.

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Contributors		Beneficiaries							Contributions				
		Government	Urban communities	Paris	Autolib	Users	Opportunity costs	OPEX	CAPEX	m€/an	m€		
		Government								21	0	21	
Urban communities									2,184	90	2,184	90	
Paris									6,43	80	6,43	80	
Autolib		2,856	4,284							97,94	200	105,08	200
Users					50,4							50,4	0
Save		12,25										112,5	
Financement													226
Gains	m€/an	12,25	2,856	4,284	50,4	112,5							
	m€	0	0	0	226	0							
Bilan	m€/an	12,25	0,672	-2,146	-54,68	62,1							18,20 m€/an
	m€	-21	-90	-80	26	0							-165 m€

Table 14 : Cost-revenue structure of the Autolib carsharing service

Table 14 illustrates the cost-revenue structure of the Autolib carsharing service; in this regard all the contributions and benefices have been calculated for each actor (the detail summary of calculation is described in 7.4.1).

This matrix not only clarifies the contributions and benefits of each actor but also it provides a general perspective of the whole ecosystem. As shown in the table, total investment of the French government, urban communities, Paris municipality and Autolib equals to 165 m €, while the annual gain for all the actors involved (French government, urban communities, Paris municipality, Autolib and users) is 18.2 m €.

## 7.5. Investigating the business model of ecosystem for initiating the innovation project

Since 2013, when we joined the project, the Vedecom institute requested us to provide a study of the actors of urban passenger transport in Satory and their financial contributions. Accordingly the action research methodology was selected and from the beginning several meetings had been held. Meetings were useful for collaborating together and bridging the real problem in practice with existing literature in management science. This part explains different stages of this collaborative research.

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### **7.5.1. Describing the process**

In order to start the research within the multi-actor innovation project, the actors are classified in three major subsets: public authorities, industrial companies and users. Afterward we conducted semi-structured interviews with the directors of Chamber of Commerce and Industry Versailles-Yvelines and Paris-Saclay Development Authority (EPPS). These interviews had several important results: first, they provided a comprehensive view about future programs for public transportation, economic development and urban planning in the territory. Second, they formalized the role of Vedecom Institute as the leader of consortium and its project and activities. As a result three public authorities authorized Vedecom to contact with the directors of companies in the zone in order to conduct interviews with them.

In the next step, we contacted the directors of the companies in the zone and requested each of them a one hour meeting. The semi-structured interviews with the directors of the companies in the zone contributed to several advancements: first, as the objectives of the project could not be forced to the stakeholders and the success of project is due to the involvement of stakeholders from the beginning, therefore these interviews provided a favorable environment in order to introduce the project and to create the first contacts. Second, the analysis of the interviews led to identify and understand the directors' point of view on transport issues as well as their general industrial plans for future developments. The major result was that at the end of the interviews, directors committed to diffuse the Vedecom's transport survey amongst their employees and permitted the participation of some of their employees in creativity workshops. Transport survey and creativity workshops provided both quantitative and qualitative information about the users of different modes of transport in the zone.

In parallel to the interviews and survey on "user" side, we continued the interviews with other public authorities and industrial partners. Two semi-structured interviews with Urban Community of Versailles Grand Parc (CAVGP), one with Paris-Saclay Development Authority (EPPS), two with Valeo, one with Renault and two with program directors in Vedecom were organized. These interviews provided a wide range of qualitative and quantitative data on technical and financial issues.

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<b>Types of data sources</b>	Semi-structured interviews with public authorities and private companies, transport survey of users, online reports of public organizations (INSEE, ADEME, URSSAF, STIF, CGDD), handbooks (Maibach et al., 2008) standards (ISO 14044), several internal meetings, sharing information and debating workshops.
<b>Semi-structured interviews’ protocol topics</b>	<p>Public authorities: economic, urban and transport development plans, general insights and expectations from transport , transport costs</p> <p>Employer companies: general insights and expectations from transport and their employees’ mobility, plans for human resource increase, main motivation for implementing in the location, shared transport plans among neighbor companies</p> <p>Industrial companies: technological innovation projects and their implementation in existing public-private ecosystem</p>
<b>Transport survey focus</b>	Distribution of place of residence, place of work, worked days per week, flexibility of work day schedule, work displacement during the day, utilized mode of transport, travel time, distance from home to work, weekly delays and general insights and expectations from transport
<b>Workshop focus</b>	Sharing information and debating for identifying the actors involved in the experimentation phase of autonomous vehicle and their contributions.

**Table 15 : Overview of the data-collection**



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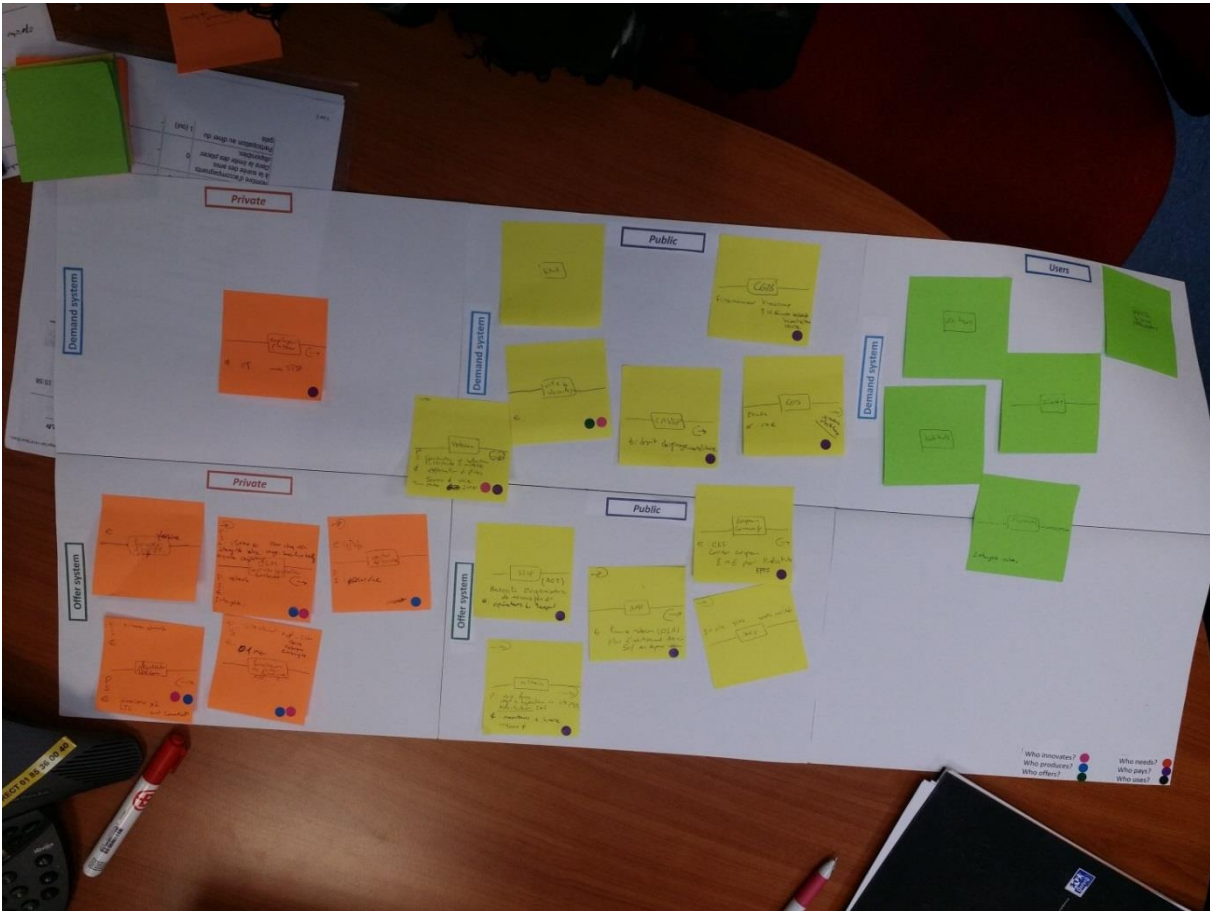


Figure 19: The workshop of elaborating the business model mapping

In order to work on the innovation experimentation, I organized a workshop with the director and experts of the Eco-mobility program. After a brief presentation, we worked together in order to identify all the actors involved and their contributions in the innovation experimentation phase. As shown in figure 19, we tried to identify all public and private actors who have a role in the business model of the innovation experimentation. Moreover we tried to identify the financial flows among the actors according to existing data.

## 7.5.2. Urban passenger transportation in Satory

Urban passenger transport is a public-private ecosystem, though it is a set of several value propositions such as public or private transport and it includes several actors and users. On the other hand organizations today inhabit ecosystems and depend on hundreds of other organizations (Iansiti and Levien, 2004b). Therefore, determining the boundaries of ecosystem assists to focus on the subject and to investigate the problem. Boundary-setting

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depends on the focus question, its related activities and the level of required detail (Allee, 2011). In this research boundaries of ecosystem were set by considering first, the geographical localization of the zone studied and second, the organizations and users involved. The zone studied is an industrial zone where several companies are installed, though the majority of the users of transport are the employees of these companies who use either private transport or public transport.

The results of the mobility survey revealed important information about the existing situation. The statistical information about the distribution of place of residence, place of work, worked days per week, flexibility of work day schedule, work displacement during the day, utilized mode of transport, travel time, distance from home to work and weekly delays provided quantitative information. This information was analyzed in line with secondary data sources such as public reports, and calculated either directly (e.g., public transport costs, fuel consumption costs, economics of transport, fuel consumption taxes) or by calculation methods such as life cycle assessments and externalities calculation.

As the zone in 2013- the date of the survey - was a business district therefore all the employees of five existing enterprises in the zone including Nexter, STAT/CEISIM, IFSTTAR, Citroën Racing and Renault Trucks Defense were requested to respond the transport survey. The participation rate to the transport survey was 32.5%, more specifications are provided in table 16.

<b>Enterprise</b>	<b>Number of respondents</b>	<b>Number of employees</b>	<b>Response rate</b>
<b>Nexter</b>	193	600	32 %
<b>STAT/CEISIM</b>	123	420	29 %
<b>IFSTTAR</b>	29	50	58 %
<b>Citroën Racing</b>	31	200	16 %
<b>Renault Trucks Defense</b>	75	230	33 %
<b>Unspecified</b>	36		
<b>TOTAL</b>	<b>487</b>	<b>1500</b>	<b>32.5 %</b>

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**Table 16 : Companies and their response rates to the transport survey**

The table below shows the percentage of car users, motorcycle users, bicycle users and public transport users. Moreover, it explains how much time they spend averagely for transport and how long their travels are.

	<b>Car users</b>	<b>Motorcycle users</b>	<b>Bicycle riders</b>	<b>Public transport users</b>
<b>Percentage</b>	66%	7%	3%	24%
<b>Average daily journey (km)</b>	42	38	8	52
<b>Average daily journey (hour)</b>	1.37	1.05	0.73	2.5

**Table 17 : Share of urban passenger transport modes in Satory**

According to the survey 94.6% of the employees work five days per week, while just 1.4% work 2 days and 3.9% work 7 days per week. 50% of the employees are subject to fixed daily hours while the rest have variable working hours.

The table 18 shows the distribution of the employees' homes location. Extracted information from this table was used to evaluate the income of departments and regions in terms of Domestic consumption tax on energy products.

<b>Department</b>	<b>Number of employees</b>	<b>Percentage</b>
<b>Yvelines</b>	257	53.4 %
<b>Hauts de Seine</b>	77	16.0 %
<b>Essonne</b>	38	7.9 %
<b>Paris</b>	35	7.3 %
<b>Eure et Loir</b>	27	5.6 %
<b>Val d'Oise</b>	14	2.9 %
<b>Val de Marne</b>	12	2.5 %
<b>Seine et Marne</b>	4	0.8 %
<b>Seine Saint Denis</b>	2	0.4 %

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Other departments	15	3.1 %
<b>TOTAL</b>	<b>481</b>	<b>100.0 %</b>

Table 18 : Departments of residence

The transport survey shows that the car users have 70 minutes, the motorcycle users have 10 minutes and public transport users have 60 minutes average delay per week. They bicycle users did not declared any delay.

### 7.5.2.1.Private transport outlook

In France when users of cars and motorcycles pay for the fuel, in fact they are paying two different taxes to the government. First, Domestic consumption tax on energy products stands as a fix amount tax for a liter of fuel. In 2013, this tax was 0.43€ for a liter of diesel and 0.61€ for a liter of gasoline. Second, Value Added Tax (VAT) was 19.6%.

- Calculation method - Domestic consumption tax on energy products (case of diesel)

Amount: 0.43€ for a liter of diesel (2013, France)

Subject: private cars

Domestic consumption tax on energy products (case of diesel) = 0.43 \* quantity of diesel consumption

Quantity of diesel consumption = Total kilometers traveled \* average diesel cars consumption

Total kilometers traveled= number of private car users \* percentage of diesel car users \* average daily journey \* annually working days

- Calculation method - Domestic consumption tax on energy products (case of gasoline)

Amount = 0.61€ for a liter of gasoline (2013, France)

Subject: private cars and motorcycles

Domestic consumption tax on energy products (case of gas) = 0.61 \* quantity of gasoline consumption

Quantity of gasoline consumption (private cars) = Total kilometers traveled \* average gas car consumption

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Total kilometers traveled (private cars) = number of private car users \* percentage of gas car users \* average daily journey \* annually working days

Quantity of gasoline consumption (motorcycles) = Total kilometers traveled \* average motorcycle consumption

Total kilometers traveled (motorcycles) = number of private motorcycle users \* average daily journey \* annually working days

In France the average age of cars is 8.3 years (source: INSEE) with more than 72% on diesel versus 25% on gasoline (source: ADEME). Almost 100% of the motorcycles consume gasoline with the average of 5.8 liter per 100 kilometers (source: CGDD). According to INSEE average diesel price in 2013 was 1.37€ and average gasoline price was 1.6€.

### ➤ Calculation method - Value Added Tax (case of diesel)

Amount: 19.6% of the diesel sale price

Subject: private cars

Value Added Tax = 19.6% \* quantity of diesel consumption \* average diesel price in 2013

Quantity of diesel consumption = Total kilometers traveled \* average diesel cars consumption

Total kilometers traveled = number of private car users \* percentage of diesel car users \* annually working days \* average daily journey

### ➤ Calculation method - Value Added Tax (case of gasoline)

Amount: 19.6% of the gasoline sale price

Subject: private cars and motorcycles

Value Added Tax = 19.6% \* quantity of gasoline consumption \* average gasoline price in 2013

Quantity of gasoline consumption (private cars) = Total kilometers traveled \* average gasoline consumption

Total kilometers traveled = number of private car users \* percentage of gasoline car users \* annually working days \* average daily journey

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Quantity of gasoline consumption (motorcycles) = Total kilometers traveled \* average motorcycles consumption

Total kilometers traveled = number of motorcycle users \* annually working days \* average daily journey

According to the information mentioned above and provided calculation methods, private transport users including car users and motorcyclists of the zone pay annually 308770€ as the domestic consumption tax on energy products and 152582€ as the value added tax to the government. It should be mentioned that in France the highest public authority is the government, after that the regions, next the departments and then the urban communities. In France the only beneficiary of VAT is the government but the income from domestic consumption tax on energy products is divided among the government, region and department. 59% of the domestic consumption tax on energy products belongs to the government; therefore 16% belongs to the region and 25% to the department where the fuel sale is occurred.

Driving a car or motorcycle not only consumes energy but also generates several negative effects; Green House Gas emissions (GHG), air pollution and noise pollution. Moreover transportation might be very time consuming according to distances and traffic jams. According to our hypothesis, the government is in charge for all dispenses relative to these effects. These externalities have been calculated and integrated to the matrix. According to ISO 14044, Life Cycle Assessment (LCA) has been used for calculation for assuming all negative effects in production and consumption of fuel products. Calculating the noise pollution was based on day time because the zone of study is an industrial zone with day working hours (Maibach et al., 2008).

### 7.5.2.2. Public transport outlook

According to the interviews and webpages of public transport providers, just three bus lines serve the zone with different planning and paths; in total they go through 98000 kilometer per year for serving the zone. Correspondingly Transport organization authority pays about five euros per kilometer as the operational costs of a bus service. Transport organization authority is a public organization for managing public transport in France; its

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responsibilities cover several issues as defining public transport offers, pricing, service exploitation and contracting with operators. Based on the decree number 59-157 dated 7/1/1959, urban communities are able to subsidize public transport in order to create new offers or maintain existing ones despite non-economic profitability. Therefore the amount of 488000 euros for exploitation the three lines bus service is covered by urban community of Versailles Grand Parc and Transport organization authority.



Figure 20 : The map of bus lines in Satory, (source: [www.phebus.fr](http://www.phebus.fr))

Regular public transport users in Ile-de-France region (the studied zone in this research belongs to this region), usually subscribe to Transport organization authority's services by paying an annual fee for public transport, they use a contactless smart card to access the public transport, furthermore employers reimburse fifty percent of their employees' public transport subscription. Employers are in charge to pay transport subsidies along with salaries for all employees, the aim is to provide employees with an incentive to use public transport, and it is paid at the end of each month, and appears as a separate entry on the pay slip.

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		Bus K	Bus X	Bus W
Working days	Path length (km)	6,5	6	4,5
	Number of service per day toward Satory	31	2	9
	Number of service per day from Satory	23	2	9
	Total	54	4	18
	Annual traveled distance	61074	4176	14094
	Annual costs	305370	20880	70470
Summer season	Number of service per day toward Satory	13	0	0
	Number of service per day from Satory	12	0	0
	Total	25	0	0
	Annual traveled distance	7313	0	0
	Annual costs	36563	0	0
School vacations	Number of service per day toward Satory	22	2	9
	Number of service per day from Satory	18	2	9
	Total	40	4	18
	Annual traveled distance	7800	720	2430
	Annual costs	39000	3600	12150
	Annual traveled distance of each line	76187	4896	16524
	Total costs of each line	380933	24480	82620

**Table 19 : Bus lines for serving Satory**

Additionally companies contribute to financing public transport through general taxes. This mandatory tax is called “Versement Transport”, and it was introduced in 1971 for public and private companies with more than nine salaried employees in Ile-de-France region. Its purpose was to provide the necessary funding to extend and improve public transport services in the Paris area, which at the time was experiencing rapid economic growth. It was then gradually extended to all metropolitan areas with a transportation organization authority.

This tax is calculated as a percentage of a company’s total payroll costs, and it is collected by Social Security and transferred to the transportation organization authority. The percentage rate applicable is determined by the individual local public authorities, although a maximum level is imposed by the government. For the zone studied in this research, the percentage was 1.6. However the employers are forced to pay this tax but in some areas, it is still hard to approve that the public transport conditions are improved or it is more reliable, extended and has wider coverage in terms of time and place.



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As shown in table 28, the transport survey provided us the information about the number of employees in different job levels. According to INSEE, in 2013, different job levels had different levels of gross monthly salaries. The information obtained from the survey was articulated with the information about salaries by INSEE. Subsequently we calculated the amount of the “Versement Transport” for all the companies in Satory in 2013. This amount is 1.23 M€.

Gross monthly salaries - INSEE	Total	Citroën	IFSTTAR	Nexter	Renault	STAT	
Global average	2965						
Management staff	5642	67%	46%	63%	79%	57%	
Professionals	3049	6%	8%	4%	3%	8%	
Employees	2147	22%	31%	29%	15%	30%	
workers	2239	2%	15%	0%	1%	5%	
Jobs exempt from VT		3%	0%	4%	2%	0%	
Number of employees		1500	200	50	600	230	420
Men	3210	78%	85%	64%	72%	78%	90%
Women	2612	22%	15%	36%	28%	22%	10%
Rate of VT		1,6%					
Annual VT		1235840	143363	38503	534295	186031	333647

Table 20 : Tax of “Versement transport” in Satory

Like private cars and motorcycles, buses also have negative effects on environment (Green House Gas, air pollution and noise pollution), and somehow time consuming. Therefore these effects were taken into consideration in calculations for feeding the matrix.

### 7.5.2.3. Business model demonstration and evaluation

<b>Offer system</b>	<p>Urban passenger mobility in Satory is a combination of public and private transport modes. In 2013, the zone is mostly industrial and transport users are the employees.</p> <p>Public transport includes three lines (k, x and w) operated by Phebus.</p>
<b>Demand system</b>	<p>According to the survey, 66% of the employees use their personal cars, 7% use motorcycles, 3% use bicycles and 24% use public transport.</p>
<b>Value structure</b>	<b>(Tangible value exchanges)</b>

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<b>Service</b>	Three bus lines are the only public transport services that allow the users to reach major rail stations.
<b>Product</b>	Users use their own cars, motorcycles or bicycles.
<b>Financial</b>	Companies contribute to public transport by paying the “versement transport” mandatory tax.  Government organizations subsidize the public transport through different mechanisms.  Urban passenger transportation generates negative externalities including GES, waste time, air and noise pollution.  Car and motorcycle users pay taxes through paying fuel prices.  STIF manage and organize the public transport.  Companies reimburse 50% of public transport costs of their employees.

**Table 21 : Business model specifications for urban mobility in Satory**

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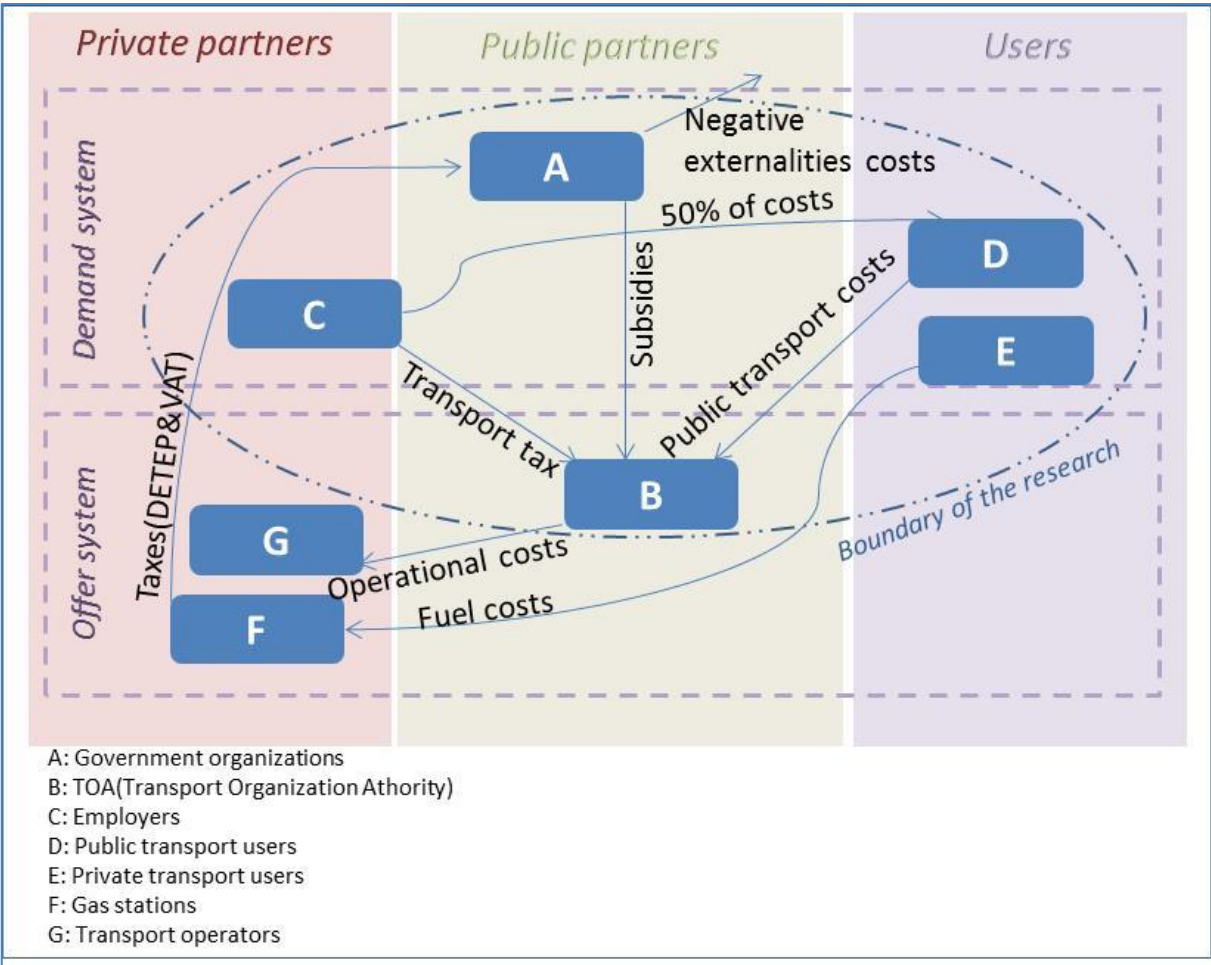


Figure 21 : The business model mapping of the urban passenger transportation in Satory

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Contributors		Beneficiaries							Contributions		
		Government	TOA	Employers	Public transport users	Private transport users	Negative externalities	OPEX	CAPEX	€/year	€
		Government		112 085				9 097 328			- 9 209 412
TOA							1 173 107		- 1 173 107		
Employers		1 235 840		191 070					- 1 426 910		
Public transport users		750 394							- 750 394		
Private transport users	461 353						452 553		- 913 906		
Earnings											
Funding										- 13 473 729	
Gains	€/year	461 353	2 098 319	-	191 070	-		+ 750 742			
	€										
Results per actor	€/year	-8 748 060	925 212	-1 426 910	- 559 324	- 913 906					
	€										
										Result ecosystem - 10 722 988	

Table 22 : The business model matrix of the urban passenger transportation in Satory

Table 22 has been constructed through the action research and all the calculations for feeding the matrix have been explained in 7.5.2.1 and 7.5.2.2. Table 22 shows that all the actors involved in the current business ecosystem of the mobility (Government, TOA, employers, public and private transport users) spend 10.7 m € annually for transportation. This amount includes also all the negative externalities due to public and private transportation.

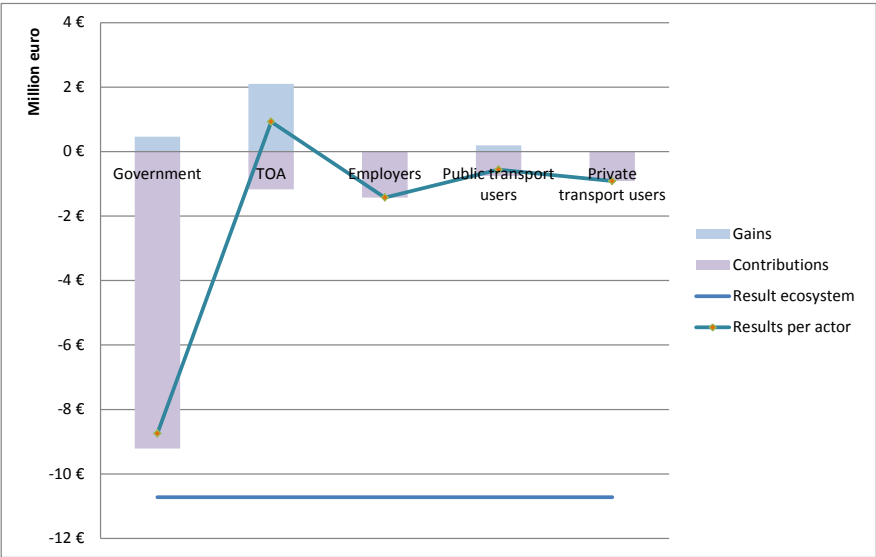


Figure 22 : The business model histogram of the urban passenger transportation in Satory

Figure 22 summarizes all the contributions and benefices of actors involved. It also illustrates the overall cost of the ecosystem (calculated in table 22).

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### **7.5.3. Autonomous vehicle background, incentives and experimentation**

The experimentation of the autonomous vehicle in Satory has not appeared all of a sudden, several dynamics resulted to this outcome. There is a long history about how different actors have collaborated together and shaped gradually a common project of autonomous vehicle. In chapter two, the roots of autonomous vehicle experimentation in Satory was discussed completely, here just a brief history is provided for reminding.

#### **7.5.3.1. The emergence of the research on autonomous vehicle**

Satory was selected in 1999 as the location of the joint laboratory between INRETS and LCPC because of its test tracks. The joint laboratory LIVIC started to do research on safe driving, speed limiting and innovation in transport. The French government's insistence on road transport safety led to the creation of VESTA project for advance transport safety technologies. In 2004, the French government started the tender for competitive clusters. VESTA project by the support of Valeo (French automotive supplier) and the Department of the Yvelines alongside the presence of Renault and Peugeot (French car manufacturers) intended to reply to the French government's tender for competitiveness cluster. VESTA was too concentrated on automotive industry therefore it required to joint other actors for increasing its eligibility. In this regard Veolia transport and the university of Versailles Saint Quentin en Yvelines joined VESTA. Afterward VESTA renamed to VESTAPOLIS. According to a governmental decision, the VESTAPOLIS and Normandy Motor Valley competitiveness clusters jointed together and created the MoveoTec competitiveness cluster with four strategic axes: Energy, mechatronics, road safety and mobility services. In 2011, ANR<sup>1</sup> (National Agency for Research), launched a call for 5 to 10 projects as IEEDs (Institutes of excellence for decarbonized energies). Each IEED was issued to a grant for its investment and operation. As the result Mov'eoTec has been converted to ITE Vedecom for working on electrification the vehicles, connectivity and delegated driving, mobility and shared energy.

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<sup>1</sup> Association Nationale de la Recherche

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This brief history shows how different actors and political decisions have influenced the research and how the research has been reoriented toward the autonomous vehicle experimentation in Satory. As summary, both the product (i.e. autonomous vehicle) and the location (i.e. Satory) were the results of several years of interaction between different actors.

### **7.5.3.2. Forthcoming projects in Satory**

Satory is located at Versailles and two major transportation projects will influence it in future years; on one hand the metro of Grand Paris will have a station at Satory till 2030 and on other hand nearest RER station (St-Cyr l'école) to Satory will be connected to the north of the department of Yvelines by train in 2019. Moreover to rail transport projects, Satory will experience urban development from 2025.

These projects are explained briefly as follow:

#### **7.5.3.2.1. Grand Paris Project**

The Grand Paris is a transport project that concerns entire Paris metropolitan area (i.e. Paris and its suburbs). This project not only aims to modernize the existing transport network, but also aims to extend it with new automatic metro lines. The line 15 will be like a ring around Paris and the lines 16, 17 and 18 will cover developing neighborhoods of Paris. This project is for improving residents' quality of life and facilitating daily travels between suburbs by solving regional inequalities problems for having sustainable city. The French Government and the region of Ile-De-France finance this project.

Satory will have a metro station by 2030 which will connect it to the Versailles Chantiers and Orly airport stations. Figure 23 shows the path of the line 18 which will have a station in Satory. Figure 24 shows the location of the metro station in Satory.

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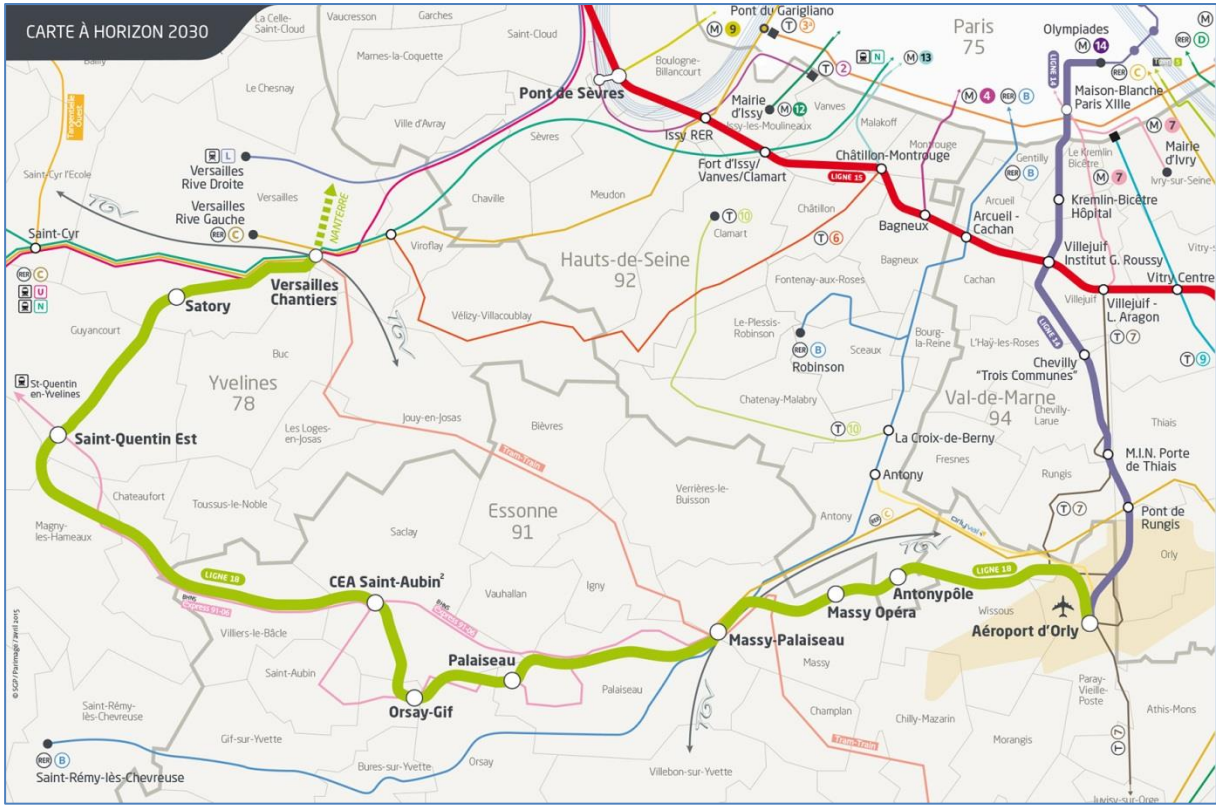


Figure 23 : The line 18 of the Grand Paris Metro (source: <http://www.societedugrandparis.fr> , version: 29 April 2015)

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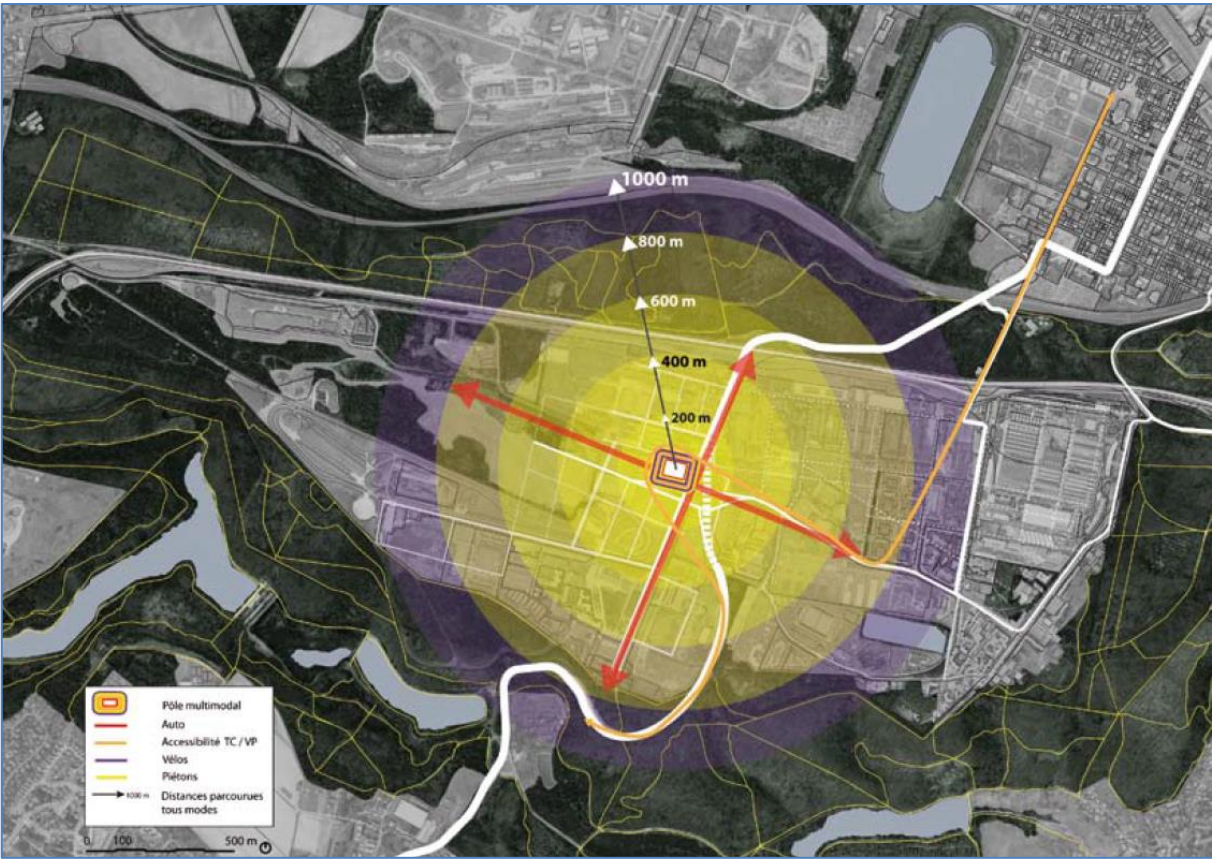


Figure 24 : The location of the future Metro station in Satory in 2030 (source: see the footnote<sup>1</sup>)

### 7.5.3.2.2. Tangentielle Ouest

The Tangentielle Ouest (TGO) project will connect the north of the department of Yvelines to its south through 30 kilometers by rail transport. TGO project has two phases; the first phase will connect RER A at Saint-Germain-en-Laye to RER C at Saint-Cyr-l'École, the second phase is the extension of TGO to RER A at Achères-Ville. Figures 25 and 26 show the path of the TGO line in both first and second phases.

<sup>1</sup> Charte urbaine et paysagère, Satory Ouest Versailles, August 2013, Accessed online on [www.epps.fr](http://www.epps.fr), February 2014



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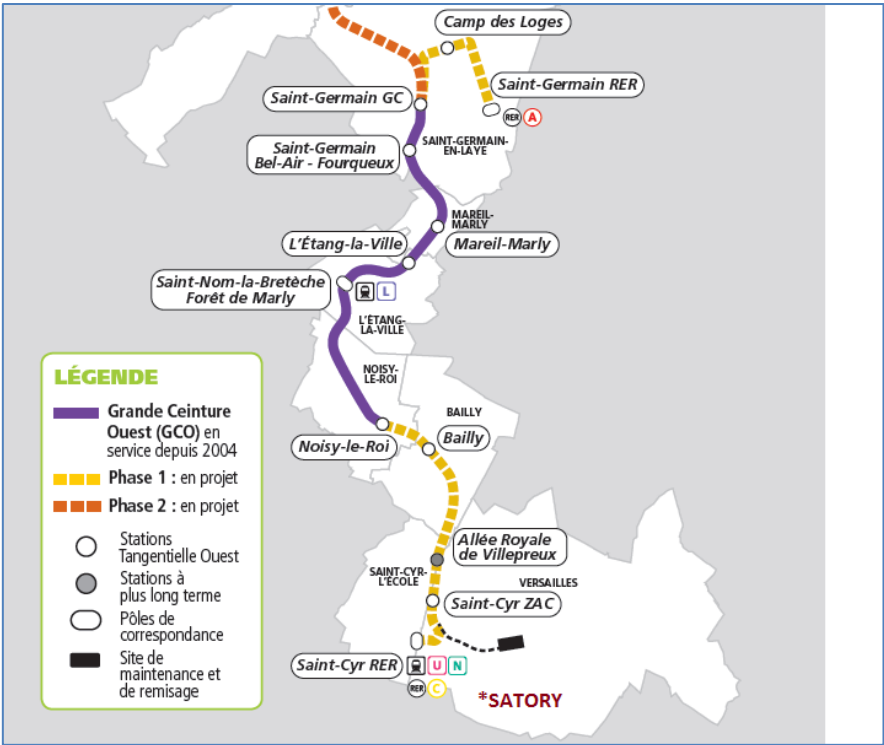


Figure 25 : The path of the first phase of TGO project (source: <http://www.tangentielleouest.fr/>)

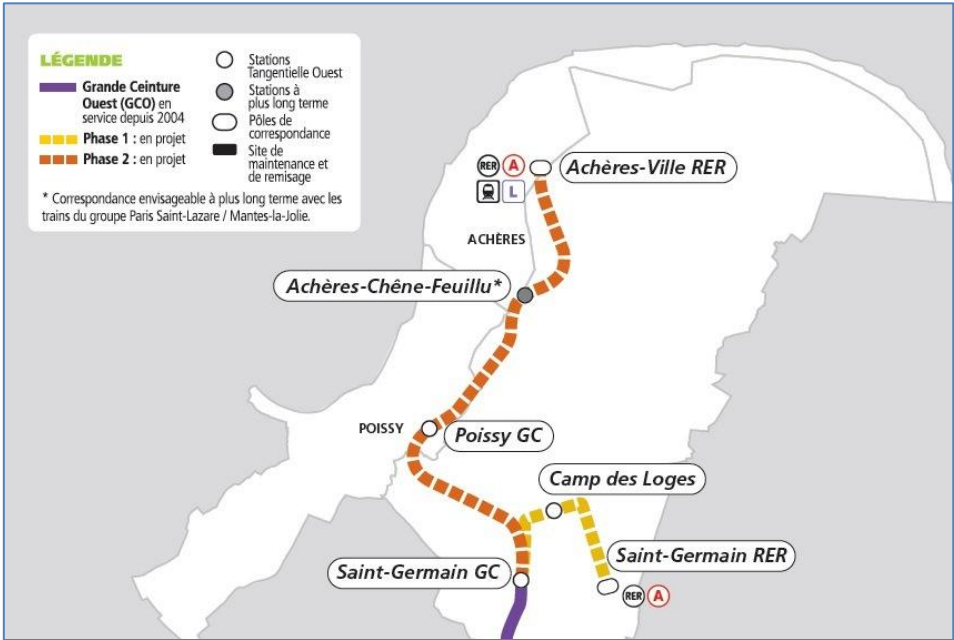


Figure 26 : The path of the second phase of TGO project (source: <http://www.tangentielleouest.fr/>)

### 7.5.3.2.3. Urban development in Satory-west

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Nowadays, Satory-west is just a business district in which army establishments and several industrial companies such as Renault Trucks Defense, Peugeot Citroen sport, Nexter are located. Moreover Satory is in connection with two national competitiveness clusters: Mov'eo and Paris-Saclay. Therefore this area is the subject for a high potential technological development concerning future motilities. In addition, Ifsttar (French Institute of Science and Technology for Transport, Planning and Networks) and the Vedecom institute will attract research laboratories and technology SMEs at Satory.

According to the EPPS<sup>1</sup>, Satory with the surface of 800,000 m<sup>2</sup> will be devoted to a mix of technological and industrial activities and residential housing. It will involve a research platform and it will locate businesses and related services. It is forecasted that 10000 jobs will be created in this area. And constructing 5000 housing units is planned.

Figure 27 shows the perimeter of the EPPS in terms of urban planning in several cities in south-west of Paris. The orange areas show the cities involved in Paris-Saclay development project.

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<sup>1</sup> Etablissement Public Paris-Saclay, [www.epaps.fr](http://www.epaps.fr)

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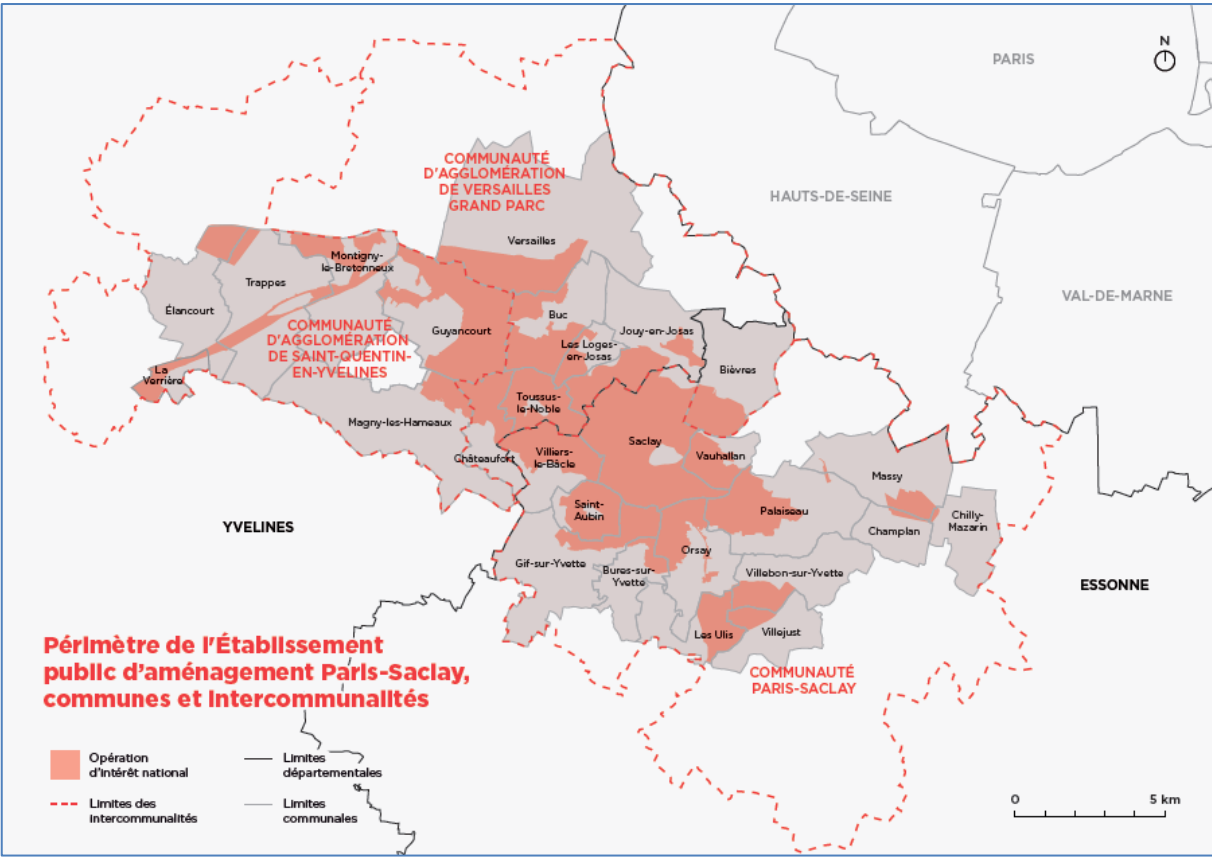


Figure 27 : Cities involved in Paris-Saclay development project (source: <http://www.epaps.fr/projets/versailles-satory>)

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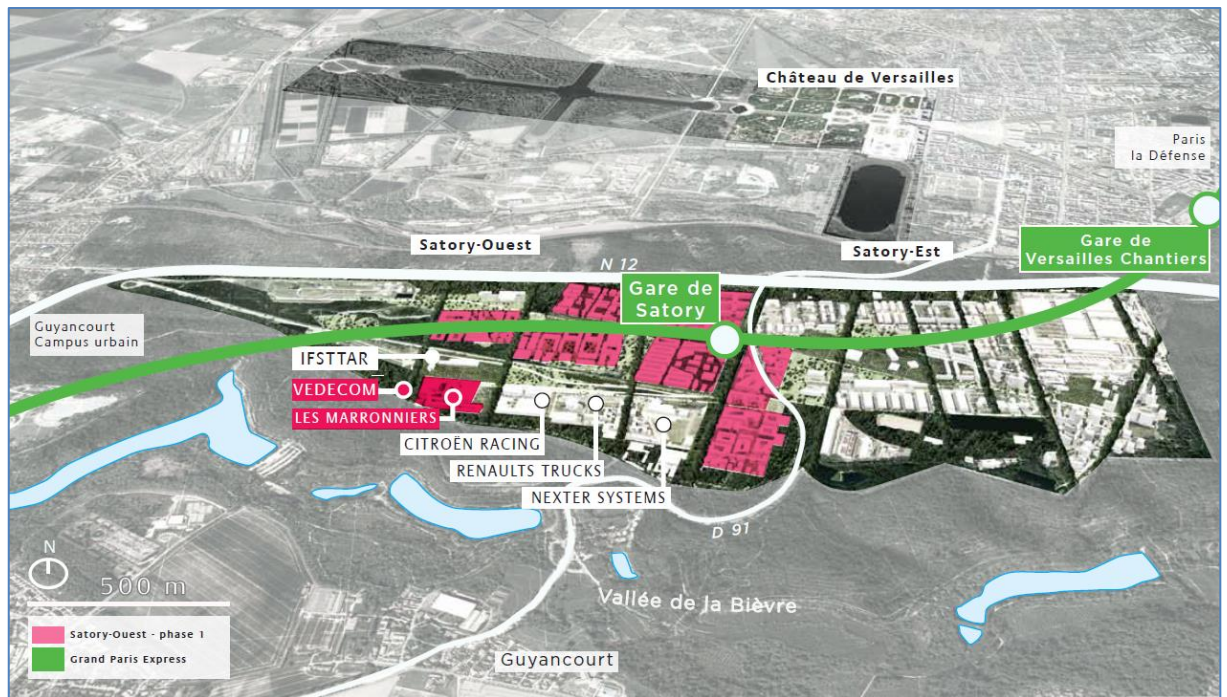


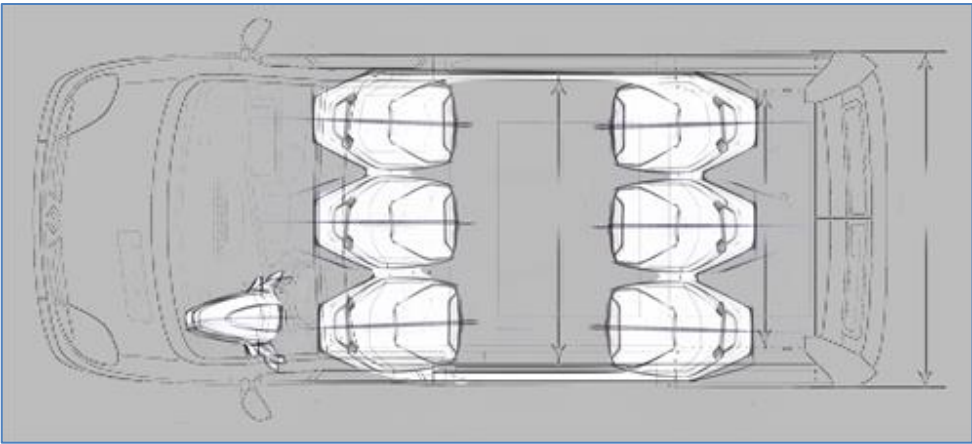
Figure 28 : Development projects in Satory according to EPPS, august 2013 (source: <http://www.epaps.fr/projets/versailles-satory>)

### 7.5.3.3. Short-term mobility demand supply through innovation experimentation

Vedecom Institute intends to launch an innovative urban transport service in Satory. It is about the autonomous vehicle experimentation on a dedicated path. The project will be inaugurated in 2018 between the RER station at Saint Cyr L'école and Satory. According to data revealed through the workshop, the project will be started by three 6-place autonomous vehicles, the round trip is estimated to take twenty minutes and the experimentation will last at least two years.

Strate Ecole de Design and Estaca Ecole d'Ingénieur are among the partners of Vedecom. They are working on modifying the Renault Trafic to autonomous vehicle. Their schematic design is illustrated in figure 29.

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**Figure 29: Autonomous vehicle design based on Renault Traffic (source: Vedecom’s presentation to its partners on 29 April 2015)**

The complexity of the autonomous vehicle project in Satory is due to at least two factors; first the “technical object” is not just a product (i.e. autonomous vehicle) but also includes several external complementary objects and also associated services. In other words the autonomous vehicle requires an ecosystem for its deployment. In contrast to conventional cars that are sold to the customer through a BtoC model, the autonomous vehicle exploitation requires the provision of complementary technologies during the use of vehicle.

As described before, Satory will be connected to Grand Paris metro in 2030. Before that, in 2019, the St.Cyr l’école station will be linked to Saint-Germain-en-Laye. It should be mentioned that the St.Cyr l’école station is located on one of the branches of the RER C that connects the heart of Paris (St. Michel-Notre-Dame) to Saint-Quentin-en-Yvelines on the west in 48 minutes by train. The exploitation of the Satory station (i.e. on the line 18 of the Grand Paris project) will end to the use of autonomous vehicle for accessing to the RER C because Satory will be connected directly to the Versailles Chantiers station which is located on RER C.

Table 23 summarizes the objectives of three major urban transport projects in Satory; the Grand Paris project is a region level project which will modernize and expand urban rail transport in Ile-de-France, the TGO project is a department level project which will facilitate the transportation. However linking St.Cyr l’école to Satory by autonomous vehicle experimentation is a urban community level in terms of use, but it involves several public

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authorities and industrial companies and creates different kinds of values for them. This issue will be studied in next chapter.

Project	Launch date	Level	Objectives
<b>The Grand Paris</b>	2030	Region	Modernizing and expanding urban rail transport and urban development
<b>Tangentiel grand ouest</b>	2019	Department	Linking north and south in the department of Yvelines
<b>Linking St.Cyr l'école to Satory</b>	2018	Urban community	Autonomous vehicle experimentation

**Table 23 : Forthcoming influencing urban transport projects in Satory**

As explained before, the autonomous vehicle experimentation in Satory is the result of interactions and dynamics among several public authorities and industrial companies since 1999. According to the interviews with Valeo (Valeo works on several devices such as radars and cameras for making the vehicles autonomous), in this state of technology before introducing a fully autonomous vehicle, the experimentation of the autonomous vehicle with lower level of automation in Satory requires a dedicated path.

Several paths in CASQY or CAVGP, were subject of a technical and economical evaluations (see figure 30). According to several studies and discussions conducted by Vedecom, the combination of the path 4 and 5b was selected because of its advantages in comparison with other paths. As instance this path would be more compatible with future urban development plans and will provide a dedicated path for autonomous vehicle experimentation from St-Cyr l'école to Satory, furthermore no major risk has been identified.

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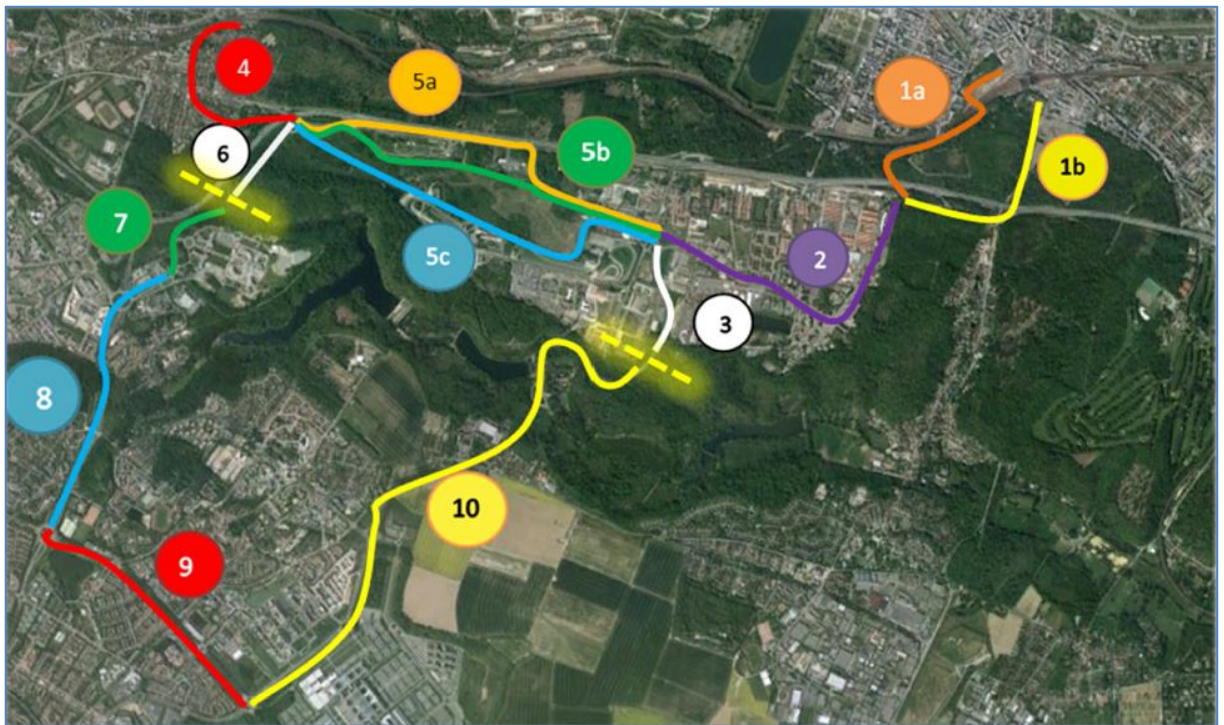


Figure 30 : Several paths choices for autonomous vehicle experimentation (source: Vedecom # R-2014-03)

Vedecom as the leader of the public private consortium benefits a subsidiary from ANR (National agency for research). Moreover its industrial partners particularly Renault, Peugeot and Valeo contribute also financially. So the management device has been used to determine, first, who are the actors involved, second, what is the amount the autonomous vehicle experimentation in Satory.

It should be mentioned that the results of using the designed management device in reference situation in Satory has been addressed to Vedecom in July 2014 as a comprehensive report. This report has been used by Vedecom for facilitating the negotiations with public authorities and persuading them for investing in civil infrastructure required for innovation experimentation. As a result EPPS has accepted to invest the amount of 15M€ on the civil infrastructure.

The table 24 shows the business model specifications of the experimentation. It shows different actors of offer and demand system as well as the financial contributions.

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<p><b>Offer system</b></p>	<ul style="list-style-type: none"> <li>• Vedecom Institute             <ul style="list-style-type: none"> <li>• Presiding the Vedecom consortium with more than 40 members of different industries and service sectors (automotive, aeronautics, system engineering, electronic components, ITC, numerical simulation, infrastructure management, transport operators, digital and energy grid operators), of several research and higher education institutions, and of urban communities.</li> <li>• Research on electric, autonomous and connected vehicles, and new infrastructure and services for shared mobility and energy.</li> </ul> </li> <li>• Founders: Renault, Peugeot, Valeo ...             <ul style="list-style-type: none"> <li>• Governance of the consortium and funding it. (However industrial partners of Vedecom are more than 40 but three of them including Renault, Peugeot and Valeo bring 60% of the private sector investment, consequently they have more power in governance).</li> </ul> </li> <li>• French National Research Agency - ANR<sup>1</sup> <ul style="list-style-type: none"> <li>• Mediator for attributing public funds to innovation projects within Future Investment Program - PIA (Programme d'Investissement d'Avenir)</li> </ul> </li> <li>• Paris-Saclay Development Authority - EPPS<sup>2</sup> <ul style="list-style-type: none"> <li>• Coordination of the development of Paris-Saclay cluster</li> </ul> </li> <li>• Other public or industrial partners             <ul style="list-style-type: none"> <li>• Participating in some aspects of projects according to their interests with lower level of financial and non-financial contributions to the partnership</li> </ul> </li> </ul>
<p><b>Demand system</b></p>	<p>Individual users who use this service for accessing public transport network of Ile-De-France through the St.Cyr l'école station.</p>
<p><b>Value structure</b></p>	<p><b>(Tangible value exchanges)</b></p> <p><b>Service</b> The public transport offer for linking Satory to St.Cyr l'école.</p> <p><b>Product</b> Autonomous vehicle and its associated exploitation equipment.</p>

<sup>1</sup> Agence Nationale de le Recherche

<sup>2</sup> Etablissement Public Paris-Saclay

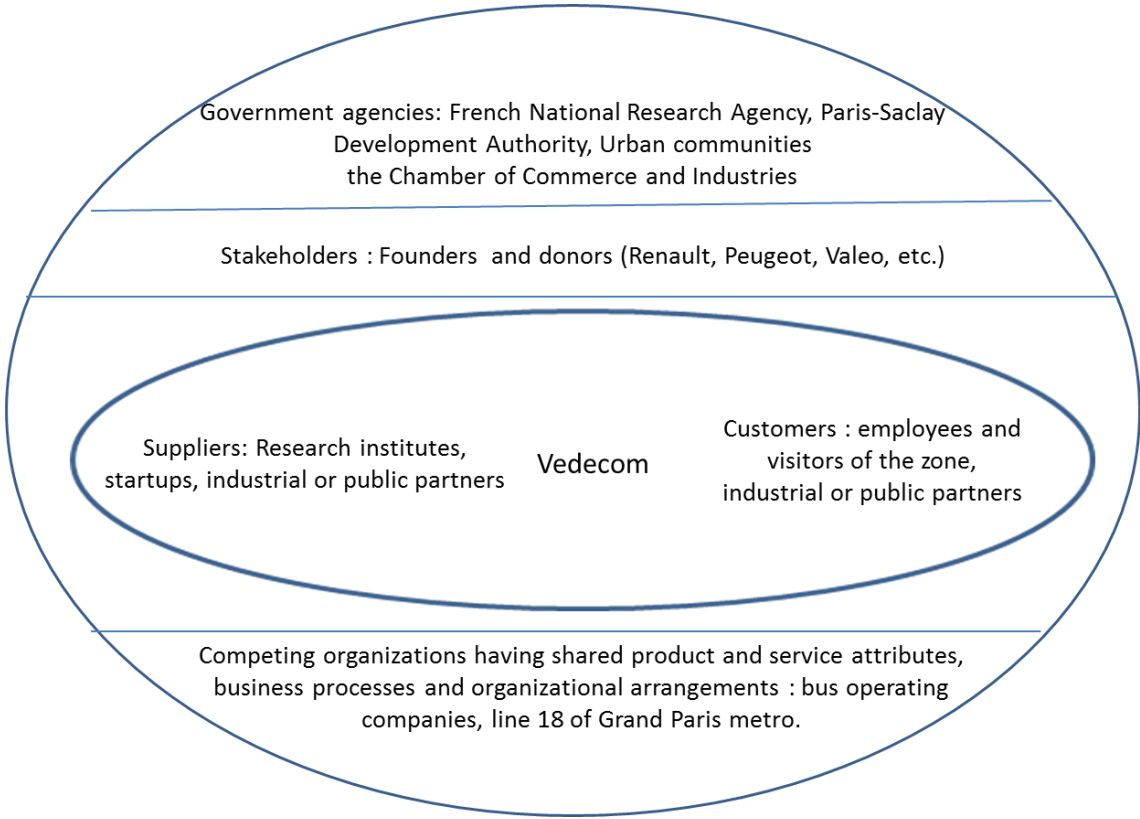


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<p><b>Financial</b></p> <ul style="list-style-type: none"> <li>• Industrial partners finance at least 50% of Vedecom’s costs.</li> <li>• ANR finances 50% costs of Vedecom</li> <li>• EPPS finances the civil infrastructure with the amount of 15 000 000 euro</li> <li>• European Commission finances Vedecom with the amount of 250 000 euro</li> <li>• Vedecom invests on electric autonomous vehicles, back office, telecommunication infrastructure and pays for energy consumption.</li> <li>• Vedecom funds the research in related subjects.</li> </ul>
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**Table 24 : Business model specifications for autonomous vehicle experimentation**

As discussed before, public urban transport in Ile-De-France is provided by STIF and pricing mechanisms include either Navigo cards or tickets. It seems that Vedecom will need to negotiate with STIF in order to make the access to the innovation experimentation through STIF’s pricing strategies. Otherwise it is so far to expect that users pay additional fare for just using this path for accessing the St-Cyr station.



**Figure 31 : An overview of the autonomous vehicle experimentation innovation ecosystem**

For starting the project at least 3 vehicles will be needed because roundtrip is approximately 20 minutes. A vehicle with six places can move 18 passengers per hour in each

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way therefore the capacity of the service in the beginning is 54 passengers per hour in each way. As a result, approximately the system will be able to move 100 passengers during the morning or evening rush hours (i.e. 8:00-10:00 and 16:00-18:00).

According to the workshop, in terms of capital investment, EPPS will be responsible to invest 15M€ for the civil infrastructure while Vedecom will be responsible for investing 2.95 M€ for three autonomous vehicles, back office, telecommunications and research. Moreover the European Commission has funded Vedecom by the amount of 0.25M€. Public and private partners of Vedecom, equally cover its costs. Therefore Vedecom should attribute 1.35 M€ of ANR's subsidy and 1.35M€ of its founders contributions for capital investment of this project. The operational expenditure including electricity, path rent, 3 work force, insurance and maintenance will cost at least 0.24M€. Vedecom can cover this charge by selling tickets to visitors who are passionate for innovation. For example during the weekends, the visitors pay 2€ for a 20 minutes roundtrip by an autonomous vehicle. If we consider that the system will attract 50000 visitors during the first year, therefore 100000€ is expected as the income from visitors. Moreover Vedecom can charge its partners to pay if they use any photo, film, etc. for marketing intentions. The latter may address particularly the public or private partners who have had fewer contributions in comparison with others in different stages of the project. If averagely 40 partners constitute the consortium, therefore if each of them contribute the amount of 7500€, therefore 300000€ is expected as the income from partners who communicate their contribution to the innovation experimentation for marketing purposes.

If we consider that each user of new system will replace it with private car, therefore negative externalities including GES, air pollution and noise pollution will decrease. According to the reference situation, Satory's transport specifications and with the French private car mix, the project will have 7, 360 and 107 euros of economy in GES, air pollution and noise pollution for each employee. On the other hand, during the experimentation phase, the capacity is 54 passengers per hour in each direction. As the employees will use the system in round trip and the working hours are 10 hours per day, therefore at the maximum level and in highly optimistic assumption, just 540 employees will use the system which will lead to 256000 euros of economy for the government.

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		Beneficiaries					Contributions	
		Government	EPPS	Vedecom	Industrial partners	EC	€/an	€
Contributors	Government			1 350 000				- 1 350 000
	EPPS							- 15 000 000
	Vedecom						- 233 500	- 2 950 000
	Industrial partners			1 350 000			- 300 000	- 1 350 000
	EC			250 000				- 250 000
	Earnings/economy	256 000		400 000				
	Gains €/year	256 000		400 000				
	€			2 950 000				
	Results €/year	256 000	-	166 500	- 300 000	-	122 500	€/year
	per €	-1 350 000	-15 000 000	-	-1 350 000	- 250 000	-17 950 000	€

**Table 25 : The business model matrix of the autonomous vehicle experimentation in Satory**

Table 25 shows the contributions and benefices of all the actors involved in the innovation ecosystem for mobility in Satory. 17.9 m € is needed for investment in the innovation project.

## 7.6. Discussion and conclusion

According to the literature, however several scholars have been highlighted the importance of cost-revenue structure and financial issues in business models (Demil et al., 2014; Teece, 2010) appropriate tools have not been introduced. This shortcoming becomes more critical in multi-actor contexts.

The literature review shows that most of the scholars define the business model around the firm while the emergence of several multi-actor concepts requires enhancing the business concept in order to make it applicable to the multi-actor contexts. This chapter attempted to do so and suggested several tools. Not only tools were designed but also they were examined through cases.

In this part of the research, the tool has been developed through the action research methodology. It supports the business modeling of an activity such as urban passenger transport which consists of several actors from public and private sectors as well as the users of different modes of transport. Using the tool through working with our collaborators opened a constructive dialogue among us and practitioners that enhanced the sharing of knowledge and the development of the management tool.

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A business ecosystem is a combination of several actors from public and private sectors as well as the users involved in a specific activity; corresponding to my research, in which the activity is defined as urban passenger transport, actors sometimes play a contributor role and sometimes a beneficiary role, this double-sided character makes the business model more complicated. On the other hand monetary flows within the ecosystem vary in terms of character and calculation methods. Based on the fact that actors play a contributor and/or beneficiary role, so the origin of each monetary flow is a contributor and the destination is a beneficiary. In addition to the monetary flows between the actors, I also took into consideration other flows which exit the boundaries of ecosystem like negative externalities and operational costs, and the flows which enter the boundaries of ecosystem like earnings and positive externalities. In this chapter a management tool has been designed and applied in different cases.

The mapping provides a holistic view of the business model in a multi-actor context, (e.g. urban passenger transport includes different value propositions from different actors for private or public transport), it helps to go beyond a specific value proposition of a focal firm, and it assists to zoom-out and provides a holistic perspective of the business and a comprehensive comprehension of offer and demand sides including public and private sectors as well as the users.. As described before, for creating the mapping of business model, the first step was identifying the actors involved. In this regard different sources of information and interviews have been used. The actors who play a role in the business model were identified by realizing the interviews and meetings or consulting websites and other sources of information such as public reports. For positioning the actors within the mapping, a cross-functional mapping has been created. It shows both identity and situation of each actor. Identity means that each actor is whether public, private or user. Situation signifies the role of each actor in offer and demand systems. This manner of mapping contributes to a much clearer representation of the business model and it illustrates visibly the position of each actor. After doing this, in order to calculate monetary flows between actors, different sources (interviews, academic articles, public reports, surveys, etc.) and methods (life cycle assessments, externalities calculation, public transport costs, fuel consumption costs, economics of transport, fuel consumption taxes, ...), have been used.

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The matrix is designed in the manner that federates different financial visions and offers a financial evaluation for the business model of ecosystem. It is an original tool that simplifies all the complexity of a business ecosystem by considering the actors simultaneously as a contributor and a beneficiary within the boundaries of ecosystem. Particularly it sheds light to financial aspect of the business model. It is adjustable to wider or narrower boundaries for ecosystem according to the case study and its objectives. It integrates financial issues relative to the negative externalities, though it provides a more realistic scheme of the business model that serves as a comparison reference for feasibility study that facilitates future actions or projects for any improvement. It should be mentioned that in designing the matrix, its use and applicability for different objectives was predicted, sometimes the scope of study is operational situation of the business model, though the financial flows concern about ongoing costs. On the other hand in the case of introducing new technology or service that necessitates capital expenditure or gets advantage from eventual funding, these items can be integrated to the matrix as well. This facility may be used for calculating the Net Present Value of the whole public-private ecosystem and not just for a firm.

The findings of this part of research help the decision makers from public authorities or private companies to understand and evaluate existing business models in order to be able to design new business models for innovation projects. The tool was developed in passenger urban transport context and adopted a qualitative and quantitative approach for cost-revenue analysis of the business model of ecosystem.

The business model not only serves to explain the content but also involves the process of doing business (Zott et al., 2011); As pointed out by Doganova and Eyquem-Renault, (2009), business models paly a performative role, therefore this part of research particularly validates the performative role of business model by assisting the decision makers to the construction of the techno-economic network of innovation. The process of using the tool itself is performative; it helps to identify all the actors involved in the activity and assist them to communicate and think collectively on a common issue. On the other hand it facilitates the evaluation of existing mechanism of the business model which results to identify opportunities for introducing new solutions, designing and conceptualizing new business models.

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The Ecosystem Business Model design tool assists the decision makers both from public authorities and industrial companies to reflect about the business model of a public-private ecosystem. It provides an evaluation method to recognize the actors involved and their contributions and benefits. Therefore it assists to identify areas that require improvement, change or even innovation. The initial intended application of the EBM tool is to investigate the business model of urban passenger transport in a zone. Therefore, it could be used to identify the actors involved and evaluate their contributions and benefices. It serves as a tool for feasibility study in public-private ecosystem in order to be able to initiate sustainable innovation projects.

This tool considers all the actors involved in the activity (e.g. urban passenger transport), it provides a system view versus firm view though zooming-out rather than zooming-in. System view facilitates the optimization of value in the network. Zooming-out gives the overall picture of a complex offer, which is necessary to understand the ecosystem in order to prepare for changes and competitions.

This tool provides a comprehensive exploration and recognition of the current business model; in other words it contributes to a feasibility study for new business models by identifying areas that either have the potential to change, improve or require modifications and innovations. It provides an analysis of the public-private ecosystem that facilitates to consider potential changes in technology and legislation due to socio-political, environmental and economic pressures.

The proposed tool demonstrated the importance of environmental issues and provided a method to integrate the evaluation of the negative externalities to the core of business model. This implication supports the public policy makers and industrial companies in their decision making processes.

The proposed tool is supportive for decision makers from public and private sectors. It clarifies what is going on within the transportation activity as a combination of public infrastructure facilities and private modes of transport. It supports the industrial actors to find the bottle-necks and work on them in order to introduce sustainable innovations. On the other hand, based on the information provided by the tool, public authorities may support more

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actively the industrial actors on the innovation journey, by their financial contributions or supports. The application of the tool unlocks the black box of the business model; it provides useful information for both public and private sectors, though the reference situation is documented wherein important actors and their contributions and benefits are recognized. In the case of transportation, the information extracted from the application of the tool, accompanies public authorities in their programs for overcoming real problems due to urban passenger transport in the zone that creates vicious circles; low public transport coverage in terms of frequency, variety and efficiency intensifies private car use. Subsequently, greenhouse gas emissions, congestion, air and noise pollution increase. On the other hand, however transportation remains as public facility infrastructure, with several regular tasks outsourced to private sector, the tool could be used here as a supportive tool for private sector to go beyond the regular tasks by evaluating the ecosystem and introducing new business models.

The process of this research itself had several contributions; the semi-structured interviews with managers from public and private sectors introduced Vedecom, its missions and future projects, therefore the interviews not only worked as a data collector but also as a mediator. In other words, at one hand, interviews led to identify the actors and their points of view and on the other hand made them aware about potential new projects and even appearance of new actors. This reciprocal application of interviews will help to the acceptability of innovative projects in the zone and contribute to their legalization. As we witnessed from the early stages of the research, public authorities including chamber of commerce and industry, urban community and development authority of the zone facilitated the research by authorizing the researchers to contact with the managers of industrial companies in the zone in order to conduct interviews. These interviews opened the door to access quantitative data through the transport survey of employees. The data extracted from the surveys were analyzed to calculate financial flows; consequently the results of the calculations fed the matrix. The matrix itself revealed the black box of the current business model and its weaknesses in providing public transport and immense use of private cars, which leads to massive energy consumption and causes negative externalities. The results of this research persuaded public authorities to attribute a pathway for experimentation the new project and to finance its construction. Moreover in the context of business model, it is

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indispensable to distinguish between user, customer and payer while they are not certainly the same. This research facilitated to target the potential customer and/or payer for the innovation. Subsequently it guided more effectively the technical team to work on technological innovations adapted to the target customer.

The qualitative aspects of the tool necessitate managerial approach while its quantitative aspect necessitates engineering background. It seems that designing software for quantitative aspect will facilitate and speed up the process for achieving the results. On the other hand further research is required to improve the generalization of the findings and application of the tool. The tool is just used in urban passenger transportation context so supplementary work is needed to examine its appropriation for other public-private ecosystems and its enhancement.



## **Chapter 8: Business model dynamics of the innovation ecosystem**

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# **8. Business model dynamics of the innovation ecosystem**

## **8.1. Introduction**

An innovation ecosystem requires several actors from industrial companies and public authorities to collaborate with each other in order to implement an innovation project (Moore, 1996). The innovation ecosystem deals with a complex project and its objectives and the means to achieve them are not fully identified from the beginning (Lenfle, 2008). Several industrial actors require to collaborate together according to their specialization in different skill areas, historical links and relationships (Zahra and Nambisan, 2012). They may need direct support of public authorities to shape a primary value proposition and to launch the innovation project while they have neither common comprehension of the project and its results nor an explicit demand (Lenfle, 2008). Therefore in an innovation ecosystem, experimentation and learning processes helps to the marketing of a product and/or service and increasing knowledge of the initially unknown innovation field. The innovation ecosystem ends with preparation for the next stage (Moore, 1996).

We investigate the answer in the light of business model literature; scholars have defined the business model concept and its components in different manners, most have a single-firm perspective (Chesbrough, 2010; Osterwalder, 2004; Teece, 2010) and few scholars have a system level perspective (Demil and Lecocq, 2010; Zott and Amit, 2010). Business model concept was almost studied in a static perspective, but recently several researchers emphasized on necessity to deliberate the business model dynamics (Achtenhagen et al., 2013; Demil and Lecocq, 2010; Wirtz et al., 2015).

As innovation ecosystem requires a system-level and dynamic view, equally we define a system-level and dynamic perspective for business model; Business model of ecosystem is a set of offer and demand systems, cost-revenue structure, value creation and capture and their interactions.

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In this chapter we focus on the value creation and capture, as a core component of a business model of ecosystem, we propose our framework for monitoring the value in an innovation ecosystem in order to prepare for the next stage either by taking strategizing actions or doing entrepreneurship.

### **8.2. Characteristics and challenges of an innovation ecosystem**

An innovation ecosystem is a complex and uncertain context; different actors from different backgrounds begin to work together on a new idea and strategy in order to deliver new offer to an unidentified customer. This is why managing innovation projects differs from development projects in which the aim is accomplishment of a clearly defined goal in a specified period of time, budget and quality requirements (Lenfle, 2008). An innovation ecosystem has specific characteristics and faces to several challenges:

- **Joining together and searching for new ideas**

Innovation often does not stand alone and it requires changes and complementary innovation initiatives from other actors (Adner and Kapoor, 2010). Innovation might be too big and complex that its implementation requires the collaboration of several actors including those from public authorities and industrial companies. Commonly a technology brick trigger heterogeneous actors with different interests (Gillier et al., 2015) to come together and try to develop innovations that will create better products and services (Moore, 1996). As they do not have a common comprehension of the project and its results, they are not able to formulate a strategy, on the other hand there is neither explicit demand on the part of customers nor clearly identified market, therefore the legitimacy of the project might be unproven (Lenfle, 2008). In order to overcome the complexity, uncertainty, lack of resources and competences, actors join together due to their specialization in different skill areas, historical links and personal relationships (Zahra and Nambisan, 2012). Early comers to the innovation ecosystem help to shape the ecosystem by attracting other important partners, protect the ideas from others who might work on defining similar offers and engage themselves to ongoing improvement that brings the entire ecosystem toward a better future (Moore, 1993).

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### ▪ **Shaping a primary value proposition**

In the beginning of an innovation ecosystem, customers and market are not clearly identified, therefore there are no clear defined objective and measurement for the value proposition and the result of the project (Lenfle, 2008). Values and the beneficiaries are unknown, values do not pre-exist, they should be designed and developed (Gillier et al., 2015) throughout the evolution of the innovation ecosystem.

However the ecosystem is immature and incomplete and the envisioned value in the start of the project is usually different from the value obtained at the end (Gillier et al., 2015) the actors struggle to shape an emerging ecosystem, to integrate their resources and to establish capabilities for creating and defining a more effective value for the initial customers (Moore, 1996). As the key success factor for the innovation ecosystem is finding new terrain and seizing it, though the actors attempt to establish “proof of concept”, a viable and exciting alternative to what is already available (Moore, 1996).

### ▪ **Experimentation and learning**

Experimentation and learning are at the heart of an innovation ecosystem. Learning from the market and experimentation are fundamental in the knowledge creation process (Lenfle, 2008). Learning what value proposition works and learning how to provide it are central to further developments; as soon as “early adopters” (i.e. customers who will tolerate a primitive version of the offer) use the innovation, the learning process starts (Moore, 1996). Attempting to explore and develop new knowledge adds great uncertainty to the process; there is much lower probability that such innovation will ultimately succeed, actors hesitate to invest in extensive research, though the project might become endless that do not immediately use many resources but do not produce any result either(Lenfle, 2008).

The innovation ecosystem stands as a probe and learn process in which the marketing of a product and/or service must be viewed as a way to increase knowledge of the initially unknown innovation field. In other words, the right business model is rarely apparent from the beginning and customers, society and the cost-revenue structure of the business evolve. In this regard learning, experimentation and adjustments are necessary for success (Gunther McGrath, 2010; Teece, 2010).

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- **Preparing for expansion**

Launching a service or introducing a product is not an end in itself; the goal should be to develop concepts and to create knowledge that can be quickly applied to the design of other applications, or the developed innovation must be integrated into the development projects, without this perspective, the investments would not be profitable (Lenfle, 2008).

While business ecosystem is dynamic and stakeholders, customers and society change, the innovation ecosystem provides a favorable dynamic environment for shaping the innovation. Managing the innovation ecosystem requires flexibility to adapt to the evolution of the environment and to the feedbacks raising during the progress (Lenfle, 2008). Action and experimentation provide different sort of values both for customers and stakeholders; it is crucial to reflect upon values created and captured in order to find new ideas (Moore, 1996) it facilitates the identification of major benefits for the stakeholders, success measurement and accordingly, improvements in the overall efficiency of the project (Gillier et al., 2015).

Once an innovation ecosystem functions, the actors should prepare themselves for further actions, this reflection and preparation might be clearer in the light of business model and its core component: the value creation and capture.

## Chapter 8: Business model dynamics of the innovation ecosystem

Phases	Characteristics	Challenges
<b>Ideation</b>	<ul style="list-style-type: none"> <li>- Starting the collaboration</li> <li>- Nonexistence of a common comprehension of the project and its results</li> <li>- Nonexistence of an explicit demand or identified market</li> </ul>	<ul style="list-style-type: none"> <li>- Trying to formulate a primary strategy</li> <li>- Proving the legitimacy of the project</li> <li>- Protecting the ideas</li> </ul>
<b>Shaping</b>	<ul style="list-style-type: none"> <li>- Non definitive objective and measurement for the value proposition and the result of the project</li> <li>- Unknown values and beneficiaries</li> <li>- Actors try to shape an emerging ecosystem and integrate their resources and capabilities for creating and defining a value proposition for initial customers</li> </ul>	<ul style="list-style-type: none"> <li>- Creating and developing values</li> <li>- Expected value in the start of the project is usually different from the value obtained at the end</li> <li>- Finding new terrain and seizing it for experimentation</li> <li>- Establish the “proof of concept”, a viable and exciting alternative to what is already available</li> </ul>
<b>Experimentation</b>	<ul style="list-style-type: none"> <li>- Knowledge creation through experimentation and learning</li> <li>- Providing a primitive version of the offer</li> <li>- Nonexistence of a definitive business model</li> </ul>	<ul style="list-style-type: none"> <li>- Uncertainty due to exploration and development of new knowledge</li> <li>- The hesitancy of the actors for investment</li> <li>- Learning what value proposition works and learning how to provide it for further developments</li> <li>- Tuning the business model in terms of offer and demand systems and the value structure</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li>- The goal of an innovation ecosystem is not just launching a new service or introducing a new product</li> </ul>	<ul style="list-style-type: none"> <li>- To develop new ideas for creating new applications</li> <li>- To expand an innovation project to a development project</li> </ul>

Table 26: Characteristics and challenges of an innovation ecosystem

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### 8.3. Synopsis of process

The Vedecom Institute is piloting the innovation ecosystem of the autonomous vehicle. Accordingly it is studied in this chapter through the action research methodology. The Vedecom institute is the leader of consortium for emerging innovation ecosystem for urban passenger transport. Our collaboration with the Vedecom institute as a research lab facilitated us to collect appropriate data and to conduct useful interviews and surveys. Vedecom institute is an administrative organization for leading the consortium of more than 40 members of different public authorities, industry and service sectors (automotive, aeronautics, system engineering, electronic components, ITC, numerical simulation, infrastructure management, transport operators, digital and energy grid operators, research and higher education institutions, and local communities). The innovation project benefices the supports of several public authorities and industrial companies.

In order to start the qualitative research within the multi-actor innovation project, we categorized the actors in three major subsets: public authorities, industrial companies and users. It should be mentioned that we classified the employees and their companies in the “users” subset. Afterward we conducted semi-directive interviews with the directors of Chamber of Commerce and Industry Versailles-Yvelines and Paris-Saclay Development Authority (EPPS). These interviews had several important results:

- They provided a comprehensive view about high-level programs for public transportation, economic development and urban planning in the territory,
- They formalized the role of Vedecom Institute as the leader of consortium and its project and activities, therefore:
- Two public authorities authorized Vedecom to contact with the directors of companies in the zone in order to conduct interviews with them.

In the next step, we contacted the directors of the companies in the zone and requested each of them a one hour meeting. The semi-directive interviews with the directors of the companies in the zone contributed to several advancements:

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As the objectives of the project could not be forced to the stakeholders and the success of project is due to the involvement of stakeholders from the beginning, therefore these interviews provided a favorable environment in order to introduce the project and to create the first contacts.

The analysis of the interviews led to identify and understand the directors' point of view on transport issues and their plans for future developments. At the end of the interviews, directors committed to diffuse the Vedecom's transport survey amongst their employees and permitted the participation of some of their employees in 'creativity workshops'.

Transport survey and creativity workshops provided both quantitative and qualitative information about the users of different modes of transport in the zone.

In parallel to the interviews and survey on "user" side, we continued our interviews with other public authorities and industrial partners. Two semi-directive interviews with Urban Community of Versailles Grand Parc (CAVGP), one with Paris-Saclay Development Authority (EPPS), two with Valeo, one with Renault and two with program directors in Vedecom were organized. These interviews provided us a wide range of qualitative and quantitative data on technical and financial issues.

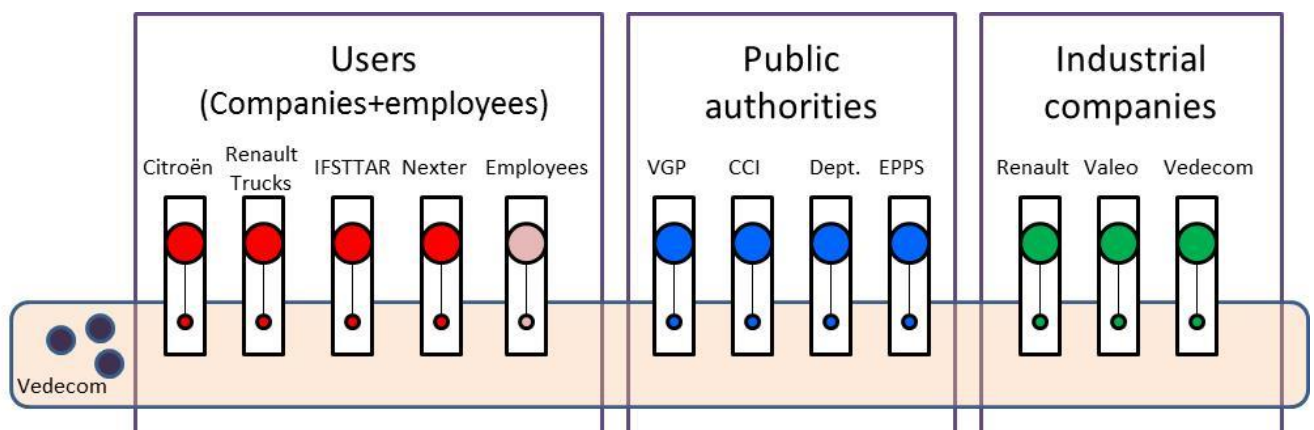


Figure 32 : A scheme of the actors involved in experimentation phase

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### **8.4. Findings and results**

As discussed above, an innovation ecosystem is dynamic and it consists at least four phases including, ideation, shaping, experimentation and preparation for further actions. However innovation ecosystems are dynamic but managers tend to have static view for their business model. Not only managers have static view but also until now just few scholars have outlined the dynamic characteristics of the business model over time. Dynamic perspective, when applied to business model, provides critical revision viewpoint to internal or external changes over time that assure the competitive advantage (Wirtz et al., 2015), Achtenhagen et al., (2013) argue that companies change, develop, shape, adapt and renew their business model in order to achieve sustained value creation where critical capabilities, activities and strategizing actions support the value creation.

In our view, dynamic perspective on business model assists to shape an innovation ecosystem; it provides a framework to monitor, revise and reflect about business model, though it performs as a decision support for further actions, either by strategizing or through entrepreneurship. In this chapter, for investigating the business model dynamics we focused on the “value creation and capture” as a principal component for the business model of ecosystem.

#### **8.4.1. Monitoring value creation and value capture**

Vedecom institute is an administrative organization for leading the consortium of more than 40 members of different public authorities, industry and service sectors. Managing such a consortium necessitates fulfilling different tasks regarding the business model of ecosystem: shaping the offer side, targeting the demand side, monitoring cost-revenue structure and assuring the value creation and capture. As the objective of this article is the investigation of the value creation and capture, therefore in the framework of this article we discuss our results on this subject. In order to construct a value monitoring tool, it would be pertinent to agree on the definitions for tangible/intangible value creation and tangible/intangible value capture.

- **Value creation**



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Tangible value creation: As the business ecosystem involves several actors, though some of the actors provide products and/or services and some others pay for them. Products, services and monetary transactions stand as tangible values. For example an energy supplier company produces the electricity and the customer pay for it.

Intangible value creation: each actor who integrates in a business ecosystem brings its expertise, experimentation and knowledge. Therefore a business ecosystem stands as a pool of intangible values brought by the actors. Also when the customers (i.e. early users) use the innovation, they contribute to the experimentation of new technology, its reputation, formalization and acceptability. The leader organization is responsible to identify the potential intangible values that help the business ecosystem to be shaped by attracting key partners in terms of industrial and public authorities.

- **Value capture**

Tangible value capture: customers pay for the product or service that they use and in contrast the actors who provide those products and services make money.

Intangible value capture: engaging in the innovation ecosystem and helping it to be implemented, provides intangible values for industrial actors and public authorities as well as customers.

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Industrial actors	Tangible value created	Intangible value created	Tangible value captured	Intangible value captured
Car manufacturers (incumbents or start-ups)	Automatic Electric Vehicle	Bringing their own knowledge, resources, expertise and experience to the project  Industrial relationships with industrial partners and public authorities  Support of the project	Revenue	Brand name  Installed base of products  Manufacturing capabilities  New markets  Distribution channels  Reputation  Relationships  Complementary technologies  French automotive cluster membership
OEMs	Automatic Electric Vehicle parts (captures, cameras, laser scanners, etc.)			
Electricity suppliers	Electricity supply			
Telecommunications suppliers	Cameras, optic fibers, multi-sensor detection, data acquisition, embedded processing and critical information transmission to communication platforms devices			
Civil infrastructure constructors	Road, bridge and parking construction			
Transport operator	Exploitation of service			
VEDECOM Institute	Managing the consortium			

Table 27 : Industrial actors of innovation ecosystem and their value creation and capture

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Public authorities	Tangible value created	Intangible value created	Tangible value captured	Intangible value captured
French Government	-	Legal support of the project	Save on negative externalities costs	New job creation  Economic development
ANR (French National Research Agency)	Funding the project	Stimulate new ideas and partnerships, particularly between academia and industry	Knowledge created through partnership	Enhancing the competitiveness and the influence of French research in Europe and across the world
Research & education institutes	Supervision of thesis and post-doctoral researches	Bringing and applying recent academic developments into industrial contexts	Articles, Patents, dissertations  Investment in education and research	Access to industry as a research field
Department of Yvelines		Support the project in local level	-	Promoting the image of the territory
Paris-Saclay Development Authority	Funding the project			Territorial marketing for attracting new enterprises and businesses
Urban community of Versailles Grand Parc	-			Promoting the automotive industry as the main industry in the territory
Chamber of Commerce and Industry Versailles-Yvelines	-			Relationship and collaboration with industrial actors and other public authorities

Table 28 : Public authorities engaged in innovation ecosystem and their value creation and capture

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Users	Tangible value created	Intangible value created	Tangible value captured	Intangible value captured
Companies	Companies' contribution to public transport fares "versement transport"	Supporting Vedecom to realize a transport survey of their employees and facilitating the participation of some of their employees in creative workshops	Better accessibility to public transport	Reputation and accessibility of their location  French automotive cluster membership
Employees	-	Respond to transport survey and generate quantitative data on transport issues	-	Use utility
Public transport users	Public transport fare	Participation of several employees in creative workshops to imagine new modes of transport	Better accessibility to public transport	Rapidity, reliability, fluidity and flexibility
Car users			New option for transport	Lower risk
Motorcycle users			Lower expenses for transport	Lower risk
Motorcycle users			New option for transport	Lower risk
Bicycle riders			New option for transport	Lower risk
Visitors		Use of new transport mode and contribute to its acceptability, experimentation, legitimacy, image and reputation	-	Play

Table 29 : Users/customers of innovation ecosystem and their value creation and capture

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### **8.4.2. Shifting from an innovation ecosystem**

An innovation ecosystem suffers from uncertainty; when the project starts, the actors do not have a clear understanding about the values that would be finally delivered. We think that using business model concept in this stage would be useful to make the project to go forward by identifying stakeholders and investigating their value creation and capture. Values are not determined in advance but they are shaped during the project, therefore the innovation ecosystem provides a suitable environment for the project to grow. Particularly the intangible values captured by the actors trigger further actions.

On the other hand the innovation ecosystem stands as an experimentation period for the innovation. The more the innovation phase approaches its end; values created and captured by stakeholders become clearer. Experimentation and learning not only enable the actors of ecosystem to discover unexpected and new values but also assist to improve and extend existing competencies and expertise.

However the evolution of the innovation ecosystem is crucial, but incumbent firms who have initiated the innovation ecosystem themselves hesitate to engage completely. They have the tendency to pass directly to the expansion stage, which is impossible in innovation projects and acts as a barrier to run the project smoothly.

This barrier has been observed in studied case; the innovation project ecosystem was technically and financially really complex. In technical view it was an innovation that required different industrial companies such as OEMs, car manufacturing companies, civil and telecommunication infrastructure providers to innovate something in their respective domains. The main concern for these actors, particularly car manufacturing companies are revenues that they might earn instead of products that they provide. In other words their major awareness is about tangible values and not intangible values. On the other hand within a car manufacturing company, the profit comes from mass production, which is not the case in an innovation project. As a result their hesitancy made the leader of consortium to look forward start-ups. If we think positively, this would be a chance for start-ups to come on board a public-private innovation project; they will cumulate and create great information, expertise, know-how and business relationships, on the contrary incumbent car manufacturer companies

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will miss these advantages and somehow in the future, when the market is established and demand exists, they will be forced to pay for the values that they missed.

The managerial challenge in transition from the innovation ecosystem is to act based on the advantages and values captured; further actions might be collective or individual. Launching a service or introducing a product is a departure point either for extending existing offers through strategizing or creating new effects by entrepreneurship.

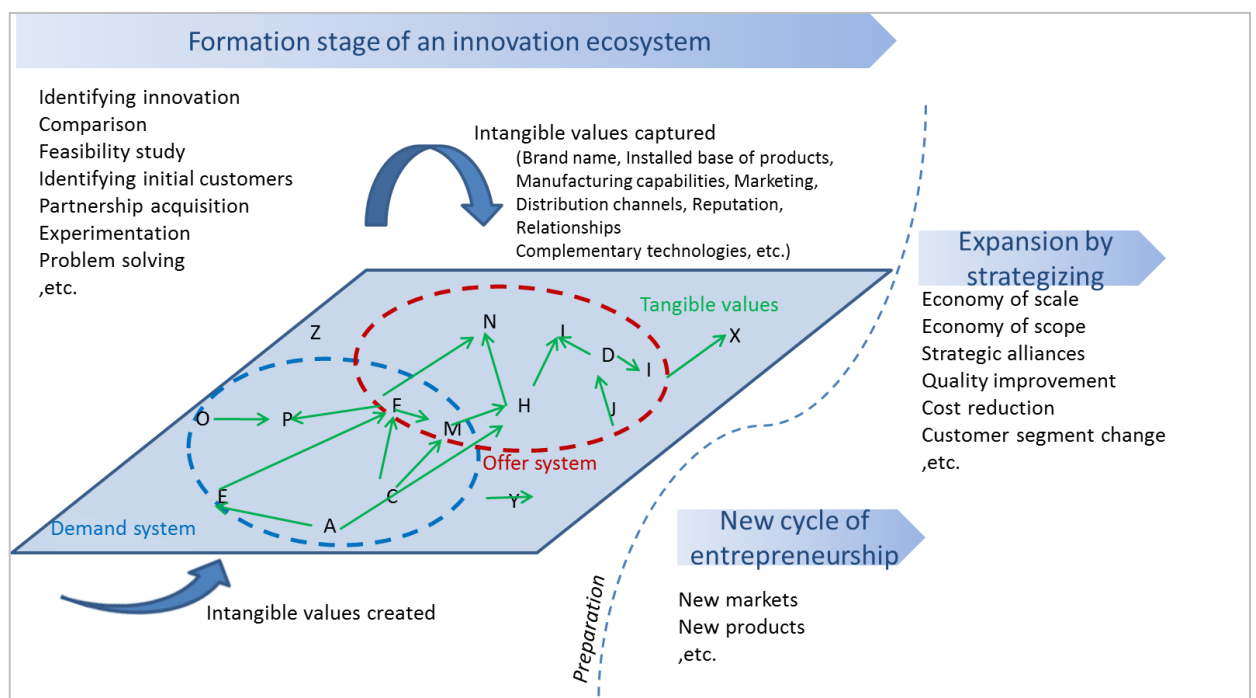


Figure 33: Longitudinal dynamics of the innovation ecosystem

### 8.5. Conclusion

In an innovation ecosystem, several actors bring their know-how, expertise, resources, relations and authority in order to create new values for others and capture new values for themselves, while they do not have clear understanding of the values that would be finally delivered. Values are not determined in advance but they are shaped during the project. Uncertainty and innovativeness throughout the innovation ecosystem implies to adopt different managerial approaches from those that are usually used in routine projects.

## Chapter 8: Business model dynamics of the innovation ecosystem

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Launching a service or introducing a product is not an end in itself; it is a departure point for new goals. Once an innovation ecosystem functions and a service or product is introduced, the goal should be extended either to reinforce existing offer through strategizing actions or to reflect about new effects by entrepreneurship.

Value creation and capture stand as a principal component of business model, therefore monitoring them assists the managers. Actors can do creative value chaining mixing and matching capabilities and intentions to invent new offers, capabilities networks, and ecosystems (Moore, 1996).

Our study investigates a conceptual gap in the literature on innovation ecosystems and their business model dynamics. It explores different types of values created and captured by various actors within the innovation ecosystem for urban transport. We find that monitoring the values created and captured, prepare useful information for the managers of industrial partners and public authorities for decision making. Our results show that an innovation ecosystem and engaging in it may provide wide range of values for the stakeholders:

- For the leader of consortium:

On the one hand public-private partnerships generally address development projects, though we do not have good examples of public-private partnership for innovation projects. On the other hand managing innovation projects differs from development projects. The public-private innovation project for urban transport provides an important position for the Vedecom institute to acquire management skills and expertise to manage innovation projects in public-private partnerships. Besides the management skills and expertise, strong relationships with industrial partners and public authorities stand as intangible values for Vedecom.

- For the industrial partners:

The innovation ecosystem requires the collaboration of different industrial companies such as OEMs, car manufacturing companies, civil and telecommunication infrastructure providers. Each of them brings their resources, expertise and experiences to the project in order to create a shared value. The project provides a favorable environment for learning and

## Chapter 8: Business model dynamics of the innovation ecosystem

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experimentation. Once the project is implemented it is a proof for installed base of products. The users' feedbacks provide them valuable information for improvement. The industrial actors join the automotive cluster and benefit from the relationships created during the project with other companies and public authorities. They develop their manufacturing capabilities which can be used in other projects. They access to new markets through new distribution channels.

- For the users:

From the beginning of the project, potential users of new mode of transport collaborated in the project. Their contributions to the transport survey provided useful information. During the experimentation they use new transport mode and contribute to its acceptability, test, legitimacy, image and reputation.

- For the public authorities:

Public authorities' engagement in innovation ecosystem is crucial for legitimization of the project. They usually search for values that they are not able to reach in the absence of collaboration with industrial actors. The French National Research Agency funds the project for enhancing the competitiveness and the influence of French research in Europe and across the world. The research and education institutes bring their recent academic developments into industrial contexts while they have access to real and ongoing research field which enrich their works. In local scale, Department of Yvelines, Paris-Saclay Development Authority, Urban community of Versailles Grand Parc and Chamber of Commerce and Industry Versailles-Yvelines support the project and benefit from the promotion of the territory, attract new enterprises and businesses, reinforce the automotive industry as the main industry in the territory and establish a collaborative network with industrial actors and other public authorities.



### 9. Discussion and conclusions

This final chapter, first summarizes the dissertation's theoretical contributions to the management literature and second it outlines the managerial implications of the research.

Research on business models in the past years attempted to establish the business model as a concept for describing the mechanisms of business. However academic contributions have made significant clarifications and triggered new avenues for research but still the business model concept is a vibrant field of research and numerous research questions may emerge and require to be answered.

In this dissertation, after reviewing the literature, three main research gaps have been identified:

First research gap referred to the firm-centric studies on the concept of business model. However some scholars have recently pointed out the importance of a system-level view on the business model concept, but research on business model lacks comprehensive system-level perspective and it is almost firm-centric. This shortcoming manifests itself more significantly alongside the emergence of several multi-actor concepts that deal with multi-actor contexts such as public private partnerships, ecosystems and value network.

Second research gap raised from various contributions from different fields of research; various researchers from different fields of research have contributed to the body of literature; accordingly the business model concept has not been defined similarly by researchers. Moreover this high level of variety has resulted to dispersed considerations for the business model components. Hence scholars have not settled a set of fixed components for the business model. This issue has limited the creation of pertinent research questions and finding appropriate approaches for dealing with them.

Third research gap related to the dynamics of the business model; however this issue has recently attracted attention but there is not a solid literature around this issue. The business model dynamics requires to be studied both in terms of the dynamics among the components of the business model and also the evolution of the business model over time.

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In parallel to identifying the research gaps, this research has been accomplished by means of the action research methodology; accordingly research questions have been defined in the manner that they could satisfy primarily the practice side and then contribute to the literature. Therefore four research questions have been defined:

- How to design a conceptual framework for the business model of public-private ecosystems?

This research question has been discussed in part II through chapter 5. After identifying the research gaps, the first fundamental requirement appeared as designing a conceptual framework for the business model of public private ecosystems. This conceptual framework have proposed two functionalities: first it has provided a solid base for the definition, components and dynamics of the business model of a public private ecosystem, and second it facilitated defining and dealing with other research questions.

- What are the mechanisms of business model innovation?

After reviewing the literature and designing the conceptual framework in part II of this dissertation, Part III discusses the results in chapter 6, 7 and 8. In chapter 6, Business model innovation mechanisms and in particular the business model innovation through effectual processes have been discussed. This chapter identifies a mechanism for the business model innovation in uncertain and highly innovative contexts through studying the dynamics among the business model components.

- How to evaluate the cost-revenue structure of the business model of a public private ecosystem?

In fact this research question was the first one that has been raised from the beginning of the research project. As explained in part I, this dissertation has been accomplished by action research methodology in order to apply managerial solutions while contributing to management science. Therefore in order to study

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this research question, the need for designing a conceptual framework has pointed out. After designing a conceptual framework and defining the business model of ecosystem and its components, in chapter 7, the cost-revenue structure of the business model of a public private ecosystem has been studied. Accordingly a prototype of a management tool has been designed and tested for a public private partnership for carsharing. After that the management tool has been used through action research alongside close cooperation with the Vedecom institute for the experimentation of the autonomous vehicle in Satory.

- What is the dynamics of an innovation ecosystem over time?

This research question has been defined in order to take into account the dynamics of business model over time. However this aspect has recently attracted the attention of scholars but it needs more contributions. According to the project within the Vedecom institute, the innovation ecosystem was complex and uncertain. It required several actors from public authorities, industrial companies and customers to come on board the project and collaborate together, while they had not common view of the project, their contributions and their potential advantages. Through action research, the characteristics and challenges of the longitudinal dynamics have been identified and strategies for moving through next stages have been introduced.

### 9.1. Theoretical contributions

After conducting the action research methodology, reviewing the literature and providing the results, main theoretical contributions of this dissertation are classified and discussed as below:

### **9.1.1.A conceptual framework for the business model of a public private ecosystem**

The business model concept has been rapidly growing during the past 15 years. Scholars from various fields of research (e.g. e-commerce, strategy and organization theory) have contributed to the literature of the business model, therefore different definitions have been attributed to the business model concept which partially overlap, and generate different interpretations even if we find persistent components. Business model concept as a research area is still under study and many fundamental questions in this context remain unanswered.

As pointed out from the literature review, the business model concept lacked a system-level perspective while it appears that having a system-level perspective is vital for developing the business model concept and using it as a tool for different managerial uses. In parallel to the literature shortcomings, our collaboration with the Vedecom institute through action research methodology verified this requirement. Given the importance of system-level view for the business model, it is surprising that scholars (with few exceptions) have paid little attention to this topic. Therefore evidences for system-level view in business model literature are few.

Alongside the development of the business model concept in recent two decades, several concepts concerning multi-actor contexts have emerged. However concepts such as platforms, public private partnerships, value network, open innovation and business ecosystem explicitly deal with multi-actor contexts, surprisingly the business model concept has been developed quite fragmented. In this regard, it seemed that the business model requires be redefining or adapting to multi-actor contexts.

Accordingly, in this dissertation, the business ecosystem concept was justified as the main frame of the underlying infrastructure for three reasons: first, the business ecosystem involves all the actors from public and private sectors as well as the users. Second, it implies also to the evolutionary and dynamic characteristic of the business. However these two characteristics provide a pertinent infrastructure, but the business ecosystem concept does not

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provide any mechanism for understanding the relationships, exchanges and transactions among the actors. It seems that one of the most important functions of business model would be its capability to show these relations. Consequently the value network concept was selected to explain the exchanges and relationships among different actors. In fact the value network concept was transposed to the business ecosystem concept in order to complete it and make it as a pertinent underlying infrastructure for the business model of the public private ecosystem.

As a result three main components have been considered for the business model of a public private ecosystem: the offer system, the demand system and the value structure. The “offer system” component describes the collaboration among several actors from public or private sectors for developing an innovation which is not possible to be implemented by just one actor (e.g. deployment of electric vehicle, deployment of autonomous vehicle). The “demand system” component describes all the actors involved who need, who use or who pay for the innovation. However in different stages of the project’s life cycle an actor may belong to both systems or alternate among them. The “value structure” component describes the value creation and capture mechanisms among the actors involved.

This conceptual design for the business model of a public private ecosystem demonstrated its functionality and conformity for studying the case of the Vedecom institute. As a conceptual framework, it was strong enough to enable us to define pertinent research questions and design the research in order to achieve applicable applications and also contribute to the literature.

Figure 34, has been designed during this dissertation and has been explained in chapter five. This is the conceptual framework for the business model of ecosystem; it includes three main components: offer system, demand system and value structure.

The dynamics among the business model components has been formulated as a research question and discussed through chapter six. Accordingly an entrepreneurial approach for the business model innovation has been explained (see 9.1.2. for brief conclusion).

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The cost-revenue structure is a subset of value structure. A management tool for the evaluation of the cost-revenue structure has been designed and discussed in chapter seven (see 9.1.3. for brief conclusion).

The longitudinal dynamics of the business model of ecosystem has been discussed in chapter eight (see 9.1.4. for brief conclusion).

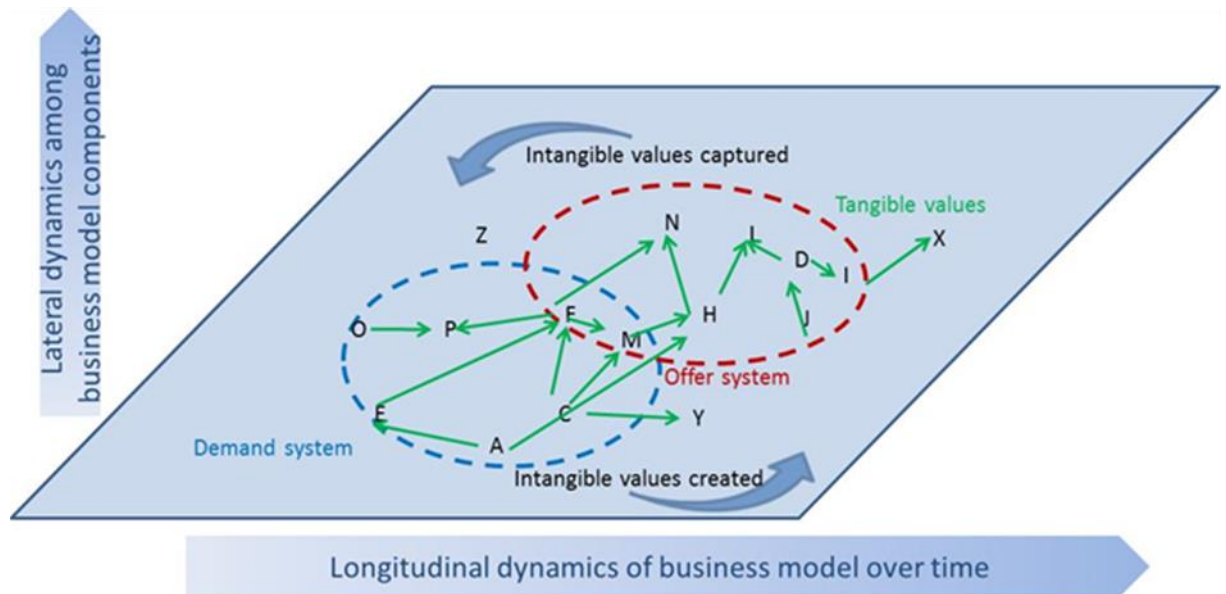


Figure 34 : The conceptual design for the business model of ecosystem

### 9.1.2. An entrepreneurial approach for the business model innovation

The effectuation logic has been transposed to the business model innovation and its conformity has been examined through empirical examination on real cases. In particular transposing the effectuation logic to the business model innovation describes the movement direction from the offer system to the demand system. Effectuation logic helps the innovation managers to take first steps and start the road toward new effects including new products, new services and new markets by unlocking one of the main ambiguities in innovation projects: “the non-fully-defined effect”.

The effectuation concept has been taken from the entrepreneurship literature and transposed to the business model literature, therefore this research supports the generalization

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of the effectuation concept as a theory. The effectuation logic assists managers in innovation projects and helps firms to go over the traditional boundaries of their respective industries and enhance their business models by working with new partners and introducing new value propositions.

This enhancement in the level of the offer system and offering new joint value propositions facilitate public private partnerships for innovation and decrease the imitability. Configuring an original offer system by effectuation logic creates a supportive mechanism for protecting the innovation by reducing the imitability. Pre-commitments, alliances and partnerships constructed through effectuation reasoning engage different actors to mutually enact a new market while none of them were able to do so individually. Furthermore the offer system has more inertia that it will not be affected by rivals easily. The effectuation process when applied to business model innovation establishes strong interrelations among the actors that retain them in the business and enriches the resources and competences of the offer system. Therefore for rivals imitation becomes more difficult because it is not just about a technology or service but it is about a business model.

Engaging in innovation is inevitable for economic development, both for the government and industrial companies, but moving towards innovation necessitates dealing with uncertainty. The effectuation reasoning provides a framework to deal with uncertainty, and reinforces the industrial companies to develop new ideas and influence public authorities' priorities. Therefore the effectuation reasoning stands as an approach for public private partnership for innovation on the contrary of public private partnerships for development which pass through tenders with strict administrative and technical specifications. In other words the effectuation logic facilitate the collaboration between public authorities and private actors for innovating mutually in uncertain situations.

### **9.1.3. New management tool for business model of public private ecosystems**

One of the main outcomes of this research was constructing a management device for the business model of public private ecosystem. The need for this tool has been outlined according to a real problem in practice for understanding the business model of urban passenger transportation. On the other hand, the existing literature on business model concept has had several shortcomings for being used in multi-actor contexts.

Three gaps have been identified: first, the existing literature on business models is almost firm-centric; such a view on business models restricts the involvement of sustainability issues who necessitate system-level perspective. Second, the business model demonstration is limited to few mapping tools whilst they are not appropriate for visualizing the business model of a public private ecosystem. Third, however the business model requires to be demonstrated in a communicative manner, but demonstrating and visualizing as qualitative approaches for business model do not provide enough information for understanding the overall state of the business and its potential impact.

A management device has been designed in order to answer a factual problem in practice and consequently it has contributed to the business model literature. Its theoretical contribution can be summarized in three aspects: first, the management device provided a system-level perspective for business model and helped to its application in multi-actor contexts. Second, the management device assisted to a comprehensive business model demonstration within a public private ecosystem. Third, it provided an evaluation method for the cost-revenue structure (the value structure subcomponent) of the business model.

### **9.1.4. New insights for business model dynamics**

Most of the contributions to the business model literature have had a static view while it appeared that it is necessary to pass to the dynamic view for business models. This need has been confirmed recently by several scholars but there are still few impressions for business model dynamics.



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In this dissertation two types of dynamics for the business model have been defined: dynamics among the business model components and the longitudinal dynamics of the business model of ecosystem over time. Dealing with the issue of the business model dynamics was the result of the progressive process of the action research. However the application of the management device has answered the problem of Vedecom satisfyingly and added something new to the management science but it seemed that this research had the potential or more development. According to the literature gaps and also the context of the research, the business model dynamics appeared as an interesting issue for further research. The business model dynamics has been studied both as the interaction among the business model components and also the business model dynamics over time.

The effectuation logic has been transposed to the business model concept for studying the interaction among the business model components. Two different approaches for the business model innovation have been identified: reactive business model innovation and proactive business model innovation. In reactive business model innovation, the demand system determines the offer system while in proactive business model innovation the offer system determines the demand system. According to the literature, mechanisms for proactive business model innovation have not been understood in comparison with reactive business model innovation. In this regard, the effectuation concept was incorporated with the components of business model in order to explain the proactive business model innovation.

Another dynamic approach portrayed the longitudinal dynamics of the business model over time by paying attention to the specifications of exploration projects and value creation and capture mechanisms within the innovation ecosystem. It portrayed the longitudinal dynamics of the innovation ecosystem by focusing on its life cycle by taking into account all tangible and intangible values created and captured by different actors through the innovation experimentation in Satory.

### 9.2. Managerial implications

#### 9.2.1. Practical outcomes of the action research for the project

The management tool has been designed and used through the action research methodology. It supported the business modeling of a complex and multi-actor activity and helped the decision makers to understand the state of the urban passenger transport in Satory. It provided a method for identifying all the actors involved and assisted for evaluating the contributions and benefits of the actors.

In addition to data collection for identifying the actors and their points of view, the process of data collection including semi-structured interviews with managers from public and private sectors was mediating; it assisted to introduce Vedecom and its projects in terms of mobility. Consequently the interviews facilitated the acceptability of innovation experimentation at Satory and its validation by local authorities.

Moreover the management device assisted the managers to attribute a pathway for innovation experimentation and to share the costs of implementing the innovation project. Moreover it helped the managers to attribute correctly their financial resources to the project. The costs of constructing the civil infrastructure for innovation experimentation were taken by Paris-Saclay Development Authority (EPPS). Vedecom as the leader of the consortium was the responsible for gathering public and private partners' contributions; in this regard the application of this management tool for innovation project determined the needed finance for running the project.

The business model not only serves to explain the content but also involves the process of doing business; accordingly business models play a performative role, therefore this research particularly validated the performative role of business model by assisting the decision makers in constructing the techno-economic network of innovation. The process of using the tool itself was performative; it helped to identify all the actors involved in the activity and assisted to communicate and think collectively on a common issue. On the other hand it facilitated the evaluation of existing mechanism of the business model which resulted

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to identify opportunities for introducing new solutions, designing and conceptualizing new business models.

This research a comprehensive exploration and recognition of the current business model; in other words it contributed to a feasibility study for new business models by identifying areas that either have the potential to change, improve or require modifications and innovations. It provided an analysis of the public-private ecosystem that facilitated to consider potential changes in technology and legislation due to socio-political, environmental and economic pressures. It confirmed the importance of environmental issues and provided a method to integrate the evaluation of the negative externalities to the core of business model. This implication supports the public policy makers and industrial companies in their decision making processes. The research was supportive for decision makers from public and private sectors. It clarified what was going on within the transportation activity as a combination of public infrastructure facilities and private modes of transport. It supported the industrial actors to find the bottle-necks and work on them in order to introduce sustainable innovations. On the other hand, based on the information provided by the research, public authorities supported more actively the industrial actors on the innovation journey, by their financial contributions or supports.

The process of this research itself had several contributions; the semi-structured interviews with managers from public and private sectors introduced Vedecom, its missions and future projects, therefore the interviews not only worked as a data collector but also as a mediator. In other words, at one hand, interviews led to identify the actors and their points of view and on the other hand made them aware about potential new projects and even appearance of new actors. This reciprocal application of interviews helped to the acceptability of innovative projects in the zone and contributed to their legalization. As we witnessed from the early stages of the research, public authorities including chamber of commerce and industry, urban community and development authority of the zone facilitated the research by authorizing the researchers to contact with the managers of industrial companies in the zone in order to conduct interviews. These interviews opened the door to access quantitative data through the transport survey of employees. The data extracted from the surveys were analyzed to calculate financial flows; consequently the results of the calculations fed the matrix. The

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matrix itself revealed the black box of the current business model and its weaknesses in providing public transport and immense use of private cars, which leads to massive energy consumption and causes negative externalities. Results of this research persuaded public authorities to attribute a pathway for experimentation the new project and to finance its construction. Moreover in the context of business model, it is indispensable to distinguish between user, customer and payer while they are not certainly the same. This research facilitated to target the potential customer and/or payer for the innovation. Subsequently it guided more effectively the technical team to work on technological innovations adapted to the target customer.

### **9.2.2. Insights for managers regarding evolutions in automotive and transportation industries**

Primary objective of each company in private sector is to create economic value and maximize profits for its shareholders. Incumbent firms in automotive industry are always competing. As instance automotive makers attempt to maintain their market shares in market decrease condition. When an incumbent firm is threatened by a new technology, the traditional way for defense may be improving existing technologies or technological innovation. In new competition in automotive industry, just a technological innovation does not assure the success while it belongs to existing business models. As instance, factors such as the automotive market saturation and sales crisis stimulate the automotive makers to diversify their products and markets. Competition in automotive industry makes the car makers to enhance their traditional business models that may concern to collaborate with new stakeholders and partners that they had not used to work with before in order to offer new products and/or services to new customers.

Public and private sectors both are subject to pressures that make them to evolve. However each sector attempts to find solutions and establish strategies to overcome these pressures, in some contexts they need to collaborate mutually. The pressures mostly concern sustainability and include economic, environmental and societal issues. The collaboration among the organizations from public and private sectors may concern also some aspects of innovation. Economic, political, societal and environmental pressures and problems force the

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public sector to find solutions. In addition to these pressures the private sector also is affected by customers' interest change, competition and regulations. In recent decade the regional innovation is one of the strategies that have been initiated by public authorities in developed countries. As regional innovation concerns big and complex projects that include several actors for collaboration and cooperation therefore it is system-level innovation that in different aspects may establish different public private partnerships for innovation.

Environmental degradation forces the public sector to implement regulations that engage private sector to better manage its activities in order to decrease its negative externalities. These regulations impose additional costs to firms to develop technologies for managing their environmental impact both in production and consumption cycles of their products. As instance, French automotive industry not only has attempted to reduce externalities due to the production of the cars but also has designed and developed technologies (e.g. electric vehicle) that have less environmental impact during their consumption. Therefore in this perspective, however greener production and products are costly for the enterprises but they contribute to the competitive advantage of the firm over the time. In other words, if moving towards greener technologies may be an obligation in front of regulations at the beginning, but over time the more the firm innovates, the more it increases its competitive advantage among its in-industry competitors. Furthermore innovation may prepare the firm for entering or creating new markets unpredictable in advance.

Designing and producing low-carbon vehicles require high investments in radical innovations. R&D, substitution of the tools, implementation the new production processes and establishment of supplier network are not only costly but also risky as there is no guarantee for success.

Funding framework for urban transport varies in terms of actors and their contributions from a city to another city. Different organizations from public or private sectors contribute to capital and operational costs through different mechanisms and amounts while fares and ticket sales do not cover all the costs.

Public authorities in different levels are the main actors for organizing the transportation; as instance in France, the government, regions, departments and the urban

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communities have different responsibilities for transportation: The government is in charge to define regulations, safety rules and technical controls. Moreover the government develops the multimodal plan for urban passenger transport. Furthermore in the specific case of the Ile-De-France region, the government organizes the transportation by STIF<sup>1</sup> (STIF is the transport organization authority in Ile-De-France region). Regions are responsible for organizing the non-urban regional rail and road transportations. They also plan for necessary actions for road and rail transport infrastructures. Departments may organize special transportation facilities for special groups such as handicapped people. Urban communities contribute to the organization of rental cars, car sharing, carpooling and rental bicycles. They also develop PDU<sup>2</sup> (urban transport plan) and facilitate the enterprises' contribution to transport through "Versement Transport" (a tax that public or private enterprises pay according to the location of the company and the salary of their employees). In summary, the transport systems that have local effects are influenced majorly by local authorities while those that have regional and national effects are influenced by governmental and regional decisions.

Integrity of the transport is another challenging issue that requires the cooperation of different cities for offering transport systems. If each city decides individually for transportation, as a result users face to the discontinuity of the transport, insufficient capacity and higher prices.

However public transport may be more efficient than private car use in energy consumption and air pollution but automotive industry is a job creator industry in some countries and particularly some cities (e.g. France, Department of Saint Quentin en Yvelines) and contributes to the economic development. Therefore providing a balance between private car use and public transport use is required to assure the economic growth besides decreasing energy consumption, air pollution and Green House Gas emissions.

Public and private sectors require tools and references for making decisions about the organizational and financial issues of the whole transport system (i.e. a combination of public and private transport use) in order to offer the most pertinent, efficient and sustainable

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<sup>1</sup> Syndicat des Transports de l'Ile-de-France

<sup>2</sup> Plan de Déplacement Urbains

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transportation systems. Decision makers need to have a holistic perspective of urban transport in different aspects; who are the public or private organizations that offer different kinds of transport? Who are the manufacturers of transport vehicles? Who are the companies that attempt to innovate in transport sector? Who are the users of transport? What they pay for? What are public or private organizations that have interest to finance transport projects? Who collects the revenues and financial contributions and how it distributes and allocates them? These kinds of questions are numerous and they imply to the requirement for having a system-level view on transportation. Having a holistic and system-level view assists the decision makers to evaluate existing situation and using it as a base line for creating better solutions.

Financing of the transportation is a complex issue in today's economy; for operating and investment costs of public transport, different set of mechanisms are used in different countries. A set of different kinds of fares, subsidies, taxes, bonus and penalty are applied through various mechanisms in different levels of public authorities (Government, Region, Department, urban community, city, AOT, etc.) and private sector as well as the users.

Innovation ecosystem implies to large and complex type of innovation that is not manageable within a company. It may be beyond the conventional R&D projects within large firms. The innovation ecosystem includes technological change and all required annex changes in other elements. Innovation is indispensable both for science and business; the hearth of science is finding new ways and the hearth of business is producing and offering profitable value propositions. Innovation not only contributes to the competitive advantage of industrial actors but also contributes to the economic growth.

The innovation ecosystem necessitates collaboration among different actors in order to achieve a common comprehension; in other words when the innovation ecosystem is research-based, no individual actor has the decisive role on the outcome of the collaboration. The collaboration and interplay among the actors shape gradually the innovation ecosystem and result to new effects.

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One of the mechanisms for regional economic growth is the competitiveness clusters. They are geographically defined areas in which several actors from public and private sectors are present and have the interest or potential to come on board the innovation project. The collaboration of several actors from public and private sectors on a subject belonging to a certain industry in a region may be defined in the framework of the “competitive cluster”. A competitive cluster cannot be designed or planned, but it is a product of several years of interaction among private companies, local public authorities and research institutes. A competitive cluster stands as an infrastructure for the innovation ecosystem; it offers a playing field for a collaborative game in which several actors from public and private sectors come together in order to foster an innovation that none of them is able to realize individually. In fact a competitive cluster is a regionalized heterogeneous community that involves industrial established companies, start-ups, research and education institutes and regional public authorities. All the actors jointly attempt to reconcile the science and business in order to make the innovation marketable and find at least some regional applications for it. Different actors in a region interact and collaborate in order to introduce some new value propositions in terms of products and/or services, while the path towards new value propositions creates directly some mid-level values for participating actors. When an innovation ecosystem is shaped in a region, it would be possible to observe the dynamics among the actors from public and private sectors as well as the users. In other words the region is a real experimentation field for innovation that is complex and large enough to study the interactions and dynamics. It is also small enough that the impact of each actor, even less important issue is not neglected.

The science and practice are interrelated in innovation ecosystems; industrial companies require innovative knowledge which is emerged in research institutes, they start to develop emerging knowledge in collaboration with research institutes, and through this experimentation new problematics or opportunities emerge that often stimulate new scientific questions.

Public organizations according to their hierarchal position in public authority may have direct or indirect roles in innovation ecosystem. The more the public organization is territorialized the more is its potential to directly influence the innovation ecosystem. One of



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their main impacts is their function as enablers. For instance, the government is at the top of the pyramid and regions, departments, urban communities and municipalities situate afterward. The public organizations in the bottom of the public authority pyramid have more interaction with people and enterprises in their zones; accordingly they participate and collaborate closely with the innovation ecosystem.

However some public authorities may have no direct interaction or relationship to the innovation ecosystem but their strategies and priorities influence the innovation and particularly the industrial actors in the region. They may support the innovation financially and politically by bringing their assets or stimulate the collaboration within the innovation ecosystem by their mediating or legislative roles.

Reciprocally, urban communities and departments seek to attract more and more R&D and innovation activities in their territories in order to increase territorial attraction. Progressive territorial attraction results to absorbing new enterprises who want to install in the territory. As much as the established companies or start-ups base themselves in a territory, they contribute to its economic development. Economic development stands as a driver for local public territories to host companies. However hosting new companies may contribute to the economic development, but in parallel it impacts the urban plans and consequently the transportation issues. For this reason, usually some enterprises are pioneers in installing in low density areas, but the story does not end here and their individual development in terms of recruiting more employees and increasing production require more urban and transport infrastructure. Moreover when the attraction of the territory increases, therefore many more companies seek to be located there. As a result shortcomings in urban facilities and transportation become dominant.

The existence of companies and research institutes in a territory facilitate the construction of the innovation ecosystem, particularly when the companies belong to the same or similar industries and the research institutes work on industry's R&D domains. The close interaction of these actors creates synergy that fosters innovation and public authorities' support (if existed), provides a favorable environment for innovation.

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As the innovation does not concern just technology, therefore knowledge should be transformed to marketable product and/or service through a business model. In other words, however innovation may be emerge within R&D centers or research institutes, but it requires a favorable environment for its application and making profit from it. Some social, economic, political and technical levers may make the environment more favorable for innovation or may act as barriers for it.

When a territory involves the processes of innovation, diverse regional networks connect public authorities, industrial companies, research institutes, potential users and customers together. Therefore not only good ideas emerge, but also there would be possibility to experiment it in real world. Innovation experimentation, particularly innovation ecosystem in reality helps different actors involved to work together in real life conditions. The collaboration in a region for an innovation helps to identify challenges earlier. In fact the innovation ecosystem is a dynamic act that its experimentation in a real world may help to overcome challenges. On the other hand innovation ecosystem necessitates that experts and scientists work together in close proximity to one another, so when an innovation is contextualized in a region, competent and skilled people have the opportunity to work together on a real subject. It implies that in addition to the knowledge and skills that are required for the innovation ecosystem, collaboration necessitates partnerships and alliances. Collaboration through partnerships and alliances make different actors from different sectors which work on a common project. Therefore connecting research institutes, industrial companies and local public authorities stimulates an entrepreneurial environment.

As innovation evolves over time, therefore having the possibility to experiment it in a territory facilitates the learning through trial and error. Furthermore the reflection on the outcomes of each trail may feed another cycle of innovation or starting to commercialize the innovation in other regions.

Coming on board an innovation ecosystem may have several advantages for the partners; however they may also face to unexpected difficulties and confusions that make them discouraged. Therefore the innovation ecosystem requires to be understood over the time, from the early stages to its maturity. Each partner dedicates some part of its resources and offers its know-how, knowledge, expertise, experience and power to the ecosystem that is

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being shaped. Each partner may need to understand what values it is going to capture while it is creating other type of values for others.

When a region is recognized as a host for a certain industry, it means that it has been a long time that the industry has been implemented there. The existence of several related and interrelated companies from same or similar industries in the region verifies that there are enormous resources in terms of skilled work force, capital and financial assets at the disposal of the companies. Moreover their experiences in that certain industry equip them with original competence, know-how, expertise and knowledge of the industry. Their proximate physical locations also have already facilitated exchanges among them and they may have already established some kind of collaboration among them. An example is the Department of Yvelines in France that is recognized for hosting several companies and institutions related to automotive industry. As a matter of fact, the main context of this dissertation refers to the ecosystem innovation project in an area named Satory that belongs to the Department of Yvelines.

Innovation ecosystem is not only uncertain but it is complex, therefore for making it successful, several prerequisites must be accounted; in an innovation ecosystem several actors both from public and private sectors work together, they have different organizational culture, they have different levels of resources, they are diverse in terms of knowledge and experience and they have different reasons to join the project and consequently they have diverse expectations. One of the challenges is to manage these differences in order to reach a common comprehension for starting the project. On the other hand when various actors are needed to work together, they expect at least to be informed about the project in its different stages or to have the right to make decisions. In addition to the actors involved to the project, it is important to take into account the potential users and customers of the project in experimentation phase and try to not impose something new that changes their everyday life suddenly. All these prerequisites not only facilitate the growth of the innovation from ideation to its experimentation, but also help to its acceptance by the first users and customers.

Beyond the interplay and interaction among public and private actors some other factors also influence the emergence of an innovation ecosystem. These factors include a wide range of social, political, environmental, technical and economic tendencies and obligations. For

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example Satory, an area in the Department of Yvelines in France was chosen for an innovation ecosystem. Department of Yvelines is famous as the host of the automotive industry in France, therefore many national and international car makers and OEMs have already located some parts of their activities there. The presence of these industrial companies and their interaction among themselves and also with local public authorities led to define a common innovation project. Furthermore several economic, social, environmental and political factors have contributed to the ideation and shaping the project. For example the low-carbon production and products became almost an obligation for the automotive industry. On the other hand low-carbon production and products are costly for the automotive industry; they need large reforms in production processes as well as high investments for R&D on low-carbon products both for their production and use. The success of technical reorientation is risky since the low-carbon innovations in automotive industry (e.g. electric vehicle) are more expensive in comparison to the conventional vehicles for the users. So if there is obligation and pressure from public policies and social movements on automotive industry to move towards low-carbon innovations but users are also disaffected to adopt innovative product for higher prices. These pressures are not stable but they fluctuate over time, therefore the automotive industry is uncertain about future toughness of regulations or users' willingness to pay for innovations. From the competitiveness view within the automotive industry, some pioneer car maker companies do not stop to innovate in order to respond the environment friendly tendencies, so they have more power to influence public policies in the favor of commercializing their innovations.

The objective of the public sector for improving transport systems is mostly offering a public facility to the citizens. However in this regard public authorities may not look for direct return on their investments but indirectly they look for the economic development, territorial attraction, job creation and environmental protection. On the other hand when private sector integrates a transportation project, naturally it looks for profit and return on investment. However public and private sector may have different or contrasting motivations but their mutual cooperation may be profitable for both.

**Part IV : Synthèse en Français**

## Introduction

La thèse, rédigée en anglais, se divise en 9 chapitres. Après une introduction posant le sujet, le chapitre 2 présente la méthode de recherche-action adoptée. Le chapitre 3 présente le cas de l'institut Vedecom et les enjeux qui y sont associés. Le chapitre 4 discute la littérature sur les business model en soulignant ses limites. Il aboutit au chapitre 5 qui propose un schéma général pour la conception d'un business model distinguant 3 composants : les systèmes d'offre et de demande ainsi que la structure de valeur, cette dernière représentant l'ensemble des flux de valeurs (tangibles et intangibles) qui circulent entre les acteurs. Ce chapitre également discute sur la dynamique du business model qu'il s'agisse de ces composants ou de son évolution dans le temps. Le chapitre 6 étudie les mécanismes d'innovation dans les business model en se fondant sur les théories de l'effectuation. Deux logiques d'innovation sont alors identifiées selon que l'entreprise réponde aux évolutions de son environnement (réactive) ou qu'elle cherche à les anticiper (proactive). Le chapitre 7, propose alors un outil permettant de représenter justement la structure de valeur du BM. Le chapitre 8 revient sur la question de la dynamique du business model. Le chapitre 9 récapitule les contributions théoriques et les implications managériales de la thèse.

Dans les pages suivants, une récapitulatif assez profond et détaillés de l'ensemble de la thèse est fourni en français. Afin de mieux décrire la thèse en profitant au maximum la limite des pages disponibles, la partie en français ne contient pas les figures ou les tableaux. Ce sont disponibles dans la partie rédigée en anglais.

## Contexte de la recherche

Le développement économique, promouvoir des industries, la compétitivité, la création d'emploi et résoudre les enjeux environnementaux sont au cours du plan d'action de la France. Pour cela, les innovations qui intègrent les acteurs variés des secteurs d'activité diverses sont en premières importance. En France et particulièrement en Ile-de-France l'industrie d'automobile joue un rôle majeur dans le développement économique et la création d'emploi. L'intervention et les stratégies publiques visent à promouvoir en France un plan national en faveur de la mobilité durable.

Vedecom est un Institut pour la Transition Énergétique (ITE) mis en place dans le cadre du Programme d'Investissements d'Avenir (PIA) du Gouvernement Français, dédié à la mobilité individuelle, décarbonée et durable. L'institut Vedecom qui fait partie du « plan automobile » de la Nouvelle France Industrielle (NFI) réunit les principales parties prenantes publiques et privées associées au développement du véhicule électrique et autonome en France. L'institut Vedecom est une fondation partenariale de l'Université de Versailles Saint-Quentin-en-Yvelines, de près de 40 membres regroupés sur une collaboration entre industriels de la filière automobile, aéronautique, opérateurs d'infrastructures et de services de l'écosystème de la mobilité, établissements de recherche académiques et collectivités locales d'Ile-de-France.

### **Problématique**

Relativement au contexte de la recherche, la problématique générale de la thèse concerne au développement et l'application du concept de business model pour les écosystèmes public-privé d'innovation. D'une part nos sociétés font face à l'impérieuse nécessité de développer des formes de transport alternatif et d'autre part, le concept du business model joue un rôle central dans les processus d'innovation. Confronter ses deux enjeux en étudiant le processus de conception d'un business model constituait donc une opportunité rare.

Cette recherche cherche à contribuer à la théorie en parallèle de fournir d'aide à la gestion. Pour aborder cette problématique nous nous sommes fondés sur une approche centrée sur la recherche-action. Sur le plan théorique, nous nous sommes essentiellement appuyés sur la littérature sur les business model en cherchant à en montrer les limites pour étudier, dans une perspective dynamique, son utilisation à l'échelle d'un écosystème.

Cette problématique générale a été scindée en quatre sous-problématiques. Ces quatre questions de recherche ont émergés pendant le procès parallèle et réciproque de la recherche-action et de la revue de littérature. Dans la partie suivante après une synthèse de la littérature, nous décrirons ces quatre questions de recherche.

## Revue de littérature

Pendant les 15 dernières années, de nombreux articles et livres ont été publiés dans le domaine du business model. En plus plusieurs revues scientifiques ont consacré des numéros spécifiques pour étudier le concept de business model. De plus le concept du business model est devenu un des axes de recherche de plusieurs conférences en sciences de gestion comme EGOS et AIMS. En parallèle le terme « business model » a eu une vaste diffusion dans le langage des managers au sein des entreprises et les entrepreneurs. Ces manifestations de l'utilisation du concept de business model dans les milieux académique et professionnels soulignent l'importance de la recherche à la fois appuyant sur le concept du business model et à la fois répondant aux problèmes réels.

Les chercheurs de différents domaines (ex : stratégie, commerce électronique, innovation et technologie) ont contribué à la littérature du business model. En conséquence il existe diverses définitions pour le concept du business model. En plus différents composants ont été considérés pour le business model.

Notre revue de littérature sur le concept du business model a révélé 3 points major :

Premièrement, le concept du business model a été développé notamment sur une firme en manquant une vue systémique. Malgré les évolutions du concept du business model, il est très peu appliqué sur les concepts qui ont également émergé dans les années 90 et 2000, et qui s'occupent des enjeux systémiques et multi-acteur (ex : le réseau de valeur, l'innovation ouverte, l'écosystème d'affaires, le partenariat public-privé). Ces concepts concernent les enjeux complexes dans le niveau d'un système et pas d'un acteur, et également les échanges hétérogènes parmi les acteurs. En plus, les enjeux de développement durable comme la réduction des émissions de gaz à effet de serre, la pollution atmosphérique et les nuisances sonores, s'inscrivent dans les missions des pouvoirs publics et les industrielles. Ils ne peuvent pas être gérés qu'avec la collaboration de plusieurs acteurs de l'écosystème. Puis les problèmes publics ou même l'introduction de certains types d'innovation nécessitent le partage des ressources et les compétences parmi plusieurs acteurs, étant donné qu'ils ne sont pas gérables au niveau d'un acteur en raison des limites techniques, savoir-faire ou financière. L'importance d'avoir une perspective systémique a été soulignée par peu nombre des



chercheurs alors que nous ne trouvons pas un grand avancé ou un outil répondant aux enjeux systémique.

Deuxièmement, la contribution des chercheurs des différents domaines dans la littérature du concept de business model a entraîné des diverses considérations en terme des composants du business model. En conséquence la définition des bonnes questions de recherches d'une part et établir les approches pertinents d'autre part sont compliqué.

Troisièmement, la dynamique des business model est insuffisamment étudiée. La littérature sur les BM n'analyse pas les mécanismes pour étudier la dynamique du business model soit entre ces composants ou de son évolution dans la durée.

Notre revue de littérature et notre recherche-action mutuellement nous ont conduits à définir 4 questions de recherche :

- Comment élaborer d'un cadre conceptuel pour le business model d'un écosystème d'innovation ?
- Quel sont les mécanismes du l'innovation du business model ?
- Comment évaluer la structure de coût-revenue du business model d'un écosystème public-privé ?
- Quel est la dynamique du business model d'un écosystème d'innovation dans la durée ?

## Méthodologie

De point du vue d'épistémologique, dans cette thèse, notre position générale en tant que chercheur par rapport à l'objet de recherche s'inscrit dans le paradigme constructiviste. Nous avons choisi la méthodologie de la recherche-action pour accompagner l'institut Vedecom qui a financé cette recherche.

Sur le plan théorique, nous nous sommes essentiellement appuyés sur la littérature sur les business model en cherchant à en montrer les limites pour étudier, dans une perspective dynamique, son utilisation à l'échelle d'un écosystème. A partir de cette analyse, nous avons construit un cadre d'analyse et avons cherché à développer des outils de pilotage de business

model adaptés à des écosystèmes d'innovation. Sur le plan empirique, nous avons d'abord mené une étude de cas sur le véhicule électrique dans l'entreprise Bolloré afin de mettre l'épreuve notre cadre théorique. Nous avons présenté ensuite l'expérimentation collective conduite à Satory sur le véhicule autonome en présentant les outils que nous avons conçue dans le cadre de la recherche-action.

Les différents questions de recherche n'ont pas émergé en même temps et toutes au début de la recherche. Une réflexion initiale dans le cadre de la recherche-action entre nous en tant que les chercheurs et les managers de Vedecom a montré l'existence d'un problème autour de la compréhension de la structure de coûts-revenue parmi les acteurs variés de la mobilité à Satory. En parallèle notre revue de littérature a confirmé que ceci est également une question de recherche.

Nous avons réalisé une étude qualitative fondée sur l'administration des entretiens semi-directifs réalisés in situ auprès de diverses catégories des acteurs de l'écosystème y compris les autorités publics, les industriels et les utilisateurs. Nous avons également réalisé une enquête auprès des usagers du transport à Satory. Nous avons pu aider les managers de Vedecom par nos premiers résultats et contribuer à la littérature du business model.

La réflexion sur les résultats à la fin de chaque cycle, nous a encouragés de créer une nouvelle question de recherche.

Nous avons mobilisé la littérature, les concepts, les théories et les méthodologies pour répondre aux problèmes réels dans l'entreprise. En même temps, nous nous sommes assurés si le problème au sein d'entreprise pourra avoir une solution qui a une importance académique.

En plus nous avons vérifié si la recherche-action elle-même couvre toutes les questions de recherche ou il y a un besoin de mobiliser d'autres méthodologies.

Ensuite la collecte de données et l'analyse de données ont entraîné aux résultats pour l'entreprise et ont fourni nouveaux avancées académique.

Nous avons choisi deux cas, le cas des véhicules électriques en libre-service et le cas du véhicule autonome. Nous avons eu quelque raison pour travailler sur deux cas :

Premièrement, quand nous avons commencé à travailler avec Vedecom, un nouveau consortium qui n'avait même pas un statut jusqu'à 2014, nous n'avons pas attendu pour Vedecom pour nous fournir de données, par contre nous avons également participé à la production de données par nos entretiens, enquête et également le calcul d'ingénierie.

Deuxièmement, selon (Yin, 2003) et (Eisenhardt, 1989), le fait d'avoir plusieurs cas soutient la validité de la recherche et la généralisation des résultats fondé sur différents groupes de données.

### **Description du cas**

Afin de conduire cette recherche nous avons choisi deux cas pour lesquels nous avons adopté deux approches complémentaires :

- Une approche a posteriori, en reconstituant des cas des offres de transports existantes, cherchant à proposer des schémas explicatifs des fonctionnements organisationnels et des business model de ces offres multi-acteurs. (Le cas Autolib)

- Une approche « in vivo » sur des projets en cours (le cas Vedecom), avec l'objectif à la fois d'analyser les business model et les organisations existantes, et d'accompagner des projets en cours avec de nouveaux outils de gestion.

Nous détaillons maintenant deux cas emblématiques de ces deux approches.

#### **Le cas Autolib**

L'étude de cas a posteriori du projet Autolib a permis de caractériser un premier type de dynamique de projet public-privé.

Nous avons mobilisé des sources secondaires (rapports annuels, articles de presse) et primaires (interviews) pour reconstituer la généalogie de ce projet depuis 2001. Nous avons notamment caractérisé la manière dont les différents acteurs publics et privés s'étaient, sur la durée, structurés en interne et coordonnés entre eux, poursuivant à la fois des logiques propres en interne et une logique globale.

Pour éclairer ce cas, nous avons mobilisé le cadre théorique de l'effectuation (Sarasvthy, 2001), traditionnellement utilisée pour décrire les dynamiques de start-ups.

Par exemple, concernant le Groupe Bolloré, nous avons montré que la roadmap de production de batteries LMP et de bornes intelligentes en voiries avait été un driver historique (dès 2001) important du projet. Le « méta-projet » Autolib n'aurait pu exister sans la poursuite de ce projet, qui s'est progressivement ouvert pour inclure d'autres acteurs. Par exemple (Bolloré a créé la société batScap, en partenariat avec EDF qui détient une participation de 20% pour développer et industrialiser des batteries au lithium métal polymère).

Alors que les raisonnements habituels nous conduisent à réduire l'histoire du projet Autolib à un appel d'offres public auquel a répondu un industriel, la monographie du projet a montré que la demande publique a en fait été dans la continuité de la structuration d'un écosystème privé complémentaire. La théorie de l'effectuation permet alors de décrire la logique de croissance de cet écosystème public-privé, qui associe une logique d'essai-erreur et une logique d'accumulation de technologies et de partenaires.

### **Le cas de l'institut Vedecom**

L'enjeu des politiques publiques actuelles, mises en œuvre notamment dans le cadre du Programme d'Investissements d'Avenir, consiste justement à créer des clusters qui mettent en synergie les acteurs de la recherche, fondamentale et appliquée, dans des ensembles hautement interactifs, où l'innovation est ouverte et partagée. Satory appartient à la Communauté d'Agglomération Versailles Grand-Parc(CAVGP). Les départements de l'Essonne et des Yvelines, sur les quatre communautés d'agglomération d'Europe-Essonne (CAEE), du Plateau de Saclay (CAPS), de Versailles Grand Parc (CAVGP) et de St Quentin en Yvelines (CASQY) composent l'Opération d'Intérêt National (OIN) Paris-Saclay. Le département des Yvelines est un soutien historique de la filière automobile et plus largement des mobilités innovantes. Le département des Yvelines est le 1er Département automobile de France. Satory est situé entre les sites de recherche et développement des grands constructeurs et équipementiers (Technocentre Renault à Guyancourt, centre de Design PSA à Vélizy, Valéo à Trappes).

## Synthèse en Français

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L'amélioration des dessertes transports du site de Satory est un enjeu majeur pour l'agglomération de Versailles Grand Parc qui a confié l'étude amont de ce projet à l'institut Vedecom.

Le périmètre de Satory souffre d'un relatif isolement en terme de transport, alors même qu'il est voué à se développer radicalement dans les années à venir en terme d'activité économique et de population.

A ce jour les plus proches gares ferroviaires à Satory sont Versailles Rive Gauche, Versailles Chantiers et Saint Cyr l'école. Satory est en plein développement du point de vue de l'urbanisme et de l'industrie. Le quartier développe 4000 logements ainsi que de 40000 m<sup>2</sup> de surface économique. Du point de vue de la mobilité, Satory sera affecté par deux grands projets à l'échelle régionale et départementale (1) la gare de Saint-Cyr-l'Ecole accueillera à partir de 2018 la future Tangentielle Ouest (TO ou TGO), reliant Achères-Ville et Saint-Germain à Saint-Cyr-l'Ecole (2) le futur métro automatique du Grand Paris Express inaugurera une gare à Satory d'ici 2030 ; la ligne 18 du métro Grand Paris va relier Satory à la gare Versailles Chantiers.

Il ne s'agit pas simplement de construire de nouvelles lignes de bus, mais de développer des offres de mobilité innovantes, basées sur des usages et des technologies modernes de mobilité tout en prenant en compte certaines contraintes : limiter les investissements fonciers, et impacts forestiers en réutilisant au maximum les infrastructures existantes ; réduire les temps de parcours aux heures de pointe par rapport aux dessertes actuelles dont les conditions de circulation risquent de se dégrader encore en cas de développement urbain et industriel; réduire les émissions; ne pas s'inscrire dans la vue du château de Versailles.

Ce projet de développement des transports à Satory est particulièrement emblématique d'un enjeu de gestion d'écosystème. Les innovations de transport envisagées mobilisent des acteurs variés (constructeurs automobiles, équipementiers, transporteurs, collectivités,...) qui doivent se coordonner en amont pour imaginer, concevoir l'offre et le business model associé. Notre action sur l'aspect « management de l'innovation » de ce projet a consisté à formaliser le réseau d'acteurs impliqués dans les systèmes de transports actuels et futurs, et à représenter le business model commun actuel et potentiel.

Un travail important a été réalisé sur le recensement et la caractérisation des acteurs impliqués à la fois dans le système de transport actuel du périmètre de Satory, et des acteurs potentiellement concernés par un futur projet de système de transport innovant.

Du côté des acteurs publics, nous avons réalisé une étude bibliographique approfondie pour appréhender les différentes instances concernées (AOT, collectivités locales, STIF,...). Nous avons complété cette étude initiale par des entretiens ciblés : par exemple avec Madame Bonnier, Directrice du Département « Projets de Territoire et Collectivités » à la Chambre de Commerce et d'Industrie de Versailles ; à l'Agglomération de Versailles Grand Parc (CAVGP) et l'Etablissement Public Paris-Saclay (EPPS) etc. Le département des Yvelines est un soutien historique de la filière automobile et plus largement des mobilités innovantes. Le département des Yvelines est le 1er Département automobile de France. Satory est situé entre les sites de recherche et développement des grands constructeurs et équipementiers (Technocentre Renault à Guyancourt, centre de Design PSA à Vélizy, Valéo à Trappes). Les acteurs publics s'intéressent notamment à valoriser l'image de ce territoire qui peut favoriser le marketing territorial pour son développement économique. Par ailleurs, il s'agit pour eux de préparer la mutation de l'industrie automobile qui a été, pendant des années, la principale source d'emplois du département et favoriser l'implantation des modes de la mobilité innovante. La mobilité et l'urbanisme restent des facteurs essentiels pour l'image du territoire, par conséquent, il existe une volonté pour créer des solutions modernes, intégrant des acteurs hétérogènes, et en prenant en compte les difficultés actuelles de financement.

Du côté des acteurs privés, nous avons réalisés des entretiens auprès d'acteurs. En parallèle, nous avons réalisé des entretiens auprès des constructeurs d'automobile et les équipementiers, afin de comprendre leurs produits, leurs roadmaps, et leurs intérêts dans un futur projet potentiel. Ces acteurs industriels ont des intérêts variés à l'opération. Les constructeurs de véhicules et les équipementiers innovent, mais ils ont besoin de promouvoir leur offre, une offre innovante qui ne peut pas être bien définie et exploitée sans l'implication des différents acteurs pour la concevoir. L'articulation d'acteurs hétérogènes dans la phase de spécification du système global pose des questions nouvelles pour le domaine de la rationalisation des activités de conception.

Du côté des entreprises qui se situent aujourd'hui à Satory Ouest, celles-ci sont plutôt spécialisées dans le véhicule, comme les véhicules militaires et les véhicules sport. Après Nexter, ces filiales de grandes entreprises y sont implantées depuis le début des années 2000 en raison des atouts du plateau comme la situation géographique et la proximité de Paris, de même que les pistes d'essais et la proximité d'entreprises du même secteur d'activité. La présence de pistes d'essais à Satory a déjà permis de rassembler dans la zone d'activités de Satory Ouest des entreprises industrielles œuvrant dans les technologies des armements terrestres (Nexter, Renault Trucks Défense) ou du sport automobile (Citroën Racing), ainsi que des laboratoires de recherche en lien avec le pôle de compétitivité Mov'eo, notamment l'IFSTTAR –Institut Français des Sciences et Technologies des Transports, de l'Aménagement et des Réseaux. Les pistes d'essais sont un atout pour Satory et lui permettent de se différencier des sites concurrents et sont un argument incontournable pour la promotion du territoire.

L'ensemble des ingrédients sont donc réunis pour impulser un projet de système de transport moderne : une impulsion politique et économique favorable liée au développement des transports sur cette zone, des acteurs publics volontaristes impliqués dans une dynamique de renouvellement des transports et plus globalement de l'attractivité du périmètre de Satory, des acteurs industriels matures et proactifs pour le développement de nouvelles solutions de mobilité sur le territoire.

## Résultats

### **1er Résultat : Elaboration d'un cadre conceptuel pour le business model d'un écosystème d'innovation**

La recherche-action en parallèle de la revue de littérature nous a conduits de proposer un cadre conceptuel pour le business model d'un écosystème d'innovation. La littérature sur les business model est centrée sur l'entreprise et s'est peu intéressée à des échelles plus larges, comme celle d'un écosystème d'innovation. La littérature sur les BM est également souvent statique et n'analyse pas les mécanismes pour étudier la dynamique de formation d'un BM d'innovation.

## Synthèse en Français

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Nous voudrions proposer un schéma général pour la conception d'un business model distinguant 3 composants : les systèmes d'offre et de demande ainsi que la structure de valeur. La structure de valeur comprend l'ensemble des flux de valeurs (tangibles et intangibles) qui circulent entre les acteurs. Nous soulignons également deux types de dynamique du business model, l'une entre les composants du business model et l'autre l'évolution du business model dans le temps.

Nous avons choisi le business écosystème (Moore, 1996) comme le concept de base pour l'approche systémique, car il nous fournit une perspective sur tous les acteurs y compris les organisations publics, les industriels et aussi les clients, tandis que nous ne trouvons pas cette globalité sur l'ensemble des acteurs chez d'autres concepts multi-acteurs. D'autre part le business écosystème explique le cycle de vie d'un business qui représente une dynamique au fil du temps.

Néanmoins que le concept de l'écosystème d'affaire fournit un schéma de tous les acteurs de l'écosystème, mais ne montre pas les relations et les échanges parmi les acteurs.

En conséquence nous avons choisi d'accompagner le concept de l'écosystème d'affaire par le concept du réseau de valeur (Allee, 2000; Brandenburger and Nalebuff, 1995). Le concept de réseau de valeur appuie sur les interactions parmi les acteurs qui génèrent les valeurs tangibles ou intangibles. Autrement dit ça explique les échanges des valeurs parmi les acteurs.

La transposition du concept de value network sur le business écosystème, facilite l'explication des échanges de valeurs parmi les acteurs de l'écosystème

Le cadre conceptuel lequel nous a avons créé pour le business model d'un écosystème d'innovation a trois caractéristiques :

Premièrement, l'écosystème d'affaire et son réseau de valeur représentent la structure.

Deuxièmement, les trois composants qui configurent le business model sont le système d'offre, le système de demande et les valeurs échangées.



Troisièmement, le business model d'un d'écosystème d'affaire est dynamique; d'une part une dynamique latérale existe entre les composants du business model et d'autre part le business model a une dynamique longitudinale au fil du temps.

Nous parlons du système d'offre au lieu d'une firme et du système de demande à la place du client. En effet dans le cas d'une innovation complexe (Adner and Kapoor, 2010) comme le véhicule autonome, une entreprise n'est pas capable de faire tous, mais une sélection d'acteurs créent l'offre, en conséquence un système d'offre (Boons and Ludeke-Freund (2013)) se forme. Également nous avons un système de demande (Roehrich and Llerena, 2011) qui consiste différents profils y compris les payeurs et les utilisateurs. Les utilisateurs ne sont pas forcément les payeurs. (Eisenmann et al., 2006; Gawer, 2014).

### **2ème Résultat : L'innovation du business model à travers des processus d'effectuation**

Notre deuxième question de recherche s'agit du mécanisme d'innovation du business model. Il s'adresse la dynamique entre les composants du business model.

Nous avons identifié deux mécanismes d'innovation dans les business model : ou l'entreprise réponde aux évolutions de son environnement dans une approche réactive ou elle cherche à créer les nouveaux effets dans une approche proactive.

Relativement au cadre conceptuel de la thèse qui propose trois composants : le système d'offre, le système de demande et la structure de valeur, nous avons constaté que dans la littérature du business model, la dynamique de configuration du business model est du client vers l'entreprise. Les questions types, qui est le client ? Quelle la valeur proposée aux clients ? Que vend l'entreprise à ses clients ? Se focalisent sur le client. Autrement-dit le client et la valeur proposée sont considéré déjà définis. Cette approche ne permet pas les entreprises de réaliser les innovations du type radical et créer les nouveaux effets.

Dans une approche systémique nous s'intéressons sur la dynamique de configuration du business model en partant du système d'offre vers le système de demande.

D'autre part, les travaux de Sarasvathy (2001) dans la littérature d'entrepreneuriat proposent la logique d'effectuation pour réaliser des expérimentations successives où les

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acteurs bricolent à partir des ressources et les compétences qu'ils ont sous la main pour générer certains effets souvent inattendus.

Nous avons transposé la logique d'effectuation au business model à fin de pouvoir définir la dynamique du business model en partant du système d'offre vers le système de demande dans les projets d'innovation. À ce titre notre cadre d'analyse a concerné la délibération du cas en temps chronologique sur quatre dimensions de la logique effectuale ; "Qui suis-je ?", " Qui je connais ?", "Que sais-je ?" et "Que puis-je faire ?"

Nos deux cas montrent le procès effectual pour l'innovation du business model:

L'analyse du cas Bolloré montre comment la configuration du système d'offre dans différents étapes a entraîné les nouveaux effets.

Nous avons choisi le groupe Bolloré à cause de son innovation rupture "Autolib", nous sommes allés un peu plus loin pour trouver la genèse d'Autolib', après avoir consulté les rapports annuelle du groupe et d'autre sources comme la communication du presse, on s'est intéressé à l'activité industrielle du groupe. Nous avons trouvé que la production des batteries LMP était un événement important ce qui a entraîné plusieurs innovations, donc nous avons fixé l'année référence en 2001, dans laquelle le groupe Bolloré a créé la société batScap, en partenariat avec EDF qui détient une participation de 20%, pour développer et industrialiser des batteries au lithium métal polymère. En 2001, Bolloré se présente en tant que producteur des papiers fins et les films plastiques. Progressivement en ayant la posture effectual, l'entreprise a pu créer les nouveaux produits, comme les batteries LMP, un prototype du véhicule électrique, les supercapacitors et ensuite d'offrir le service Autolib, le véhicule électrique en libre-service.

L'exemple du Vedecom montre l'évolution de la recherche et l'expérimentation dans l'industrie d'automobile et du transport.

La logique effectual de la création des partenariats entre les différents industriels (comme Renault, Peugeot, Valeo, Veolia), les centres de recherche et les financeurs a résulté au final à l'expérimentation du véhicule autonome à Satory. Le point de départ était la collaboration entre deux centres de recherche pour la sécurité routière. Ce projet a été

développé en intégrant des partenaires industriels et publics. Dans chaque étape, les acteurs diverses ont apporté leurs expertises et ont donné nouvelles directions pour les projets.

### **3ème Résultat : Conception d'un outil de gestion pour le business model d'un écosystème public-privé**

Notre troisième question de recherche s'adresse la conception d'un outil de gestion pour le business model d'un écosystème public-privé.

Relativement à notre collaboration avec Vedecom, le besoin de comprendre la structure de coûts-revenue a été identifié. Nous avons essayé de visualiser et évaluer le business model de l'écosystème. À partir d'une étude de cas sur le véhicule électrique dans l'entreprise Bolloré, nous avons construit un prototype d'outil de gestion.

En parallèle dans le cadre de notre recherche-action nous avons commencé par la collecte de données par les réunions, les entretiens, l'enquête, le workshop et les données publics de certains organisations (INSEE, ADEME, URSSAF, STIF).

Les entretiens auprès des autorités publics ont été pour comprendre leurs plans pour le développement et également leurs visions sur la mobilité.

Les entretiens auprès les entreprises situées à Satory ont cherché de savoir les stratégies d'entreprises en termes de développement dans les années d'avenir.

Les entretiens auprès des industriels ont été pour savoir les innovations technologiques en train de développé au sein de ces entreprises.

A partir des données collectées, nous avons fait un travail ingénierie pour chiffrer les contributions et les bénéfices des acteurs de l'écosystème de mobilité à Satory.

Nous avons pris en compte toutes les modes de transport pratiqué dans la zone de Satory y compris les lignes du bus, les véhicules particulières et les deux roues motorisées. En plus nous avons calculé les externalités générées par chaque mode. Nous avons également inclus toutes les contributions des acteurs.

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Ce travail de conception d'un outil de gestion pour le business model d'un écosystème public-privé repose sur trois étapes.

1. Basé sur le cadre conceptuel proposé, nous avons identifié et classifié les acteurs dans deux catégories, le système d'offre et le système de demande en les envisageant en tant que bénéficiaire et contributeur financier. L'identification des acteurs de l'écosystème a été faite en les envisageant en tant que bénéficiaire et contributeur financier, et en caractérisant le type de contribution et de rétribution issus de l'opération du projet. Cette étape a été réalisée en compilant une campagne d'entretiens menés avec des spécialistes des collectivités locales notamment, et la lecture d'articles et d'ouvrages spécialisés sur l'économie locale des transports. Ceci a permis de fédérer les différents flux économiques (coûts et recettes directes, subventions, redevances, externalités qualitatives,...), de les caractériser et de les représenter dans une même matrice contributeurs / bénéficiaires.

2. Puis nous avons fourni un chiffrage pour chaque cellule de la matrice qui correspond à un flux financier. Un chiffrage économique a été fait pour chaque cellule pertinente de la matrice « contribution / rétribution ». Le chiffrage a été fondé sur plusieurs sources : des entretiens réalisés auprès des entreprises de la zone de Satory, des données publiques, et des données primaires recueillies lors de l'enquête déplacement menée au sein de Vedecom. Le chiffrage repose sur des méthodes de calcul qui font référence notamment dans les études d'économie des transports, et qui sont calibrées sur des hypothèses réalistes. L'ensemble a fait l'objet d'une communication régulière et d'une validation auprès du comité de pilotage de thèse Télécom/Vedecom.

3. En conséquence, nous avons retiré un bilan pour chaque acteur et également pour l'ensemble des acteurs au sein de l'écosystème. Un bilan économique acteur par acteur, permettant de caractériser globalement le budget pour chacun, en unifiant les gains et les recettes hétérogènes sur les différentes briques du business plan.

Nous avons envisagé également une expérimentation de la navette autonome pour la desserte entre la gare de St.Cyr et Satory.

Un projet d'innovation est à la fois instable et à la fois évolutif ; l'outil de gestion développé nous a fourni une photo instantanée de la structure coût-revenue, autrement dit ça

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peut être reproduit si n'importe quel élément change (l'intégration ou la sortie d'un acteur, la modification des contributions).

Le trajet et le niveau technologique de ce service sont les résultats des interactions parmi les différents acteurs.

Satory appartient au département des Yvelines, l'industrie automobile est le premier générateur d'emploi dans le département des Yvelines. En conséquence, une piste d'expérimentation d'une mobilité innovante s'accorde avec la stratégie du département en terme de création d'emploi et promouvoir de l'industrie automobile.

De plus Satory est un des rares lieux à Versailles qui a encore la capacité du développement en terme d'espace libre, c'est pour ça que le projet a été soutenu par la communauté Versailles Grand Parc.

De même l'Etablissement Public Paris Saclay a soutenu le projet car Satory est dans leur périmètre de développement.

Pour la desserte locale à Satory le trajet entre la gare du St.Cyr l'école et Satory a été choisi. Cette liaison sera sans effet sur les personnes venant du sud de Satory, qui utilisent aujourd'hui leur voiture, et qui continueront. Par contre pour les personnes qui viennent de l'ouest et du nord, dès lors que leur domicile sera proche d'une gare Transilien sur les lignes vers Rambouillet ou Plaisir-Grignon, ou, demain d'une gare de la future TGO, la nouvelle liaison offrira une réelle alternative au véhicule particulier, puisque ces voyageurs éviteront, à l'inverse de ceux qui viennent de l'est, le détour de 5 km par la gare de Versailles-Chantiers. Et puis, pour les personnes nombreuses qui viennent de l'est, en provenance de Paris et des Hauts de Seine, le détour par Saint-Cyr apparaît comme une alternative possible, d'autant plus attractive que la liaison Saint-Cyr Satory offrira une très bonne qualité de service (vitesse, temps de correspondance), mais aussi que les lignes de bus versaillaises resteront prisonnières de la congestion.

Pour permettre le déploiement de ces véhicules automatisés et semi-autonomes, voire complètement autonomes à terme, il est indispensable d'accompagner les travaux de recherche et développement des constructeurs automobiles, des équipementiers et des

organismes de recherche par des tests sur routes. Le projet de la liaison de St.Cyr à Satory est une occasion pour permettre aux industriels (constructeurs de l'automobile, équipementiers, télécommunication, ...) de développer et expérimenter au mieux le concept du véhicule autonome pour un vrai besoin avec le soutien des pouvoir public.

Les niveaux d'automatisation sont définis en 5 niveaux de '0', pas d'atomisation à '5', tout autonome. Chaque niveau d'atomisation génère un véhicule différent du point de vue de ses performances automatiques et donc il sera adapté à un type de service et à une infrastructure spécifique.

Ce niveau de service n'assurera pas une rentabilité financière mais l'expérimentation générera des valeurs plutôt intangibles pour les acteurs.

### **4ème Résultat : La dynamique longitudinal du business model d'un écosystème d'innovation**

Notre 4ème question de recherche s'agit d'étudier la dynamique du business model d' l'écosystème d'innovation au fils du temps. La littérature sur les business model est également souvent statique et n'analyse pas les mécanismes pour étudier la dynamique de formation d'un BM d'innovation.

Nous rappelons que nous avons identifié deux types de dynamique du business model : soit une dynamique entre les composants du business model (la dynamique latéral) soit une dynamique dans la durée (la dynamique longitudinale). Pour la dynamique latéral nous nous sommes appuyé sur le concept d'effectuation (Sarasvathy, 2000) et nous en discuté lors de deuxième résultat. Pour la dynamique longitudinale basée sur le concept de l'écosystème d'affaire (Moore, 1996), nous avons identifié quatre étapes pour la naissance d'un écosystème d'affaire.

L'idéation, la constitution, l'expérimentation et la préparation pour l'expansion représentent les quatre étapes de la naissance d'un écosystème d'affaire. Par conséquent le business model de l'écosystème est dynamique et évolue en terme de la création et de la captation de valeur par les acteurs diverses.

Basé sur l'ensemble des valeurs échangées dans l'écosystème, une dernière étape de préparation se justifie pour décider de continuer et développer l'innovation expérimentée ou bien revenir sur l'effectuation pour créer les nouveaux effets à partir du business model constitué.

### Conclusions

Nous revenons sur les différents apports des résultats présentés :

Concernant les apports d'ordre empirique de notre travail de recherche, nous constatons que l'écosystème d'innovation de mobilité à Satory s'est créé suite à les interactions parmi les acteurs diverses des secteurs public et privé aux cours des deux dernières décennies.

Les facteurs économique, environnementale et sociétale en parallèle d'émergence de nouveaux acteurs et le changement des utilisateurs ont conduit les constructeurs automobiles, les équipementiers et les autorités publiques de collaborer pour innover.

Dans la phase d'expérimentation, les constructeurs d'automobile n'ont pas été très intéressés car ils cherchent l'économie d'échelle. Les petites entreprises et les start-ups ont plus de motivation. En plus dans le cas de véhicule autonome, la technologie est sophistiquée mais la plupart de ces technologies comme les caméras, radar et laser s'inscrit dans le business des équipementiers. Par exemple Valeo a joué un rôle dans la création de l'écosystème d'innovation piloté par Vedecom, mais elle ne se limite pas à ça et s'avance dans ses propres projets.

Concernant les apports d'ordre théorique de notre travail de recherche, en générale nous avons développé et appliqué le concept du business model pour les écosystèmes d'innovation public-privé.

Ce travail de recherche nous a permis de concevoir un cadre conceptuel pour le business model de l'écosystème, de délibérer la dynamique du business model entre ces composants et de son évolution dans le temps, et puis de concevoir un outil de gestion pour la visualisation et l'évaluation du business model.

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Concernant les apports managériaux de ce travail de recherche, notre collaboration avec l'institut Vedecom dans le cadre d'une recherche-action a eu plusieurs effets en terme managérial :

Cette recherche a joué un rôle performatif dans différents étapes de la recherche y compris la collecte de donnée, la génération de données, l'analyse des données, la conception d'outil et la communication des résultats intermédiaires.

Les démarches de la recherche, essentiellement les entretiens, l'enquête et les résultats d'outil de gestion ont aidé la formalisation de l'institut Vedecom en tant que le leader du consortium pour la mobilité innovante vis-à-vis de ces partenaires.

La recherche a fourni une approche pour l'évaluation du business model de mobilité. De plus les externalités ont été intégrées dans l'outil. La première application du modèle a caractérisé le business model d'écosystème actuel de Satory. Une première tentative pour représenter de manière globale ce que les uns et les autres payent et perçoivent pour les transports sur ce périmètre. Le business plan d'écosystème, comprends d'une représentation par réseau de valeur qui explicite la cartographie et les acteurs et les flux financiers qui les relie, et puis une représentation matricielle du business plan, détaillant à chaque niveau « qui verse quoi à qui », et caractérisant à chaque fois le type de flux, en plus troisième élément est un histogramme qui montre la viabilité de l'écosystème ainsi que la situation de chaque acteur dans l'écosystème. La première application de ce modèle a été de caractériser le business plan d'écosystème actuel de Satory. Il s'agit de la première tentative pour représenter de manière globale ce que les uns et les autres payent et perçoivent pour les transports sur ce périmètre. Sur le cas du projet Satory, cette méthode a permis de chiffrer le budget global actuel de la mobilité à Satory, élément original et essentiel sera déployé sur les solutions de mobilité qui se dégageront du projet. Sur un plan générique, l'approche modulaire du business model d'écosystème constitue une avancée méthodologique importante, permettant d'aboutir à une vision globale du business plan d'écosystème d'un projet de mobilité sur une zone donnée.

La recherche a aidé Vedecom et ces partenaires industriels et publics pour une décision collective en terme technologique, emplacement et niveau de service. Vedecom a pu engager



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ces partenaires pour soutenir et mobiliser des financements pour ses projets et particulièrement l'implantation du site d'expérimentation à Sator.

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### Semi-structured interviews

#### Entretien auprès des acteurs publics

- Combien d'entreprises se situent-elles à Satory?
- Combien d'actifs y viennent travailler?
- Quel est le plan de transport?
- Est-ce que à votre avis à Satory, il y a des projets de transport qui peuvent aider l'amélioration de circulation?
- Quels sont les leviers d'attraction et Qu'est-ce qui favorise l'attractivité d'une zone?
- Qu'est-ce que ces leviers apportent? Et, à qui?
- De quels avantages peuvent bénéficier les entreprises?
- En fonction du secteur d'activités de l'entreprise, quel peut être le poids de la desserte transport dans l'implantation ou le départ d'une entreprise sur la zone de Satory?
- Quel est le budget de transport et aménagement de territoire?
- Quel est la part de budget de transport dans le budget total?
- Quel est le budget de communication, promotion du territoire et marketing public?
- Pouvez-vous nous présenter votre organisme ainsi que les buts qui sont les siens?
- Comment voyez-vous votre rôle dans l'avenir de la Région Ile-de-France?
- Quels freins identifiez-vous à la mise en place d'une stratégie de développement durable dans les transports de votre commune / collectivité? Comment pourrait-on les relever à votre avis?
- Quel est le rôle des entreprises situées sur le plateau dans le plan de transport?
- Est-ce qu'il y a des objectifs, contraintes ou directives pour la promotion sociale de certains quartiers?
- Est-ce que vous voyez une importance pour les offres innovantes de la part des entreprises concepteurs (constructeurs d'automobile), pour structurer et orienter la demande et le mode de transport?
- Quels sont les leviers d'attraction et Qu'est-ce qui favorise l'attractivité d'une zone? Que-t-ils apportent et à qui?

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- Quelle est votre implication dans le projet de desserte du Plateau de Satory? En quoi consiste-t-elle? Qui s'en occupe? Comment définirez-vous votre rôle dans ce projet?
- Est-ce un projet stratégique? En quoi est-il important?
- Va-t-il coûter trop cher? Comment pourra-t-il être financé?
- Quels moyens de transports il faudra prioriser à votre avis? Et des solutions alternatives au transport?
- Qu'est-ce qui va satisfaire les habitants, les industriels et les utilisateurs de choix de transport?
- Quel est votre connaissance des problématiques de desserte sur le Plateau?
- Quelles sont les priorités à engager pour la desserte de cette zone? Et pour son développement?
- Pensez-vous qu'il est important de prévoir l'insertion de cette zone dans le paysage plus large de l'Ile-de-France en général et sa liaison avec le Plateau de Saclay en particulier?
- Quelles sont les modalités de financement de vos projets de transport?
- Optez-vous pour un appel d'offres? Ou bien constituez-vous un PPP?
- Qu'est-ce qui permet d'avoir des subventions? Ou qu'est-ce qu'il faut faire pour capter des subventions?

### **Entretiens auprès des acteurs industriels**

- Pour vous, quels équipements peuvent promouvoir l'utilisation d'un véhicule en mode partagé? Et indirectement la circulation automobile
- Comment voyez-vous l'électrification du véhicule?
- Comment voyez-vous la délégation de conduite?
- Par rapport à ces nouvelles mobilités, à l'introduction de l'électrification du véhicule et à la délégation de conduite, comment voyez-vous le rôle de la couche service et des infrastructures routières?
- Dans le cadre de l'amélioration des dessertes transports de Satory et de la mise en œuvre de nouveaux véhicules liés à ces nouvelles infrastructures liés à ces nouvelles mobilités, comment voyez-vous la contribution de votre entreprise?
- Connaissez-vous des start-up locales qui pourraient contribuer à vos côtés à ce projet?
- Quels types de lien souhaitez-vous engager avec ces partenaires?

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- Quel sont les caractères des projets qui sont déjà adoptées et mis en œuvre et qui sont écartées et ne sont pas mises en œuvre?
- Comment se passe une décision typique pour un projet innovante?
- Quel est le processus de décision d'un projet innovant et comment se définissent les phases, les durées et les documents de références ?
- Quels sont les procédures de recherche utilisées pour identifier les pratiques de transport durable urbain?
- Quelles sont les procédures de décision utilisées pour effectuer un choix entre les différents projets?
- Quelle est la recette financière pour vos projets innovants?
- Pour vous, quelle sera le type de propulsion de la voiture de demain?
- Que signifie la politique environnementale chez vous?
- Est-ce qu'il y a des objectifs fixés pour les enjeux environnementaux?
- Comment souhaitez contribuer à protection de l'environnement et maîtriser la consommation d'énergie de la voiture de demain?
- A quel type de véhicule s'adresse en particulier vos innovations?

### **Entretiens auprès des entreprises situées à Satory**

- Quel est le domaine d'activité de votre entreprise? Quelles sont ses contraintes?
- Combien de vos salariés travaillent dans votre établissement de Satory?
- Est-ce que vous conseillez à un ami d'implanter son entreprise à Satory? Pourquoi?
- Quels termes associez-vous naturellement au plateau de Satory? Voyez-vous des points communs entre les entreprises implantées comme la vôtre sur le plateau?
- Qu'est-ce qui manque au plateau pour être réellement attractif? Quels sont ses atouts?
- Si vous deviez relocaliser votre activité aujourd'hui, où iriez-vous et pourquoi?
- En quoi les transports pourraient contribuer à développer votre activité?
- Quels sont les problèmes pour les salariés qui habitent loin?
- Pouvez-vous estimer (même très approximativement) le nombre d'heures hebdomadaires de retard des salariés dues aux transports (retard par rapport à l'horaire habituel)?

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- Dans quelle mesure votre entreprise a-t-elle pu rencontrer des difficultés de recrutement / turnover lié à la desserte du plateau / à la vie en général sur le plateau?

### Entretiens auprès des directeurs de l'institut Vedecom

Comment Vedecom a géré:

- La définition des projets communs avec ses partenaires?
- La reformulation d'une stratégie pour Vedecom?
- La compatibilité de sa stratégie et ses objectifs avec celles de ses partenaires?
- La répartition de responsabilité parmi différents partenaires?
- L'acquisition de nouveaux partenaires? sur quels critères ?
- Le partage des ressources (humaine, financière, équipement techniques, ...) et des compétences (savoir-faire, expertise, expérience)
- Le bon déroulement des tâches au sein de Vedecom et également chez ses partenaires?
- Nouveaux besoins?
- Le départ des partenaires du consortium? que sont leurs motivations pour quitter le centurium ?
- La demande pour ses innovations? qui sont ses clients ?
- L'attractivité du projet pour ses partenaires industriels et publics?
- Le financement pour ses projets?
- Les événements éventuels qui ont menacé ou renforcé la position de Vedecom?
- Les changements dans son environnement et aux feedbacks pendant son progrès?

### Transport survey

In 2013, we conducted a transport survey in Satory. In this survey the employees of the enterprises were asked to reply to the questions through an online platform. The participation rate to the transport survey was 32.5%. For designing this survey, 7 meetings have been held among two PhD students, their thesis directors and Vedecom's directors.

#### Votre trajet quotidien

1. Lieu de résidence (Code postal et Commune):
2. Lieu de travail principal (Nom de l'entreprise, Code postal et Commune):
3. Nombre de jours dans la semaine où vous vous déplacez à Satory en moyenne (*hors congés*) :  
 1-2 jours                       3-5 jours                       6-7 jours
4. Vos horaires de travail sont :  
 fixes                                       variables
5. Êtes-vous amenés à vous déplacer de/vers/dans Satory en dehors du trajet domicile-travail ?  
 oui                                       non
6. Quelle est:  
L'heure la plus fréquente de départ du lieu de résidence (trajet aller)?  
L'heure la plus fréquente d'arrivée au lieu de travail (trajet aller) ?  
L'heure la plus fréquente de départ du lieu de travail (trajet retour) ?  
L'heure la plus fréquente d'arrivée au lieu de résidence (trajet retour) ?
7. Si vous prenez les transports en commun, nommez vos stations de départ, de correspondances et d'arrivée :
8. À combien estimez-vous le nombre de kilomètres que vous effectuez entre votre domicile et votre lieu de travail (aller simple) ?
9. Quel est le budget mensuel moyen (en euros) que vous consacrez aux transports (en déduisant les remboursements de votre employeur) ?

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10. A combien de minutes par semaine estimez-vous le retard que vous accumulez en moyenne dans les transports (embouteillages, recherche de stationnement, retards de transports en commun, etc.) ?

11. Indiquez à quelle fréquence vous utilisez les moyens de transports suivants pour vos déplacements domicile-travail de/vers/dans Satory. Pour les moyens de transports que vous ne possédez pas, indiquez "Non concerné".

	Non concerné	Jamais	Peu souvent	Souvent	Très souvent
Voiture (en tant que conducteur)	0	1	2	3	4
Voiture (en tant que passager)	0	1	2	3	4
Deux-roues motorisés	0	1	2	3	4
Autres modes mécanisés	0	1	2	3	4
Transports collectifs	0	1	2	3	4
Vélo	0	1	2	3	4
Marche (+ de 15 mn aller simple)	0	1	2	3	4
Autre ( <i>préciser</i> ) :	0	1	2	3	4

12. Indiquez à quelle fréquence vous utilisez les modes de transports suivants pour vos déplacements professionnels (hors trajet domicile-travail) de/vers/dans Satory. Pour les moyens de transports que vous ne possédez pas, indiquez "Non concerné".

	Non concerné	Jamais	Peu souvent	Souvent	Très souvent
Voiture (en tant que conducteur)	0	1	2	3	4
Voiture (en tant que passager)	0	1	2	3	4
Deux-roues motorisés	0	1	2	3	4
Autres modes mécanisés	0	1	2	3	4
Transports collectifs	0	1	2	3	4
Vélo	0	1	2	3	4
Marche (+ de 15 mn aller simple)	0	1	2	3	4
Autre ( <i>préciser</i> ) :	0	1	2	3	4

## Annexes

13. Indiquez à quelle fréquence vous utilisez les modes de transports suivants pour vos déplacements personnels (courses, loisirs, accompagnement, etc.) de/vers/dans Satory. Pour les moyens de transports que vous ne possédez pas, indiquez "Non concerné".

	Non concerné	Jamais	Peu souvent	Souvent	Très souvent
Voiture (en tant que conducteur)	0	1	2	3	4
Voiture (en tant que passager)	0	1	2	3	4
Deux-roues motorisés	0	1	2	3	4
Autres modes mécanisés	0	1	2	3	4
Transports collectifs	0	1	2	3	4
Vélo	0	1	2	3	4
Marche (+ de 15 mn aller simple)	0	1	2	3	4
Autre ( <i>préciser</i> ) :	0	1	2	3	4

14. Pour chacun des services de mobilité proposés ci-dessous, indiquez à quelle fréquence vous utilisez chacun de ces services, quel que soit le type de trajet? Si vous ne connaissez pas le service proposé, indiquez "Je ne connais pas".

	Je ne connais pas	Jamais	Peu souvent	Souvent	Très souvent
Taxi	0	1	2	3	4
Autopartage public (ex : Autolib)	0	1	2	3	4
Autopartage privé (ex : Twizy)	0	1	2	3	4
Covoiturage via un site Internet	0	1	2	3	4
Covoiturage avec des collègues/proches	0	1	2	3	4
Location de véhicule à courte durée	0	1	2	3	4
Location de véhicule avec option d'achat	0	1	2	3	4

### Vos difficultés



## Annexes

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15. Quelles sont les difficultés que vous rencontrez lorsque vous vous déplacez de/vers/dans Satory en voiture?

16. Quelles sont les difficultés que vous rencontrez lorsque vous vous déplacez de/vers/dans Satory en transports collectifs?

17. Quelles sont les difficultés que vous rencontrez lorsque vous vous déplacez de/vers/dans Satory en deux-roues (motorisés ou non)?

18. Quelles sont les difficultés que vous rencontrez lorsque vous vous déplacez de/vers/dans Satory avec un autre moyen de déplacement? Précisez les moyens de déplacement que vous utilisez.

### Vos priorités

19. Quel degré d'importance accordez-vous à chaque priorité proposée pour améliorer votre mobilité à Satory?

	Non concerné	Pas du tout important	Peu important	Important	Très important
Avoir des horaires de trajet fiables	0	1	2	3	4
Dépenser moins d'argent dans mes déplacements	0	1	2	3	4
M'occuper pendant mon trajet	0	1	2	3	4
Partager mon trajet avec d'autres personnes	0	1	2	3	4
Obtenir en temps réel des informations qui facilitent mes déplacements	0	1	2	3	4
Aller à Satory et/ou partir de Satory quand je veux	0	1	2	3	4
Stationner mon véhicule le plus près possible de mon lieu de travail	0	1	2	3	4
Perdre moins de temps entre deux modes de déplacement	0	1	2	3	4

## Annexes

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Me déplacer plus rapidement	0	1	2	3	4
Me restaurer pendant mon trajet	0	1	2	3	4

20. Auriez-vous d'autres priorités pour améliorer votre mobilité qui ne sont pas citées dans le tableau précédent ? Si oui, lesquelles ?

### Remarques diverses et renseignements

21. Dans ce cadre, vous êtes libre d'ajouter toute remarque, question, suggestion qui ne répond pas directement aux questions posées dans le questionnaire. Vos idées pour améliorer la mobilité à Satory sont également les bienvenues.

22. Votre sexe :                     Masculin                     Féminin

23. Votre âge :

- |  |  |
|--|--|
| <input type="radio"/> 25 ans ou moins    | <input type="radio"/> Entre 46 et 55 ans |
| <input type="radio"/> Entre 26 et 35 ans | <input type="radio"/> Entre 56 et 65 ans |
| <input type="radio"/> Entre 36 et 45 ans | <input type="radio"/> 66 ans ou plus     |

24. Votre catégorie socioprofessionnelle :

- |   |   |
|---|---|
| <input type="radio"/> Agriculteur exploitant                        | <input type="radio"/> Ouvrier                       |
| <input type="radio"/> Artisan, commerçant ou chef d'entreprise      | <input type="radio"/> Retraité                      |
| <input type="radio"/> Cadre ou profession intellectuelle supérieure | <input type="radio"/> Sans activité professionnelle |
| <input type="radio"/> Profession intermédiaire                      | <input type="radio"/> Étudiant                      |
| <input type="radio"/> Employé                                       | <input type="radio"/> Militaire du contingent       |

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## Résumé

L'innovation fait partie d'un environnement organisationnel nouveau, évolutif et complexe qui rassemble des acteurs divers, appartenant à différents secteurs d'activité. L'innovation représente une stratégie pour le développement socio-économique des industries, villes ou régions, et elle implique plusieurs acteurs des secteurs public et privé qui manifestent des motivations et attentes hétérogènes. Par conséquent, ces innovations ambitieuses deviennent complexes, et leurs développements et leurs implantations nécessitent la coordination et la collaboration des différents acteurs pour travailler sur divers aspects technologiques et non-technologiques interconnectés. Cette thèse en sciences de gestion s'intéresse à explorer le développement et l'application du concept de business model pour les écosystèmes publics-privés pour l'innovation à travers de la méthodologie de recherche-action. Le processus de la recherche-action est progressif et l'émergence de chaque question de recherche est accompagnée par des actions appropriées incluant la revue de la littérature, l'application des méthodologies complémentaires, le recueil de données et l'analyse. Cette thèse fournit un cadre conceptuel pour le business model de l'écosystème, explique les mécanismes de l'innovation du business model, propose un outil de gestion pour l'évaluation de la structure de coûts-revenues de l'écosystème public privé et discute la dynamique longitudinale de l'écosystème d'innovation.

## Abstract

The innovation has become a part of a new, evolving and complex organizational environment by including diverse actors from different sectors of activity. The innovation stands as the strategy for socio-economic development of industries, cities or regions and it involves several actors both from public and private sectors with heterogeneous motivations and expectations. Consequently, such ambitious innovations become complex that their development and implementation require the coordination and collaboration of different actors for working on various inter-connected technological and non-technological issues. This dissertation in management attempts to explore the development and application of the business model concept in public private ecosystems for innovation through the action research methodology. The process of action research is progressive and the emergence of each research question is accompanied by appropriate actions such as literature review, applying complementary methodologies, data collection and analysis. This dissertation provides several theoretical contributions to management science and delivers several suggestions for management practice. This dissertation provides a conceptual framework for the business model of ecosystem, explains the business model innovation mechanisms, suggests a management tool for evaluating the cost-revenue structure of the public private ecosystems and discusses the longitudinal dynamics of the innovation ecosystem.