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FRAMING THE SCOPE OF VALUE IN EXPLORATORY PROJECTS: AN EXPANSIVE VALUE MANAGEMENT MODEL

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Abstract

Organizations often launch exploration projects (EP) aiming at developing innovative products (or services) by the exploration of new technologies, users, ecosystems or business models. Because a fundamental purpose of any project is to create value, the approach of value management (or value engineering) has been largely adopted in the organizations to manage the projects. However, the fact to move beyond the existing markets and the established technologies imply great difficulties and uncertainties for managing creative projects. Indeed, because exploration projects precisely aim to invent products (or services) that do not exist before, the value to create is unknown at the start of such project. So, what does value management precisely mean in situation of exploration project?

This research aims to clarify the nature, the beneficiaries, and the ways to manage the value in such situations. After reviewing the historical development of the two traditional approaches of value management in project management literature, we then show we show their inadequacies for managing exploratory situations. This article is based on a longitudinal of two case-studies into a collaborative management research conducted with a major French car manufacturer. The two case-studies are an inter-firm EP corresponding to the joint exploration of an innovative multimodal urban platform by the automotive firm and two other industrial partners and an intra-firm EP aiming at generating innovative projects for the development of the electric vehicles.

We propose an *expansive value management model* (EVM) towards three main propositions: 1) evaluating and stimulating the creation of value with a constant comparison with the dominant designs - (2) sustaining the exploration by tuning the degree of undecidability - (3) stimulating the emergence of new ecosystems by the creation of new platforms projects. Finally, this research proposes key managerial principles for EP management and a set of indicators to monitor the exploration process (i.e. identifying design rules to break, managing two kind of design paths…) and the collective dimension (i.e. the beneficiaries…) of EP.

Keyword: value management, exploration, radical innovation, exploratory projects, creativity, dominant design

INTRODUCTION, PLAN AND OBJECTIVE

The Exploratory Projects

Successful exploration projects (EP) are essential for ensuring renewal, competitive advantage and long-term growth of organizations (March, 1991). Exploration is often reported as important activities that enable firms to build new competences that will increase their innovation capabilities. Instead of only focusing on the development of efficient and short-term innovation products, it has been argued that firms must also move beyond local search in order to access distant and unfamiliar knowledge and competences. The capacity of exploring future opportunities and challenging the dominant design is argued to be at the source of the future development of product innovation differing radically from competitors (Abernathy & Utterback, 1978; O'Connor, 2008; Utterback & Abernathy, 1975; Utterback, 1994). Exploring new areas of knowledge offer great opportunities to shift to new technological trajectories that could even create entirely new markets (Benner & Tushman, 2003). However, face to these uncertain projects where great space is given to experimentation and learning (Sylvain Lenfle, 2011; Loch, DeMeyer, & Pich, 2006; Lynn, Morone, & Paulson, 1996), managers and scholars are still in search of processes, organizational structures and operational instrumentations to better guide the evolution of such project. In the literature of innovation management, scholars show that EP requires management principles that are substantially different from those involved in more routinized projects. Due to their high level of uncertainty, their long cycle times and the lack of information, a major recommendation is to avoid monitoring the performance of explorative projects with traditional quantitative criteria such as financial tools like discounted cash flow and net present value (Paulson, O'Connor, & Robeson, 2007). Instead, specific management control approaches that focus on the team capacities to identify possible damages of unforeseen uncertainties, to learn and to redirect projects are favored (Leifer, O'Connor, Rice, & O'Connoer, 2001; Loch, Solt, & Bailey, 2007). Along the same line, (Chiesa, Frattini, Lamberti, & Noci, 2009), based on (Simons, 1994), underline that managers do not control exploration process such as activities of concept generation with standardized procedures but they rather continuously discuss the corporate value and missions of the organizations in order to properly frame the creative process.

Several authors show that the knowledge searched during exploration activities are more or less distant from firms' core-activities and expertise (Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001): firms may be involved in more or less unknown territory. We label EP to define projects that start whereas the outcome to deliver is unknown (or at least partially non-defined). At the beginning of an EP, actors do not know what the nature of their activities would be, they do not know what are the technological, commercial or even societal aspects to explore and with whom to collaborate. Contrary to the traditional new product development projects, participants of EP are not directly in charge of developing new commercial products but rather, their objective is to explore the opportunities of broad innovation fields in order to increase their disruptive innovation capability (Gillier, Piat, Roussel, & Truchot, 2010; A. Hatchuel, Le Masson, & Weil, 2001). This organizational capability has been defined by (Assink, 2006) as a particular dynamic capability that manage "the internal driving energy to generate and explore radical new ideas and concepts, to experiment with solutions for potential opportunity patterns detected in the market's white space and to develop them into marketable and effective innovations, leveraging internal and external resources and competencies" (p.219).

Most of the time, exploration is claimed to occur during the early phase of the innovation projects (Khurana & Rosenthal, 1998; Reid & de Brentani, 2004), but, over the last five years, such open innovation projects gain crucial attention from scholars who suggest that

exploration activities are not only the first steps of a project but that they can be an entire project with specific resources and activities, intermediary and final results (Armand Hatchuel, Le Masson, & Weil, 2005; Le Masson, Weil, & Hatchuel, 2010; S. Lenfle, 2008; Sylvain Lenfle, 2012; McGrath, 2001; Sutton & Hargadon, 1996). (Danneels, 2002) designated as "pure exploration", the innovation process under which the outcome is not a commercial product but a tool to build new competences relating to both customers and technologies. In our view, EP is great opportunities to develop the "second-order competences" conceptualized by (Danneels, 2012). Indeed, EP permits to develop "the competence to build new competences" (p.519) which would be the generator of future innovations. (S. Lenfle, 2008) carried out a research on a European automobile manufacturer and he showed how EP destabilizes the traditional models of project management. In an alliance context between the automobile manufacturer Renault and Nissan, (Segrestin, 2006) points out the difficulties of exploratory partnerships to simultaneously manage cohesion and coordination issues. In the same vein, based on an exploratory partnership constituted by members coming from different horizons, with different economic interests, (Gillier, Kazakci, & Piat, 2012; Gillier et al., 2010) formulate theoretical frameworks and specific management tools to collaboratively manage broad innovation fields. In a French technological cluster specialized in health, (Agogué, Le Masson, & Robinson, 2012) highlight the crucial role of an "un-locking" actor who is able to manage exploration processes and to suggest new conceptual expansions for an industry.

However, although the exploration process is reported as a key element of radical innovation, very few attempts aim to investigate the exploration process in itself. Although most research recommend to correctly balance the exploitation and exploration activities (O'Reilly & Tushman, 2004), the exploration process is still much less understood than exploitation activities. We concur with (Dunne & Dougherty, 2010) on the fact that, instead of examining processes of exploration in details, most of research focuses on outcomes such as patents or new commercialized products. Unfortunately, these outcomes do not systematically indicate the nature of the process itself: exploratory processes may sometimes result in incremental innovation, while exploitative processes may lead to radical innovation. Still, except few research (Elmquist & Le Masson, 2009; Armand Hatchuel et al., 2005), very few recommendations are provided to evaluate and control this specific type of project, dedicated tools and frameworks are still required.

Objective and research questions: investigating the Value Management in Exploratory Projects

This article aims to deepen our theoretical and practical knowledge about the way to control EP. But, what needs to be controlled in exploration? What needs to be managed and measured? What is important in exploration process? These basic questions first imply to shed light on what constitutes *the value of EP*. We focus our literature review on a famous management project practice: *the Value Management (VM)*. Developed in the early 50's from the field of value engineering and value analysis in order to optimize the design and manufacturing process (Dell'Isola, 1966; Jones, 1963; Miles, 1961; Zimmerman & Hart, 1982), value-driven project methodologies are now largely deployed in numerous industries like construction (Bowen, Edwards, Cattell, & Jay, 2010; Male, Kelly, Gronqvist, & Graham, 2007; Naaranoja, Haapalainen, & Lonka, 2007) and they are validated by several international standards (AS/NZS 4183, 1994; SAVE, 1998). However, even if much research shows that applying the previous VM principles could be successful to manage "hard" projects (Crawford, 2004) (or "well-defined" projects), research results are more nuanced regarding the implementation of VM in "soft" projects (or "wicked" projects) such as the strategic elaboration of programme or the early stages of building design (Green, 1997; M. Thiry,

2001). In consequence, new VM methodologies and practices are proposed since mid-90's. This second movement points out two critical aspects of VM for project management: some projects create new value that could not be analyzed before the project starts - the value cannot be only calculated in terms of economic or business value but may cover several other forms (ethical value, ecological value, strategic value…). However, the differences between the "hard" VM methods (Dell'Isola, 1966; Jones, 1963; Miles, 1961; Zimmerman & Hart, 1982) and the "soft" VM methods (Green, 1994; Male et al., 2007; M. Thiry, 2001) are not completely obvious and lead to several polemics in the literature (see for example, the debate between (Ellis, Corresponding, & Keel, 2005) and (Green & Liu, 2007)). In short, the "soft" VM techniques seems to be only useful for the early stage of projects, then, gradually, the "soft" VM merged with "hard" VM. The "soft" projects are progressively transformed into "harder" ones. Particularly, "soft" VM largely use the "functional language" of "hard" VM tools and techniques (see for instance, the SMART methodology proposed by (Green, 1992) or (M. Thiry, 2001) who claimed that "Functional analysis (is a) `frame of reference'" (p74) for "soft" projects). So, does a VM model exist for an extremely "soft" project like EP? In this paper, we positively answer the question and we defend the idea that this specific type of projects required a radically different management model from "hard" and "soft" VM: we propose the *Expansive Value Management* model (EVM).

In order to clarify the model of VM in exploration, our research investigates the three following sub-research questions:

1) In EP, *what* is the value to be managed?
2) In EP, *for whom* is the value to be managed?
3) In EP, *how* is the value to be managed and what are the appropriate indicators?

Plan of the research

The plan of the article is the following:

In section II, we first take a critical review of "hard" and "soft" VM in the project management literature. We stress the fact that the "hard" VM and, more surprisingly, the "soft" VM are both problematic for managing the value of EP for the same reason: the two VM models are applied in a stable-design regime perspective (Le Masson et al., 2010). Under conditions of stable-design regime, managing the value of a project is quite easy because the project attributes, the tasks, the timetable or the necessary resources are well known. In this case, a successful VM project would organize the progressive convergence of stakeholders' interests and tasks in order to deliver the maximum value. We claim that VM for EP cannot emerge from the stable-design regimes aiming to optimize solutions but it requires a new management model based on innovative-design regimes. VM have to work in situations where the "target value" is unknown at the outset.

In section III, we introduce the *Expansive Value Management* model (EVM) towards three main propositions: (1) evaluating and stimulating the creation of value with a constant comparison with the dominant designs - (2) sustaining the exploration by tuning the degree of *undecidability* - (3) stimulating the emergence of new ecosystems by the creation of new platforms projects.

In section IV, the two case-studies and our research methodology are introduced (Einsenhardt, 1989; Yin, 1990). We conduct a collaborative management research (David & Hatchuel, 2008) at Renault, a major French car manufacturer. We present two case-studies: an intra-firm EP aiming at generating innovative projects for the development of the electric vehicle, the "Low Carbon Emission Mobility" project (*LCEM case study*) and an inter-firm EP corresponding to the joint exploration of an innovative multimodal urban platform by Renault

and two other industrial partners, the "Urban and Intermodal Platform optimized in Energy" project (*UIPE case study*)
In section V, the results are discussed and interpreted and the *expansive value-management model* is introduced. This interpretation is translated into managerial principles. In section VI, we address the limits of this research and further researcher perspectives are discussed.

CRITICAL REVIEW OF THE LITERATURE: THE CRISIS OF VALUE MANAGEMENT IN EXPLORATORY PROJECTS

The "hard" VM: Converging toward solutions by the clarification of the design and manufacturing process

The root of VM can be found in the development of value analysis (also called value engineering) occurring during the mass production context of WWII. In the literature of VM, this philosophy is often referred as the "hard" VM paradigm (Dell'Isola, 1966; Jones, 1963; Miles, 1961; Zimmerman & Hart, 1982). In 50's, Lawrence D. Miles, a purchase engineer at General Electric, formulates the premise of value engineering (Miles, 1961). In his seminal book entitled "Techniques of Value Analysis and Engineering", his multiple steps methodology called "Job Plan" is presented: 1- information searching: clarification of the mission – benchmark and state of art ; 2- analysis: analysis of the primary and secondary functions and their associated cost and commercial value ; 3- creativity : generation of alternative ways to improve value and to meet functional requirements ; 4- judgment: evaluation of the performance and the cost-saving of all the alternatives. ; 5- development planning: identification of tasks and actions required to reach the final value. The "Job Plan" is exemplified on various case studies such as the manufacturing of a temperature control, a metal strip hinge or an X-ray equipment. According to Miles, VM is successful if the "product or service has appropriate performance and cost" (p.5). Miles' methodology is a systematic methodology to develop and compare alternatives in order to deliver the most satisfying solution to a predetermined problem. According to the author, studies may be carried out only after that the problem is correctly defined and required the prior investigation of these five questions: "What is the item or service? What does it cost? What does it do? What else would do the job? What would be that alternative cost?" (p. 18).
In Miles view, managing the value mainly consists in managing the relationships between the function and the cost: the valuable solutions are those which fulfill functions at the lowest cost. Value analysis is still today one of the most popular tools in engineering and manufacturing communities. A lot of methodologies have been proposed in order to correctly identify what the customer wants (e.g. functional analysis system techniques), to eliminate all the unnecessary costs (e.g. cost analysis methodologies) or to compare several alternatives with multicriteria analysis methodologies.

The "soft" VM: converging toward solutions by the clarification of the stakeholders' expectations

Arguing that strictly applying the basic Miles' conception of VM is not sufficient for "soft" project characterized by unclear and intangible goals, the involvement of multiple stakeholders and the exploration of several complex alternatives, (Green, 1997) claim that VM is undergoing a "Kuhnian paradigm shift" and a new wave of VM techniques has been proposed. For (Green, 1997), "*The traditional literature on Value Engineering (e.g., Dell'Isola, 1982; Miles, 1972) invariably assumes that design problems are both well-defined and static over time. Clients are further assumed to be unitary in nature and able to articulate objectives which are both consistent and transitive.*" (p20) and he concluded: "*The concept of optimization is seen to be entirely inappropriate for the multi-perspective human problem*

situations which characterize the early stages of building design. This is particularly true for multi-faceted clients." (p20).

From a planning activity and positivist philosophy promoted by "hard" VM, VM methodologies progressively shift to a more social constructivist activity emphasizing the inter-subjective creation of knowledge. In this second perspective, VM was mainly used to manage a social process that monitors the progressive convergence of the multiple stakeholders about what constitutes the value and the outcomes of the project. In this perspective, VM was no more the exclusivity of engineering teams in R&D and final customers but it must take into account the needs and expectations of many other people such as internal stakeholders (Marketing, R&D, strategy department…), external partners (distributors, suppliers..) and even employees. Progressively, the VM literature evolved beyond engineering product development toward a more holistic and upstream approach such as strategic project management, early briefing phase of building project or programme management (Ellis et al., 2005; Michel Thiry, 2002; Yu, Shen, Kelly, & Hunter, 2005).

(Green, 1992) proposes this definition: "*Value management is concerned with defining what 'value' means to a client within a particular context. This is achieved by bringing the project stakeholders together and producing a clear statement of the project's objectives. Value for money can then be achieved by ensuring that design solutions evolve in accordance with the agreed objectives. In essence, value management is concerned with the 'what', rather than the 'how'*".

(Green, 1992, 1994) proposed the SMART methodology that permits key project stakeholders to ensure the development of a shared understanding of the project objectives. This methodology aims to prioritize the project objectives and needs in order to assure that the decisions regarding the project (solutions, ideas…) would be accepted by all during the projects life-cycle. Along this line, (M. Thiry, 2001) pointed out the essential process of sensemaking during VM workshops to assure a continuous awareness of value by the stakeholders. He claimed that sufficient time must be allocated so that stakeholders can make sense of their common problems, discuss personal cues of a situation, and construct shared view of the situation and of the different alternatives to pursue. (Liu & Leung, 2002) propose a VM model for soft system where the final target is achieved through several interactions between the customers and the team members. They claim that VM must focus greater attention on the phase of team goal definition by explicitly clarifying the clients and participant's values and goals. They argue that taking time to specify the project goal will increase participant commitment and satisfaction. The model is structured on a loop system of five components: input-values-goal-actions-outcomes. (Douglas & Lubbe, 2006) used this model for the management of corporate travel. In order to reduce the divergence of interests during the project, several authors propose to improve the briefing phase where the customers' requirements are collected. (Yu et al., 2005) propose a value management framework in order to systematically identify and formulate the customer requirements. They identify 13 variables that have strong influence on the briefing process. In order to manage the collaboration between stakeholders, (Luo, Shen, Fan, & Xue, 2011) propose a group decision support system that could increase the customers participation in the clarification of requirements, ideas generation and selection.

Limits and inconsistencies of "hard" and "soft" VM for Exploratory Projects: from stable to innovative design regime

In spite of the important differences described above, our careful analysis of literature stresses the fact that both "soft" and "hard" VM, however, share a major assumption: the two latter VM models are thought within a stable-design regime perspective. In a stable-design regime,

VM is deployed from the moment when one knows quite well: what is the outcome to deliver ("the object") and who are the stakeholders ("the actors") to involve in the project.
Indeed, in "hard" VM perspective, VM is conceptualized as a planning activity that could be decomposed of two distinct phases: a phase of problem definition and a phase of problem solving and tasks execution. At the start of VM workshops, the final target has to be defined the clearest possible. The description of the product or service (i.e. its functional and technical analysis) and the description of the customers' value (i.e. what the customer wants) have to be precisely formulated. Once the need or the objective to attain is known, then value analysis provides "an ordered way for selecting the best among the alternative system which could fullfil" (Liu & Leung, 2002). ***In this version of "VM", the execution of the efficient VM methodologies and techniques requires to previously clarify what is the "object" (final product, service…) to produce at the end of the project. An effective "hard" VM is a process that generates the same value that was analyzed at the beginning of the project.***
In "soft" VM perspective, VM is conceptualized in a more social constructivist activity emphasizing the inter-subjective creation of knowledge through which the problem and the solution evolve together. These social aspects are often symbolized by the first step of project, the briefing phase, during which the different stakeholders meet together, explain to each other what their respective priorities are in the hope to find a common scope of value and final target. Although, "soft" VM argue for the involvement of all the stakeholders and not only the final customers, one also assumes that the value to manage is knowledgeable. "Soft" VM proposes successful methodologies and techniques in order to enable the different participants to quickly agree on the definition of common value. ***In this version of "VM", the execution of the efficient VM methodologies and techniques requires to previously clarify who are the "actors" to involve in the project. An effective "soft" VM is a process that generates the value for the actors who was identified at the beginning of the project.***

According to us, "hard" and "soft" VM aim to reduce the uncertainties and ambiguities and aim to organize the progressive convergence of stakeholders' interests and work process in order to deliver the best value for all stakeholders. For these two models of VM, managing the value aims to reduce the level of uncertainties regarding "the object" and "the actors". Generally, the set of techniques and methodologies of VM aim to eliminate unknown by choosing the best mastered technologies and processes at the lowest cost and by identifying the best commercial customers. Even "soft" VM techniques such as the SMART methodology aim to "establish clear project objectives and to ensure that they are understood by all parties" as soon as possible. Although the "soft" VM better accepts the "openness", it is still assumed that the uncertainty (for instance, due to conflicts between stakeholders) would be eliminated later. Finally, once the "object" and "actors" are approved, the "soft" VM process is progressively transformed into a "harder" VM process with the use of traditional value engineering concept and tools (functional analysis, cost analysis…).
Unfortunately, these two conditions of stability regarding the "object" (i.e. what is the value to manage) and the "actors" (i.e. for whom the value is managed) are inconceivable in the case of EP. As said previously, at the beginning of EP, the valuable "object" and "actors" to manage are unknown. Once one knows what is the value to deliver and for whom, by definition, the exploration process is over. Fundamentally and theoretically, we claim that managing the value of exploration process with the principles of the two traditional VM progressively lead to turn exploration into an exploitation process and ultimately, to make the exploration disappears. Contrary to traditional VM approaches where exploration is seen as the quick inception of a project like the briefing phase, we claim that exploration activities are not only the first steps of a project but are an entire project with specific resources, intermediary steps and final results.

In EP, because one does not know the final outcome to achieve, the situation of exploration does not permit us to either deduce the appropriate tasks, actions and steps to follow as suggested in "hard" VM, or to deduce the missing competences and the right stakeholders as indicated in "soft" VM. Managing value in EP cannot be considered as a prescriptive activity obtained by a prior analysis of a product or an existing system; the "track" to follow cannot be planned in advance. Rather than controlling the tasks, the schedule, the responsibilities, which will be necessary for converging toward the expected final value, we claim that VM exploration process requires methods and techniques grounded on a radically different logic (see table 1). In the next section, the Expansive Value Management Framework is introduced.

	Main focus	Underlying theories	Boundary assumptions	Assumptions challenged by Exploratory Projects
"Hard" VM	How to deliver the value?	Decision theory of Problem solving and search (Simon, 1973)	VM is applied within the conditions of stable-design regime : The problem, the object and the stakeholders are known. The value of the final solution is known at the outset.	VM in innovation-design regime : ✓ The deliverables are unknown ✓ The valuable assets are unknown (no commercial value...) ✓ The list of beneficiaries (customers, stakeholders…) is unknown.
"Soft" VM	What is the value for the stakeholders?	Organizational theory of Sensemaking (Weick, 1995)		

Table 1: The basic assumptions and challenges of Hard and Soft VM

GENERAL OVERVIEW OF THE EXPANSIVE VALUE MANAGEMENT FRAMEWORK

Proposition 1: managing value toward a continuous comparison with the dominant design

In EP, as argued by (Le Masson et al., 2010), the value does not refer to a final product or to a specific solution but more broadly to an innovation field. An innovation field could be defined as a broad area in which an organization aims to carry out innovative activities by expanding an initial concept and its associated knowledge base. The authors suggest assessing the quality of an innovation field by examining:

> *"Concepts that, after development, become commercial products ; Concepts that have been explored but adjourned due to lack of time or resources. ; New knowledge that has been used during the exploration and can be reused on other products (e.g. components, technical solutions, new uses, and so on) ; New knowledge that has not been used during the exploration but can be useful for other products."* cited by (S. Lenfle, 2008) (p. 473).

Although this framework clarifies how evaluate the exploratory projects, it still need research to better control the exploratory process in a valuable way. How can one know if one advances in the "good" direction? What are the reasons for deciding which concepts and knowledge are suitable to focus on? How can we control such chaotic processes? Basically, in "soft" and "hard" projects, the actors monitor and adjust their action in accordance to the final

goal to reach (most of time, this goal is the expected final product or services to deliver). The successful "hard and soft" projects are those that minimize the deviations by delivering what was originally defined and accepted by the customers and stakeholders. In EP, we also find this kind of deviation but in a specific way: because the expected final state is unknown, actors do not adjust their process to a final state to reach but they adjust their process with the initial state to change. More precisely, they guide their actions and monitor their advancement in comparison with the dominant design to struggle (Abernathy & Utterback, 1978; Utterback & Abernathy, 1975; Utterback, 1994). According to our model, face to the choice between two or more alternatives, the actors should give the priority, as much as possible, to the alternatives that aims to break the dominant design and to create new ones.

Proposition 2: managing value by tuning the degree of undecidability

A common hypothesis in innovation literature such as NPD is that the uncertainty (i.e. lack of information) and the ambiguity (i.e. existence of different interpretations of a same piece of information) have to be reduced in order to provide clarity and efficiency. In EP, managing the value does not aim to reduce the uncertainties and ambiguities but, quite the contrary, it implies to continuously invest the unknown by preserving areas of uncertainties and ambiguities during the project. Uncertainties and ambiguities are no more considered as a risk to avoid but, on the contrary, project members should endeavor to invest it in a structured way. This key finding is quite similar with recent research provided by (E. Brun, 2011; Eric Brun & Saetre, 2009; Gutiérrez, 2011) who emphasize the importance of ambiguity and equivocality in the upstream activities of innovation. This second proposition is also in line with the notion of "undecidability"[1] incorporated in the Concept-Knowledge theory of innovation (A. Hatchuel & Weil, 2002, 2009). During all the EP, a high level of ambiguities and uncertainties should be preserved: once uncertainty and ambiguity are reduced on a certain dimension, new possibilities of exploration must be opened in another dimension of the innovation field. Practically speaking, such "undecidability" state could be maintained by, on the one hand, generating and maintaining a high and various scope of concepts (new ideas…), and, on the other hand, generating and maintaining a high and various scope of design capabilities (knowledge, skills required for the implementation of the concepts...). Note that, disequilibrium between these two scopes would negatively lead to the two usual symptoms of "creative" projects. In one hand, if the EP is managed in such way that it generates too much concepts compared to knowledge, the project would "stay in the air": the results of the EP would be too conceptual and impossible to make it real. On the other hand, if too much knowledge is generated compared to concept, the degree of exploration would progressively disappear: no disruptive innovation could be launch in the future and the actors would stay in their "comfort" zone.

In EP, the level of undecidability is a fruitful piece of evidence that the direction undertaken could possibly lead to the generation of various disruptive concepts and the creation of new and surprising learning. Undecidability, by definition, prevents stopping the exploration process: actors must learn new knowledge to say if it is worth continuing or not. Besides, the ambiguity does not necessarily induce a critical lack of clarity. Most of the time, it is very clear for the actors that they do not have the same interpretations of a same concept but they just continue to "play with this ambiguity" to learn of each other. They do not unify their view but they try to understand each actor's interpretations in order to stimulate learning toward unfamiliar areas.

[1] The authors emphasize the importance of undecidability in innovation. Undecidable propositions like new ideas cannot be rejected or accepted with respected to designer's knowledge. Such propositions are unknown and need to be explored.

Proposition 3: managing value for stimulating the emergence of new ecosystems

Our third contribution concerns the beneficiaries of the value generated by the EP. The value is not only provided to the final customers and the stakeholders involved in the project, the EP creates value for the subjacent ecosystems in emergence. Indeed, the value may be absorbed by the contributors of the project but, more surprisingly, the results of an EP may also stimulate external actors who would independently launch their own project. Because that the value of an EP is not limited to a solution of commercial product or service, actors can interpret differently the value generated by the EP. The innovation field may generate different values for different people. When the potential values of the exploration by EP team are communicated, they emulated also initiatives from external actors outside the scope of the project. EP project appears as a kind of activator of emergent ecosystems.

This proposition highlights the fact that leaders of EP build the social dimension of the innovation field in the same time they are designing it. Regarding social theory, in contrast to the Actor Network Theory **(Akrich, Callon, & Latour, 2002)** that emphasize that the number of alliés is a critical factor for the diffusion of innovation, it is interesting to notice that the number of alliés is not sufficient for evaluating EP. EP must also attract a high number of heterogeneous alliés. Heterogeneous alliés would permit to enlarge the scope of potential value.

RESEARCH METHODOLOGY

Methodological framework: collaboration research and case studies

The research methodology adopted is a collaborative research (Shani, Coghlan, & Coughlan, 2008) carried out by academics and practitioners that aims to link theoretical gaps with problems encountered by firms. This kind of research is well acknowledged to open possibilities of mutual learning between these two social worlds. The research follows the main principles of intervention research that aims to produce actionable knowledge for practitioners and to create new scientific models (Argyris, 1993; David & Hatchuel, 2008; Lewin, 1946). Intervention research is particularly recommended for research whose objective is not statistically to validate existing theories but rather to revise existing theoretical models and to formulate new ones. Furthermore, this research is based on cases-studies (Einsenhardt, 1989; Yin, 1990). In management science, qualitative research is particularly justified to lead in-depth and comprehensive examination of complex and dynamic phenomena; such is the case for the exploration processes. As said previously, EP is still poorly investigated. In this research, two contrasting case-studies (intra-firm / inter-firm) are investigated and discussed.

Based on the work of (S. Lenfle, 2008), these two case-studies can truly be qualified as “Exploration Projects”. Indeed, they meet four major criteria: at the outset of the two projects (1) the final result to achieve was fuzzy, participants did not know exactly the outcome to produce. The projects do not aim to develop a new product but rather to explore a broad innovation field. (2) The tasks and activities to be done were not exactly known in advance but they were vague and ambiguous, several alternatives were imaginable. (3) The target value was also unclear: partners do not really know who would be the “customer” of such project – not any market was identified. (4) A central role was given to experimentation and learning. The two projects mainly aim to learn about various and unfamiliar areas of knowledge, skills and competences for the firms (see annex for further details).

The data was collected by two of the three authors (one academic and one practitioner) who were involved as active members in the two projects. Their deep implication in the empirical field permits to collect rich materials about how the value has been managed. For instance, information regarding the generation of ideas, the knowledge management (learning, identification of knowledge…), the decision-making process (preference of partners, choice

of the knowledge to investigate, judgment of intermediate results…) or the group dynamic has been gathered. The third author of this research, who was not engaged in the empirical fields, was in charge to manage the data analysis process with his two co-authors.

Description of the two case-studies from Renault Corporation

An intra-firm exploratory project: "Low Carbon Emission Mobility" (LCEM)

The first EP observed was led in Renault between December 2010 and November 2011. As with many firms in this industrial sector, environmental policies had compelled the company to actively look for new technologies and business models for vehicles with low carbon emissions. Despite the fact that the firm was already involved in many projects of research and advanced engineering on this topic, top-management decided in 2010 to launch an EP in order to forecast and structure new long-term strategic domain of learning for the Research Department. The official purpose of the project, as it was communicated inside the firm, was to identify competitive targets for 2030 on low carbon emissions mobility and to propose a roadmap of learning and innovation projects based on electric vehicles' technologies or uses.

The initiative was held by a manager of the Research department, who was in charge to build and manage a cross-functional workgroup of a dozen of experts from engineering, services and foresight departments. The EP team was restricted to firm's boundaries for strategic reasons but was very cross-functional in order to gather most of the potential contribution of front-end knowledge and foresight from firm's various activities. The main task was firstly to benchmark and describe the state of the art (existing products, technologies, mobility and energy facilities …) regarding low carbon emissions mobility inside or outside the automotive industry. Second, the team made an inventory of former and on-going projects managed by the firm. At the same time, they built a systematic inventory of the relevant criteria to assess or compare the performance of potential technologies, business models or services for low carbon mobility devices.

This knowledge was shared and represented by the formulation of design paths during three workshops of 4 hours. The main design paths were: 1/ transporting more low carbon energy in the mobility device; 2/ gaining energy during the journey of the mobility device; 3/ Supporting fluid intermodality with electric vehicles. Relying on this structure of the EP's playing field, they conducted three other workshops in order to deep these pathways and identify alternative creative design paths with the ones they identified as the mainstream of the automotive industry. These workshops have been managed with a design methodology specifically developed for the exploration process (Hooge, Agogué, & Gillier, 2012). Finally, they assessed the level of competitiveness of the firm on each potential design path and selected a short list of few design paths to build the roadmap.

As the target of the project was conceptual and large, the team members did not know what they were looking for and the first three workshops were mainly focus on debating what a 2030 strategy on low carbon mobility meant for their firm. To do it, they investigated very different domains of knowledge such as technologies and services, markets and business models, contemporary uses and societal trends. Often, the exploration was very large and unfocused; the project leader had to reassure the members who felt lost. His arguments were many, but he mostly insisted on the fact that the modeling of the actual knowledge regarding low-carbon mobility was already a result for the firm; he claimed that this knowledge could be reused and shared for other activities. The team leader continuously repeated that the LCEM project was an exploratory one and that it was absolutely normal to diverge as the target was unclear. Similarly, the final selection of a few design paths was aiming to acquire the most generic knowledge, with potentially larger positive impacts on the learning than the development of the innovative concept that the led them.

Few months after the end of the EP project (November 2011), several feedbacks could be given on the EP. First, the project has been positively valued within the Research Department: a second step of the exploration has been allocated until 2013 and the project leader has been given a wider scope of investigation on Electric Vehicle research. One year later, design paths' explorations are still under process with heterogeneous dynamics. The classical New Product Development process of the firm had absorbed some of them, while other design paths were redefined or appeared, requiring more investigations. The involvement of initial workgroup members was still strong but spread on the paths where they expected the most feedbacks for their own activity. Nevertheless, the common sharing of the whole roadmap sped greatly and over time the interactions across each exploration. At last, some parts of the second step of the EP had been opened to industrial partners from Energy and Highway industries, in order to build synergic roadmap of research.

An inter-firm exploratory project: “Urban and Intermodal Platform optimized in Energy” (UIPE)

The second EP emerged in a cross-industry think tank, The Renault’s Innovation Community, on future mobility and innovation practices. This community is composed of most than 90 representatives from industrials groups, consulting firms, forecasters and academics. They have been meeting in quarterly sessions since 2008. In 2010, representatives of three large French firms — the carmaker Renault, the public transportation operator RATP and the energy provider EDF — decided to collaboratively work on same issues regarding the aspects of mobility in green city. At the outset, the value of the project was really unknown; the project was not supported by any final market. The main purpose was to share ideas and to discuss the societal requirements about mobility and energy such as the dense house development vs. urban sprawl, the ageing of people, infrastructure congestion (road, bus…), the local air pollution, the scarcity of parking, etc. in order to image new services, products and infrastructures. More precisely, the interactions between the members aimed to develop a common vision of an urban platform in order that each firm could contribute with its resources, services and products - energy network, public transportation (bus, metro, trains and trams), and cars - .

After few months of discussion and debating, they converged on an approximate definition of what could be the elements of a mid-term multimodal urban platform. At this time, the project became official under the name of "Urban and Intermodal Platform optimized in Energy" (UIPE project). To go further in sizing the energy flows, the three partners signed a collaboration agreement to be able to found a consultant firm specialized in energy auditing and carbon footprint estimations. While working together on energy flows regarding the consummation of transportation (bus, metro, trains, trams, cars) and the efficiency of sustainable technologies, they discovered unexpected valuable elements of interface that conduct them to explore new potential fields of value, and relevant innovative partnerships. Finally, the project led to a virtual prototype of the UIPE, which simulate the different flows of energy according to several variables as *e.g.* the time of the day, influx of individuals or mobiles, and renewable energy production and consumption. The deliverable was largely communicated in the 3 firms in order to sensitize their staff to this new vision and to train them to the diversity of nowadays energy flows and perspectives. Furthermore, project members also use it to support new partnerships achievement on the topic, including innovative partners as e.g. local authorities, in order to build a network of stakeholders whose aiming this kind of platform comes true.

INTERPRETATION OF THE RESULTS: FORMULATION OF MANAGEMENT PRINCIPLES OF THE EXPANSIVE VALUE MANAGEMENT MODEL

5.1. Sharing the dominant design and the main design rules to break

In the two case-studies, the EP was initially formulated as a broad innovation field. The formulation of the innovation field was the topic of extensive discussions: actors freely expose their respective interests and expectations. They discuss about the possible technologies, the business models, the functionalities and services, and the expected customer values that could be covered. These early discussions often highlight a specific type of design-path that we labeled as *bottleneck design-paths*. Bottleneck design-paths were the traditional solutions, knowledge and competences that had been or were already carried out by the organizations. Often, such design-paths were often close to the dominant design, they were a kind of good synthesis of the major beliefs and traditional challenges met by the organizations. Because such projects were already well investigated in the organizations by a large number of people, they decide not to pursue in such directions and find quite more deviant design-paths. However, even if such bottleneck design-paths were abandoned, their emergence enables actors to agree on what were the baseline and the main dominant designs to break.

5.2. Exploring the "value-to-explore" by managing two types of design-paths

Progressively, from these discussions emerged the *values-to-explore*. The values-to-explore were very fruitful spaces of learning where actors could challenge some of the dominant designs, beliefs and assumptions discussed previously. These values-to-explore were still very abstract; each actors could had a different representations of the potential results of the exploration. From these values-to-explore, many creative proposals were generated and clustered in several design-paths. We observed that this ideation process was not a random process but quite well controlled. Indeed, once expressed, the design-paths were quite systematically confronted to the dominant design and the bottleneck design-paths. For each of the design-paths, the gap with the actual dominant designs and today firms' know-how was reported. Such confrontation provides a global overview of the possibilities of gradual renewal of the dominant design. The actors classified the design paths depending on the number and the variety of the classic design rules they break and on the effort of learning they necessitate. Two main categories of design path were formed and simultaneously managed: the *crazy design-paths* and the *achievable design-paths*. Each of these types of design-path implies a very specific form of VM.

<u>The value of the "crazy" design-paths: a pretext to learn new knowledge for renewing innovation capabilities</u>

The crazy design-paths were the most disruptive ideas that greatly challenged the organizations. They were perceived as great potential sources of value creation, but, of course, they were also very hard or almost impossible to reach. Most of the time, the actors do not even know exactly how to make these ideas work. However, although no physical solutions were expected by the actors, these design-paths were not discarded at all. They were opportunities to meet very different people and to access original and heterogeneous knowledge. Indeed, these design-paths were conceptually explored because they provided a specific value: they contribute to the renewal of innovative capabilities. Such design-paths do not aim to provide new solutions, but rather, they help managers to question themselves in order to better formulate their future challenges.

The value of the achievable design-paths

The achievable design-paths were the original and quite feasible ideas in mid-term. These design-path lead to the identification of missing knowledge that was possible to acquire. Typically, actors assumed that such knowledge already exists in their organization or outside and they had often an idea who could be the appropriate experts. These design-paths enable actors to generate valuable solutions. The achievable design-paths results in the production of "intermediary products" that, then, could be developed in a more traditional NPD process.

	LCEM Project	UIPE Project
Innovation field	Low carbon Emissions mobility	Energy and multimodal mobility
Main dominant design	Focus on enlarging the on-board stock of electric energy	Focus on a limited scope of value: speed, size and energy efficiency
e.g. rules to break	• Expectations on Technology progress on Li-Ion battery for Electric vehicles • Automotive paradigm on business model (1 Owner, 1 Driven, 1 vehicle) • Autonomy expectations of drivers • Costs of infrastructure evolutions	• The energy efficiency is managed equipment by equipment • Each transport mode is independent from the others • Each equipment is supplied by an ad hoc energy network
e.g. bottleneck design-paths	• Energy charging on the way and impacts on ageing the stocks • Definition of Mobile Stocks	• Technological limits: weight and cost • Big energy needs for stations • Limited space for infrastructures
e.g. "Values-to-explore" = new rules	• On-way charging • Fluidity of intermodality • Re-insuring of drivers with low carbon emissions devices	• Global traffic and energy optimization. • Heat energy recovery for electrical production. • Self-energy production
e.g. of Crazy design paths	• Highway charging • Unlimited on-board stock of electric energy	• Energy recovery for security lightning by pedestrian walk. • Mini hydraulic power plants based on water leakage recovery
e.g. of Attainable design paths	• Fast charging during a travel • Smart-grid payments	• A new station self-producing a part of its energy needs • Electrical Vehicles to grid

Table 2: Summary of LCEM and UIPE projects

CONCLUSION, LIMITS AND FURTHER RESEARCH

Summary: the Expansive Value Management vs. "Hard" and "Soft" VM

Our analysis shows that EVM is a very different framework to the "hard" or "soft" VM (see Table 3).

First, the nature of value is different. EVM does not evaluate product/service but an innovation field. The evaluation does not consist to measure financial results and the respect of the cost/quality and delay but, more broadly, to assess the contribution of the EP to the firms' innovation capability renewal. More precisely, the evaluation must address the scope of concepts (ideas…) and the design capabilities (new skills, new technologies…) built during the EP. A successful EP is a project that constantly generates a large and various scopes of concepts and that also provides robust design capabilities. In order to better monitor the balance between these two dimensions, we provide new indicators (number of design rules broken, ratio between the number of crazy and attainable design paths…).

Secondly, the ways to manage the value during the project is also different in the case of EP. Instead of minimizing the derivation to the final target, EP have to continuously manage the process in accordance with the initial state and dominant design to break. The actions and decisions taken in an EP should maximize, as much as possible, the challenge of the dominant designs and the creation of new design rules.
Finally, the beneficiaries of EP are not only the customers and the stakeholders, but an EP has an impact for the new ecosystem underlying by the innovation field. Because radical innovation is often associated with large and collaborative movement, a successful EP does not have to generate innovation inside the firms but it must also contribute to the creation of new ecosystems. For that, a good indicator is the nature of the beneficiaries: heterogeneous ones would see different value potential for an innovation field and this would be beneficial to the impetus to the creation of new ecosystems.

<table>
<tr><th colspan="2"></th><th>Hard VM</th><th>Soft VM</th><th>Expansive VM</th></tr>
<tr><td colspan="2">Mission</td><td>Minimizing the risk of « non-value »</td><td>Clarifying the stakeholders value</td><td>Generating new proposals of value</td></tr>
<tr><td colspan="2">What is the value?</td><td colspan="2">Commercial value of goods (product, service...)</td><td>Value of concepts and knowledge of an innovation field</td></tr>
<tr><td colspan="2">Value for whom?</td><td>Value for the customers</td><td>Value extended to the stakeholders</td><td>Value extended to the ecosystem</td></tr>
<tr><td rowspan="6">How to manage the value?</td><td rowspan="3">process</td><td>The target value is identified at the outset</td><td>The target value emerges during the project</td><td>Targets value are renewed during the project</td></tr>
<tr><td>Highly prescriptive</td><td>Moderately prescriptive</td><td>Poorly prescriptive</td></tr>
<tr><td>Managing the conformity of the process with Job Plan

Elimination of unknown at the outset</td><td>Managing the conformity of the process with stakeholders expectations

Progressive elimination of unknown</td><td>Managing derivation with the initial dominant rules

Generation and structuring of the unknown</td></tr>
<tr><td rowspan="2">social</td><td>Stable and cooperative team (clear division of labor)</td><td>Evolutionary and collaborative team</td><td>Heterogeneous and co-creative team</td></tr>
<tr><td>Searching the experts for developing the solution</td><td>Searching the alliés for diffusing the solution</td><td>Searching contributors for creating new ecosystem</td></tr>
<tr><td>Process indicators</td><td colspan="2">VAN, QCD</td><td>- number and variety of dominant design rules broken
- number and variety of new design rules created
- number and variety of knowledge mobilized
- keeping an equilibrium between crazy design-path and achievable design-paths
- number of new projects generated</td></tr>
<tr><td>Social indicators</td><td>Satisfaction of the final customer at the lowest cost</td><td>Satisfaction of the greater number of stakeholders for a same value</td><td>Satisfaction of heterogeneous stakeholders regarding multiple values

- Partnering with unfamiliar partners/ partners not in the traditional value chain</td></tr>
</table>

				- Emergence of Industrial ecosystems for new business models exploitation
	Main tools	Job Plan, Functional approach, Quality Function Deployment, Cost Modeling	Stakeholders analysis, conflict resolution techniques, Group decision support system, SMART	Concept-Knowledge tools
Type of rationality		Expected utility under risk	Subjective expected utility under uncertainty	Rational choice under unknown

Table 3: Main differences between EVM and Hard/Soft VM

Limits and perspectives

This research is supported by two case-studies; however, further research is required to improve the generalizability of the findings. Particularly, the industrial sectors involved in this research (automotive, energy) are both old and mature. Consequently, the existing products and services developed in these industries are supported by old and stable dominant designs. Further research could focus on the management of value in the exploratory projects in emergent industrial sectors with no dominant design (creative industries, biotechnology industries…).

This research proposes recommendations for managing value in exploration process. Especially, new set of indicators based on the notion of design rules are introduced. We emphasize the fact that the value of exploration process can be approached by identifying the design rules that are broken and the new design rules that are created. More studies are needed to validate such proposal, in particular, more knowledge are required to measure what are the optimal ratio to reach for achieving successful exploratory projects. Besides, the process of determination and the evolution of the design rules in these teams must be investigated further: where do the new design rules come from? How can one identify the old ones? How teams do cope for managing multiple and deviant design rules?

This research is to link with a recent movement in the academy that aims to rethink the project management practices in situation of creative and explorative situations. This research opens also new questions regarding the decision making process in situation of unknown. Many theories and algorithms exist for decision making under risk (expected value…) or uncertainty (Savage's minmax regret, Laplace criteria…), very important contributions are wanted for control and decision making theory in the unknown **(Miller, 2007)**.

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ANNEXE

The table below gathers the key features of the two studied project.

	LCEM Project	UIPE project
Characterization of the EP		
Clarity of the target + main concept	Very low - Statement very conceptual and fuzzy	None
Diversity of investigated knowledge	Technologies, bundles of less efficient technologies, contemporary uses of mobility for individuals and professionals, emergent business models, new services, etc.	State of the art of technologies with low energy consumption (for mobility and also for all the need of the platform as heating, air conditioning, lighting, safety and urgency systems), storage and energy recovery systems. Exploration of urban hub services from new door-to-door mobilities to virtual mobility and platform embedded facilities as shops, offices and services to individuals.
Diversity of the means of exploration undertaken by the teams	Detailed analysis of contemporary uses of mobility and description of associated markets, design of scenarios of mobility, simulation of energy consumption, innovative design workshops	Knowledge sharing between partners, industrial visits, energetic design, virtual modeling flows of individuals, mobility devices and energy.
Diversity of explored paths	Broad divergence in the first workgroups. Final road map with three design paths very distinctive	Very high - sometime confusing for members
Characterization of the management of the EP		
Means of identifying the paths to investigate	Knowledge sharing of information from technological, competitive and business intelligence	Common interest of partner to increase their knowledge on every topic they considered as a potential interface between theirs offers of products
Means of assessment of the relevancy of identified design paths	Building of reference scenario based on contemporary mobility uses and available mobile devices. Assessment of the innovativeness of the new design paths by comparison. Debates of workgroup's experts on the potential value for the firm and spontaneous support from other members of the research department (frequent presentation of potential concepts)	Intuition of feasibility of energy recovery - Even the smaller energy flow had been carefully explored
Means of exploration of the potential paths	Strategic watching from workgroup members, availability of skilled resources and innovative partnerships	Autonomous investigation of members followed by frequent sharing and debates
Characterization of the outcomes of the EP		
Nature of the "official" results of the projects	Robust modelling of the innovation field, new representation of individual mobility, proposals of new business models and steps to reach them, identification of relevant partnerships	Virtual prototype of a urban hub of mobility with dynamic visualization of the different flows (individuals, mobiles and energy) - State of the art on energy technologies (low consumption, storage and recovery)
Reuse of generated knowledge in other activities	Large cross-fertilization in the Research department as team members was involved in few other on-going projects. Unexpected impacts on internal combustion engines projects.	UIPE is now either a training tool or a basement for works on the concept of smart cities in the three firms
Identification of unexpected value, killed by traditional Value management process	The EP had demonstrated the relevancy to learn on some services that do not include vehicles	Integration of urban hub facilities and demonstration of their potential benefit impacts on energy
Generation of new projects	First steps of the roadmap on the three design paths became official Research projects.	Extension of UIPE project for city electrical transport planning