Value management for exploration projects

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Abstract

Whereas exploration projects stand as important drivers to renew the assets of the firm and open new business opportunities, it is well recognized that the project evaluation and value management methodologies are likely to kill them. The article provides elements to solve this paradox. We rely on a longitudinal study of three exploration projects and the projects conducted afterwards, in the automotive and space industry. The analysis suggests that the value creation process can be regarded and managed as a dual process of *potential value creation* and *value realization*. The article discusses the linkages with existing practices and theories.

Keywords: project management, exploration projects, project evaluation, innovation, capability building, multi-project management, real-option.

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Introduction

The innovation-based competitive environment has been leading firms to a paradox for project management. On the one hand, they have been continuously streamlining their new product development process, converging to a dominant model of project management (Kerzner, 2013; PMI, 2013). This model put an increasing attention to risk elimination, cost, quality and lead time optimization, focusing on the convergence towards a predefined goal. On the other hand, since firms cannot only rely on such projects to renew their products and competences, a growing stream of literature has been focusing on more breakthrough innovation projects. This type of projects is known as *exploration projects* (Lenfle, 2008) i.e. projects characterized by unforeseeable uncertainties (Loch & al, 2006) for which neither the goals nor the means to attain them are clearly defined from the outset. The exploration projects are therefore expected to stand as a *second order* dynamic capability (Danneels, 2002), allowing the company not only to develop more innovative products (in term of market segment, usage, technology basis, product architecture, business model) than it is used to launch, but also creating new competences and routines that can trigger new business trajectories (Benner & Tushman, 2003). Such projects stand as the crossroad of development projects (focused on rapid and cheap product development) and research projects (focused on knowledge creation).

The generally-agreed tools and management theories proposed several frameworks to better understand and manage this value creation process. The inherited rational approach widely relies on the *ex ante* definition of a given set of performance (price and volume, lead time, customer willingness to pay for a given set of functionalities). These theories hardly

take into account the serendipity required to reevaluate during the project the set of performance settled at the beginning. So the project reaches the objectives or fails, but does not map how it could build on the ongoing experience to redefine its value and its ability to open new business avenues. Even if the capability building approach now clearly identifies the importance of the learning cycle occurring from one project to another, it is right now far from being used in the concrete value management toolbox.

Given this theoretical and empirical issue, the article aims at better understanding the way the value creation process could be better managed in the context of breakthrough exploration projects. To do so, it relies on a multiple case approach, studying on each case: what was the initial expectation of the project, how the company reoriented the project and/or the second generation, what are the assets developed with the initial project and how they helped to make this reorientation to be effective and successful.

This article is organized as follows. Section 1 discusses the literature on project evaluation. Section 2 presents the methodology. Section 3 exposes the cases, which are in turn analyzed in section 4. Section 5 sums up the main theoretical and managerial implications.

1. Literature review

1.1. A theoretical and empirical problem: value management for exploration projects

The project management literature has been following the concrete projects management concerns. Given the increasing innovation-based competition (Brown & Eisenhardt, 1997) projects management attention shifted from development projects (Clark & Fujimoto, 1991) to exploration projects (Lenfle, 2008). And project control concerns shifted from cost control

and traditional value management - such as *earned value* - to a deeper understanding of the strategic value generated through the projects (Brady & Davies, 2004; Shenhar & Dvir, 2007).

In the early 1990s the challenge was to coordinate various organizational units to deliver new products (Clark & Fujimoto, 1991). This progressively conducted to streamline the design processes so they can achieve a good quality-cost-lead time performance. Much of the project management literature has been focusing on how to bridge organizational units in a way that can maximize these performance indicators. This progressively stabilized project management principles (e.g. heavyweight project management, concurrent engineering...) that are now very well known and applied (PMI, 2013).

Recently, this theory building path about project management has been described as putting too much emphasis on control over flexibility (Lenfle & Loch, 2010). First, it is said to have lost the roots of project management which was initially focused on a *design to innovation* management, more than a *design to cost* or design to *quality management*.

Second, it neglects the knowledge creation process which is a key for the long term firm performance. Indeed, projects play a critical role in the competence building dynamic of the firm (Brady & Davies, 2004; Maidique & Zirger, 1985). Within the project-based-organization, it led to a better articulation between project management and the research departments in order to nurture multi-projects learning trajectories.

In this window of opportunity, academics have identified *exploration project* as a good vehicle to feed such a product-competence dynamic. Whereas *research projects* aim at creating new knowledge that will be used afterwards, whereas development projects aim at using existing knowledge to create new products, *exploration projects* target these two objectives in parallel (Lenfle, 2008). Therefore the management of such exploration projects

challenges the dominant model of project management (Kerzner, 2013) which defines project as the convergence toward a predefined goal within budget, quality and time constraints. On the contrary when firms relies on project to manage exploration neither the goals nor the means to attain them are clearly defined from the outset, since "*little existing knowledge applies and the goal is to gain knowledge about an unfamiliar landscape*" (R. McGrath, 2001, p. 120). Therefore the strategy generally evolves during the project and new competences and/or market opportunities frequently appear. Consequently recent research in the project management field has identified specific management principles for exploration projects (Lenfle, 2008; Loch, DeMeyer, & Pich, 2006), and emphasized the crucial role of inter-project learning i.e. the carry-over of knowledge from the first exploratory project to its successors (Brady & Davies, 2004).

One critical issue is the value management philosophy and methodologies that are used before, during and after the project. The economic constraint indeed has been spreading deeper and deeper within project management and more and more upfront in the design process. Decades ago, the R&D budget was unlikely to be questioned about its profitability (Roussel, Saad, & Erickson, 1991). Now, every single R&D project – development project or research project - has to provide elements to evaluate the outcomes of the associated investment. A large body of literature has been focusing on this issue.

1.2. Three approaches for project evaluation and value management

We can package these theories in three schools of thought: the rational approach, the uncertainty reduction approach, and the capability building approach.

The *rational approach* for project evaluation and management has its roots in the postwar development of system analysis (Cleland & King, 1968; Miles, 1972). It is dominant in most

textbooks on project management. This rational approach considers the project as the convergence toward a clearly, *ex-ante* defined goal within specified constraints of cost, quality and time. The techniques of value management (Miles, 1972) help optimizing the definition of the goal. Afterward, during the project, the corresponding methodologies help screening the progression of the planned tasks, and monitoring the *earned value* compared to the initial target. The *ex-ante* evaluation methodologies imported and adapted several tools coming from the finance techniques within the project management toolbox: Return on Investment, Internal Rate of Return, Net Present Value... These methods integrate data about project cost control with data about the customer value of the set of functionalities delivered by the product, expected sales...

While perfectly suited to traditional projects, this rational approach presents important limitations in a context of exploration. There is a wide consensus on the fact that this is likely to kill innovation (Christensen, Kaufman, & Shih, 2008). Exploration projects rarely survive the resource allocation process in large organizations given this set of criteria (Baldwin & Clark, 1994; Bower, 1970; Dougherty & Hardy, 1996). Relying on US historical data, Baldwin and Clark (1994) demonstrate that a rational finance based approach had a systematic and pernicious effect on investment decisions: it caused managers to favour short-term profitability over the creation of capabilities and learning capacity. Thus, as stated by Levinthal & March, exploration is perceived as "*on average unfruitful*" which is damaging in today's competitive environment (Levinthal & March, 1993). The *ex-ante* evaluation of a project is very difficult when neither the costs, nor the revenues can be foreseen with some reasonable probability.

The *uncertainty reduction* approach precisely roots in the critique of the rational approach. To increase the number, the frequency and the objectivity of screening criteria (for instance anticipated ROI, sales previsions...) decreases the project flexibility required to scout and integrate new information during the project. This stands therefore as a factor of learning failure and tends to decrease the product success (Sethi & Iqbal, 2008). In this perspective projects are seen as a process of information acquisition that progressively leads to uncertainty reduction (Klein & Meckling, 1958). Thus one cannot define the result of the project nor the path to reach it beforehand. Therefore the project manager should make "*deliberate effort to keep his program flexible in the early stages of development so that he can take advantage of what he has learned. (…) In order to maintain flexibility he commits resources to development only by stages, reviewing the state of his knowledge at each stage prior to commitments*" (ibid., p. 357). We can recognize here the theoretical foundations of the real option approach which emphasize the fundamental value of project flexibility when confronted with unforeseeable uncertainties (Kester, 1984; Schwartz & Trigeorgis, 2004; Trigeorgis, 1996). This school of thought led to important development both for *ex ante* evaluation of projects and their management (Huchzermeier & Loch, 2001; Schwartz & Trigeorgis, 2004). There is a long tradition of research putting the emphasis on project flexibility and adaptability, in which are rooted contemporary project management processes like DDP - Discovery-Driven Planning - (R. G. McGrath & MacMillan, 1995) or NTCP - Novelty, Technology, Uncertainty, Complexity and Pace - (Shenhar & Dvir, 2007).

The *capability building* approach focuses on the reuse potential of what has been created by a specific project. A project can therefore fail to reach its initial objectives but, nevertheless, produce important concept and/or capability that will prove very useful for

future projects and/or the firm (Keil, McGrath, & Tukiainen, 2009). This widens the rational and uncertainty reduction approach, encompassing the future projects within the first project evaluation. "*When the carryover of learning from one product to another is recognized, it becomes clear that the full measure of a product's impact can only be determined by viewing it in the context of both the products that preceded it and those that followed*" (Maidique & Zirger, 1985). Several authors have confirmed such a multi-project learning track (Brady & Davies, 2004; Le Masson, Weil, & Hatchuel, 2010).

Taking into account this capability building perspective in the evaluation and management tools is far from being easy. Several attempts have been made, including some qualitative variables in the portfolio screening metrics, e.g. "competence building" or "brand impact" (Cooper, Edgett, & Kleinschmidt, 1999). Advanced portfolio approaches proposed to divide the general project portfolio in more homogenous buckets and score them through criteria that are coherent with the firm's strategy to ensure alignment (Cooper et al., 1999; Terwiesch & Ulrich, 2009). The design theory approach insists on the expansion value allowed by the project i.e. its ability to generate new concepts and or new knowledge (Gillier, Hooge, & Piat, 2013). Applying the principal-agent to the project investment decision invites to not only consider the intrinsic performance of the project (kept by the project manager), but also a wider organizational value represented by the project's owner and funder (Zwikael & Smyrk, 2012).

1.3. Literature discussion

Going back to the initial research question "how to better frame and manage the value of exploration projects?" the literature review provides important guidelines and limitations.

The literature helps framing the temporal and analytical scope required to study the value creation mechanisms in the context of exploration projects. We need to look both at the financial direct outcomes of a single project, but also the resources and competences generated through the project. In term of window of evaluation, we need to adopt a multi-project perspective, looking at how the sequence of projects could build on the assets created by the initial project to generate tangible economic advantages.

We so define the value brought by a project as the set of economical advantages within the company that hosted the project, advantages that result from the project, in the sense that would unlikely have occurred without the project.

However, we surprisingly have little elements about how the value is managed across series of project relying on the same concept and/or common competences (what Le Masson & al, 2010 call "lineages" of projects). Speaking about the nature of the value created, most of the literature relies on a "define and run" paradigm, whereas other bodies of literature indicate that the definition of the strategic intent and footprint of the project is one of the main missions of an exploration project. The flexibility in project management is reputed to concern the *how?* The *what?* but not the *why*? The three above presented approaches all consider – explicitly or implicitly - that the value management consists in framing *ex ante* a specific structure of value for the project, and then realizing this value in the most favorable way given the events which happen during the project. The rational approach (value management, NPV…) freezes the composition of the expected cash-flow, and orients the project to make it happen: "this is a process optimization project", "a blockbuster for the Asia", "a low cost service". So the performance of the output is already set in an early DNA of the project. Academics only recently consider the projects as potentially disruptive towards

these screening criteria (Petit, 2012). The real option school of thoughts considers the future probable scenarios in a “decision under uncertainty” paradigm, making the future realizing or not realizing a given predetermined scenario, not creating new ones.

Now speaking about the management of such value creation process, the literature is still largely influenced by a project by project evaluation philosophy. One symptom is that very little is said about the way projects can generate (and maximize) such impacts on resources and competences. A second symptom is that if there is a wide consensus about the fact that the evaluation should integrate “qualitative” impacts, this impact can be called value only if future projects are able to turn these new knowledge and competences into new products. When dealing with the control of project dynamics, the dominant portfolio management methodology consists mainly in eliminating the projects that have a bad risk / NPV (or scoring) profile, very little on building dynamically evaluated cumulative projects.

This critical review invites us to better frame the research issue. How do firm modify their expectations about the exploration projects they launch? How to describe this dynamic process? What can we learn to better manage the value creation process during a project and/or a sequence of projects?

We now present the methodology we use to investigate this issue.

2. Methodology

As described above, whereas value management is not a new topic, the way companies create value through exploration project and exploit it on a multi-projects scale is still an underexplored issue. In order to get insight about it, we choose a qualitative longitudinal approach (Eisenhardt, 1989). We rely on a process analysis (Van de Ven, 1992) to study how several exploration projects actually developed the business.

2.1. Choice of the industries and cases

We chose quite different industries but which are facing an increasing pressure both on launching radically new products and on mastering the R&D productivity. The intent was to see how these companies faced at the same time the need to innovate at a multi-product scale, and the pressure for direct ROI for each project.

The automotive industry appeared as a natural candidate. Carmakers have to differentiate within a saturated market structured by a dominant design. The low margin business model and current crisis demands to justify the expected profitability of any R&D investment. In the automotive industry, we chose to focus on two cases of projects which changed the company's performance and products: the Renault Espace and the Toyota Prius 1.

In order to enlarge the applicability of our results, we chose to supplement the automotive industry analysis with a project (Topex/Poseidon) taken from another industry (space industry). We chose the space industry, with which we had an ongoing research focused on project evaluation. During decades, this industry has benefited from public funding to launch high-investment programs with low requirement to justify these investments (Apollo being the paradigmatic case). Our research with a space organization as other researches (Kwak & Anbari, 2012) showed that this situation has dramatically changed. Now the space programs increasingly face the need to justify the investment and give a visibility about the expected value created. Moreover, their great variety – from pure scientific research to operational environmental management – complicates the evaluation process and criteria.

On each case, we rely on several sources of data (direct involvement within the projects, archives, interviews, newspaper). This data collection process allowed to have a correct

triangulation of the interpretations (Yin, 1994), and to be able to tell about the innovation process taking the point of view of the firm which launched the initial breakthrough.

[Please insert here Table 1 - Data sources]

2.2. Framework

We frame the data collection with the guidelines given by the literature (Van de Ven, 1992). We track the whole project lineage (Le Masson et al., 2010) encompassing the duality product / assets on a multi-product scale. First, we looked at the project direct outputs, and also asset creation. More precisely, we investigated what were the impacts of the initial project, in term of competence building, brand image… Second, we tracked how these assets were reused by the next projects and how it supported their performance. The following section presents the cases structured in that way.

3. Case studies

3.1. The Espace project

In the early 1980s, Matra and Renault worked on a car concept called « European van ». They built on the success of the van in the US, and try to adapt the concept on the European market. Renault launched in 1984 the Espace, a very unusual car on the market at that time, with a relatively low investment: 153m$[1] (in € 2013). The sales curve was also very unusual. The first month, only 9 clients bought one. Then 2600 units sold in the six first months, including a lot of taxi drivers and ambulances, who appreciated the room inside. The

[1] Figures are in $ of 2013.

reputation of the model installed, and finally customers stepped in. Renault eventually sold 500’000 units of this first model.

The big impact of the Espace product was to create a new market segment in Europe (VAN-D today) and build a strong reputation on this concept. The product strongly influenced the shift of the brand positioning towards “car for living”, the company kept this slogan during more than 10 years. Another asset was the competence in R&D. Based on previous experiences, Renault “monospaces” remained steadily better in car dynamic and comfort than competitors, which can be identified as a design competitive advantage (the car is high, and designing a high car with the dynamic behavior and comfort of a sedan is key on this market). Another asset was the interior modularity, which was an active field of experimentation since the 1980’s Espace.

The company could stop here, but it decided to not only pursue the Espace effort. In 1993, the launch and commercial success of the city-car *Twingo* was definitely made possible thanks to the legitimacy acquired on “monospaces” and “car for living”. The legitimacy was important in the eyes of the customer who could buy a “small Espace for city”, and in the eyes of the Renault decision makers who progressively found rational to launch a concurrent product of the existing products of the segment, assuming the risk of cannibalization.

The company deployed the concept on the C-segment in 1997, with the Scenic model. This was an overwhelming success, with more than 2 million units sold in 7 years. Competitors rapidly imitated this move (in 1998) but no one managed to reach such volumes. Even the following models of Scenic (II in 2003 & III in 2010) still were above competitors in term of volume.

3.2. The Prius 1 project

In September 1993, Chairman Eiji Toyoda asked to build "*a car for the 21st century*", with very open specifications. "*A small-size car with a large cabin as the most important prerequisite for the 21st century car. Fuel-efficiency would be necessary*". "*50% consumption compared with a Corola*" (Itazaki, 1999, p. 3). This is only in November 1994 that hybrid arose, as an easy way to explain its fuel economy. The so-called G21 project gave birth to the Prius 1. The project targeted 1'000 and then 2'000 units per month. During the first year, Toyota sold an average of 1000 units per month, foremost public agencies, politicians, actors and artists who bought the car. Initially targeted for the Japanese market, the worldwide considerable attention paid by the public, the press and the public agencies persuaded the company to expand worldwide. This implied developing, a couple of months after the initial homeland launch, a specific version of the Prius to sell overseas in Europe and in the US. Surprisingly, the product sold very well in the US (especially in California), and participated to the improvement of the Toyota brand image in North America.

Financially, the Prius 1 project was a considerable failure. The product was only sold at 100'000 units in the first 6 years, with a cost of more than 1 billion dollars (source MITI).

But the Prius project has been considered from the beginning as a transformation of the resources and competences of the firm. Chairman Eiji Toyoda said before the project: "*Should we continue building cars as we have been doing? Can we really survive in the 21st century with the type of R&D that we are doing now? There is no way that this situation will last much longer*" (Ibid, p.3). The G21 project was a way to disrupt from the complexification of the R&D, and from the brand image of Toyota which was getting too old compared with Honda. 13 years later, the R&D has benefited from a great update, not only on powertrain but

also on all the Noise Vibration and Harshness competences. The brand value was twice as high in 2008 than in 2000, mainly because of the Prius effect (source Interbrand). And, most important, the company legitimated a new concept of vehicle, the hybrid, on which it could rely on distinctive competences and legitimacy to dominate competitors for a decade.

The company took advantage of the knowledge acquired by its R&D division and of the customer knowledge to build a brand new Prius that was not only a kaizen of the first model, but a dramatic move forward in term of exterior design, comfort, NVH, and hybrid performance (Nonaka & Peltokorpi, 2006). The Prius 2 was marketed in 2003, and was immediately a considerable success. In 2007 the Prius 3 was launched, and other products such as Camry and Yaris also were "hybridized" in the late 2000s. Eventually, the first Prius move triggered a story that provided 4 million units of hybrids in 15 years. The company runs several years ahead of competition on this new concept it just created 15 years before. By continuously investing to upgrade the underlying assets (R&D capability, brand, factories, and ecosystem), the Toyota hybrid remains the most desired hybrid vehicle even if numerous competitors appeared.

[Please insert here Figure 2 – Volumes of Prius]

3.3. Topex/Poseidon and Space oceanography

Altimetry satellites analyze ocean circulation, ocean-atmosphere interface, sea ice, wave height and wind speed across the world's oceans. At first, Topex and Poseidon were two distinct projects on both side of the Atlantic, the first led by NASA, the second led by CNES. Since none of them received a sufficient budget to develop a dedicated mission, discussion between CNES and NASA began in 1983, and led to a joint project. Thus TOPEX/Poseidon became the first mission dedicated to ocean altimetry. The satellite was launched in 1992.

The first objective was a scientific and social one. Earth observation satellites have been considered from the 1960s, to establish a global view of earth surface, as well as to better understand and monitor the environment. It had been especially identified that the study of the ocean global dynamic and ocean moves was an issue, as these oceanographic data are an important lever to improve climate change models. Spatial experts considered remote sensing systems as a very suitable tool, as they allowed a global and homogeneous coverage throughout the world. However, at the first stage of the project, oceanographers were not used to that technology and were not convinced of the validity of the data taken from 700 miles away from Earth. Thus, the mission had not only to bring data but also to confirm their reliability. This objective was fully achieved: data produced by Topex/Poseidon contributed substantially to the understanding of the ocean/atmosphere interaction and the ocean dynamic. In ten days, Topex/Poseidon had collected more reliable, precise and exhaustive data than in 100 years of data collected from the seafloor.

The second objective was the demonstration of a new altimeter, smaller and more precise than other available altimeters. Other satellites, such as Seasat or ERS 1, have already produced altimetry data before, but they did not have a sufficient precision level to provide usable data (precision around 24 inches). This objective was also fully achieved, and the sensor provided data with a precision of 1 inch.

The third objective was to develop new applications from space. The initial funding was provided due to the promising nature of the data collected for the military activities, such as submarines missile trajectory and concealment. The goal was then to validate the value added for this “niche market”, and explore new markets based on the same kind of data. The mission

confirmed that data could be used for these military issues, and the increase in altimetry precision opened new arenas for business development, which materialized afterwards.

One noticeable effect of the Topex/Poseidon project was to structure and network an increasing number of actors, ranging from space oceanography research laboratory, subsidiary dedicated to operational services, institutional entity, etc. It progressively demonstrated the relevance and added value to these stakeholders, and has attracted more and more players in the game.

TOPEX/Poseidon has been followed by the Jason program, among which satellites Jason-1 and Jason-2 are currently in operation. These projects could build on the previous TOPEX/Poseidon success on numerous aspects:

- The altimeter technology developed on the first TOPEX/Poseidon was improved and reused on the following oceanographic satellites
- The reliability of the data and refinement of the precision allowed expanding to new scientific domains: mesoscale ocean circulation, eddies and mean sea level knowledge, cyclone modeling and prediction, etc.
- The market applications and the associated ecosystem also expanded, from pure military/scientific issues to more commercial ones: fisheries management, offshore activities, tourism, security, etc.

CNES acts now as a recognized player of this field, and the number of scientific and commercial applications increases each year.

4. Discussion

The analysis of the cases provides insights about the value management in the context of exploration projects. We first describe the value dynamic observed and describe how it fits

with the existing literature. We then detail how the notion of *potential value* can be used as a consistent describer of such dynamic, and as a concrete lever of exploration project management.

4.1. Value management theories vs. exploration projects

First, the study confirms previous research findings on the fact that the *rational approach* is far from being sufficient to anticipate and explain the financial impact of exploration projects.

The cases first highlight that the classical notion of value management (Miles, 1972) stand as a poor describer of the value creation process triggered by the exploration projects. Yes, the initial project has functional attributes, and the underlying development project tries to identify some attributes that can create a customer appeal, minimizing the costs. Yes, the project followed an *earned value* logic based on the monitoring of task accomplishment. But the final value delivered to the company goes far beyond this logic.

Indeed exploration projects start with broad hypothesis, since the teams know very little about the market, the customer preferences, the potential partners, what is technically feasible or not, etc. The paperwork studies made during the project help, but the main lessons learnt about the critical attributes and market orientations come during the launch period of the product, and the costs are optimized afterwards once the direction is set.

What happened to the Espace, Topex, and Prius… only a year after the launch is quite different from the functional attributes that have motivated the launch of the project. We find here the consequence of exploration projects, which define their strategic intent during and after the project.

In a way, one could describe the value dynamic using the real option logic. Even if, from what we know from the cases, none of them used the real option tools to help the decision making, we can imagine that they could. At the beginning of the project, the team could have drawn scenarios, uncertainty variables; define associate value and probabilities of occurrence. But how could they? Who could imagine that the US could be the best initial niche to launch the Prius? That the Espace product would eventually turn into a more global Monospace concept that would constitute a critical attribute of the whole Renault's brand?

First, whereas existing literature mainly considers that the main uncertainties should be solved during the project - i.e. before product launch - (Ford & Sobek, 2005) following the flexible development logic, the cases show that important information – namely about market and uses – appear after product launch. Second, the project does not only provide information to reduce uncertainty about predefined variables, it actually provides new variables.

These value frameworks not only have a limited explanation capacity regarding the cases presented here, but relying on them during the projects would have hampered the value creation process. For instance, sticking to the initial plan (or scenarios) would have led to continuously trying to convince the initially imagined niche (e.g. the Japanese market for the Prius, the military / scientific market during 3 years for the Topex) whereas the success came from non planned opportunities (US for Prius, numerous diverse applications for Topex during 13 years).

The capability building framework stands as a good describer. Each project has been building critical capabilities, in term of product concept creation and capture, R&D competence, brand image… But the underlying value of these newly developed assets only

reveals once they are activated by further projects. This invites us to consider these capabilities as “potential value”.

4.2. Potential value creation and value realization

The ex-post analysis provides insights about what this initial investment actually paid for.

Because of the technical and market novelty implied by both projects, they demanded to build new and specific competences on unusual domains. The table 2 proposes a synthesis of the different resources and competences built through the initial project. For examples, the project can promote an original product concept in the eyes of the customer, which becomes increasingly aware of its existence and specific benefits. It can also develop the brand notoriety which can make upcoming products more desirable if they can build on the same position path. It cans obviously develop specific R&D design capabilities: proprietary technologies, patents, product and/or process design competences... It can also create original relationship (with private or public actors) than the firm can use afterwards.

[Please insert here Table 2 - Potential value created by each initial project, and then realized by other projects]

We define these new assets as a “potential value”. They stand as resources and competences that are built through the project, and can be used afterwards to create tangible economic advantages for the firm. Let us highlight the close linkage between the potential value creation and the nature of the project. We know for a long time that mainstream project only use existing competences, and that this can create *core rigidities* (Leonard-Barton, 1992). Only exploration projects are far enough from the core business and competences to really create potential value. The originality of the project compared to the dominant design, the newness of the knowledge space to be explored can be both analyzed as negative risks in the

traditional project evaluation perspective and as potential value axes in an approach that takes into account the dynamics of organizational learning (Gillier et al., 2013).

If creating this potential value during and after the projects appeared as a critical factor, *realizing* this value at a multi-project scale was the key movement to shift from a promising attempt to a great economic success. The most profitable projects were the next projects, which pragmatically built on the acquired assets to converge to well-targeted products. The success of the Scenic clearly relies on the concept and brand footprint about “monospace”, the generations 2 and 3 of the Prius kept capitalizing on both a strong engineering experience and a unique reputation on the hybrid concept, the CNES projects did fully exploit the technical expertise about altimeter and its newly-acquired worldwide reputation to widen the applications and partners... We so define the *value realization* as (1) the continuous revaluation of the opportunities and assets built through an exploration projects and (2) the project development initiatives that rely on this pragmatic revision.

This invites to consider the value management process of exploration projects as a dual potential value creation / value realization process, spreading at a multi-project scale. The figure bellow summarizes this management pattern.

[Please insert here Figure 5 - The value management for exploration project, managing the value potential and value realization process]

5. Conclusion and further research

Exploration projects are both a necessity in the current competitive context and at the same time very difficult to justify using the classical frames and methodologies. The notions of potential value management questions existing theories and practices.

Facing the limitations of traditional project evaluation methodologies, companies have the choice: sticking to them and kill projects that cannot *ex ante* provide sufficient arguments to guarantee their direct profitability, or by-passing them relying on top-management "guts feeling". In the space behind, stands a great avenue to develop new decision tools and evaluation processes that will take into account the specificity of exploration projects. Integrating the value potential logic stands as a challenge to do so. It invites to complement the classical screening methodologies with a more strategic *continuous* monitoring process. What are the assets that are being developed through the project? What can we do with them? To what extend does is question the product planning strategy, and even the corporate strategy?

If the traditional evaluation patterns integrate these issues at the beginning as go-nogo criteria, the article shows how the evaluation process would benefit from complementing the ex-ante initial evaluation with periodical ex-post revisions during the project in two ways. On one side, reevaluation of the potential expansion value on the base of the new opportunities that appears from the first moves. On the other, assessment of the realization of this potential value, due to events that occurred in the period. Fruitful value management appears as a subtle mix of continuity in the learning and agility in the expectations as implementation during the evolution of the successive projects.

This invites bridging the learning-by-project logic with the real option logic. In a value potential perspective, the project continuously builds and uses options, depending on the assets built and considered along a sequence of projects. The first way is to consider that critical uncertainties are to be solved not only during the development project – as the flexible development indicates – but after the product launch, on a multi-project scale. The second is

to integrate that one of the project's mission is not only to reduce uncertainty about a previously settled scenario, but also to create new options and scenarios, and building in parallel the assets that will make them likely to happen in a profitable way. We see that a consistent value management for exploration project can exist only by linking the three theoretical schools of thought – rational, uncertainty and capability building.

Let's finally come back to the paradox raised at the beginning of the article. Rational tools and methodologies for project management have been created to better innovate, whereas they are reputed to increasingly kill innovation. With an ever increasing emphasize on radical new products and capability building importance, these tools and methodologies have no choice but to better take into account the value creation project at a multi-project scale. The notions proposed in this article – potential value creation, value realization – help better framing this issue, and contributing to solve this paradox.

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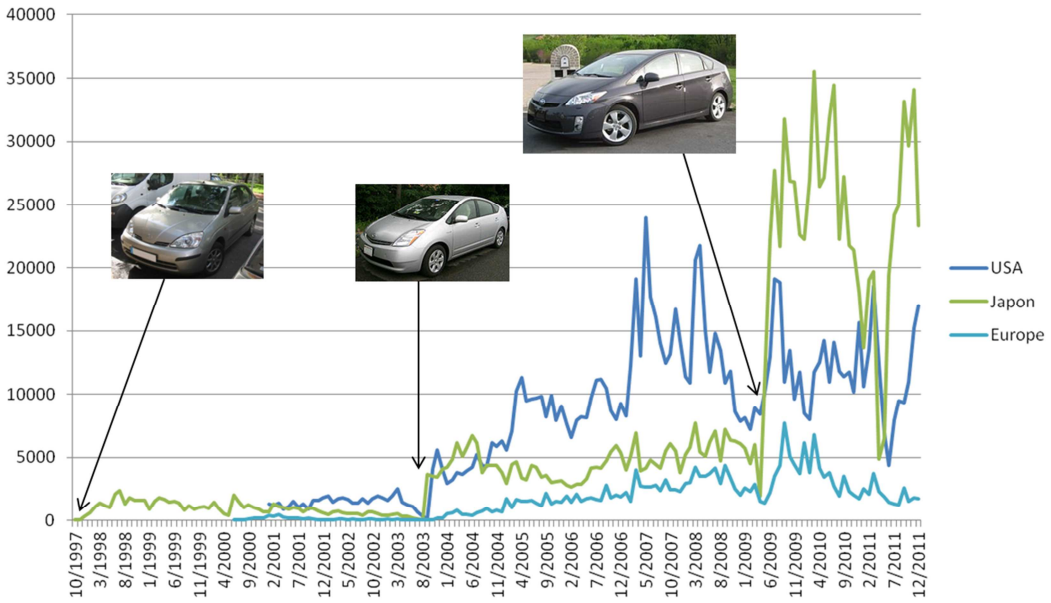

Figure 1 – Volumes of Prius

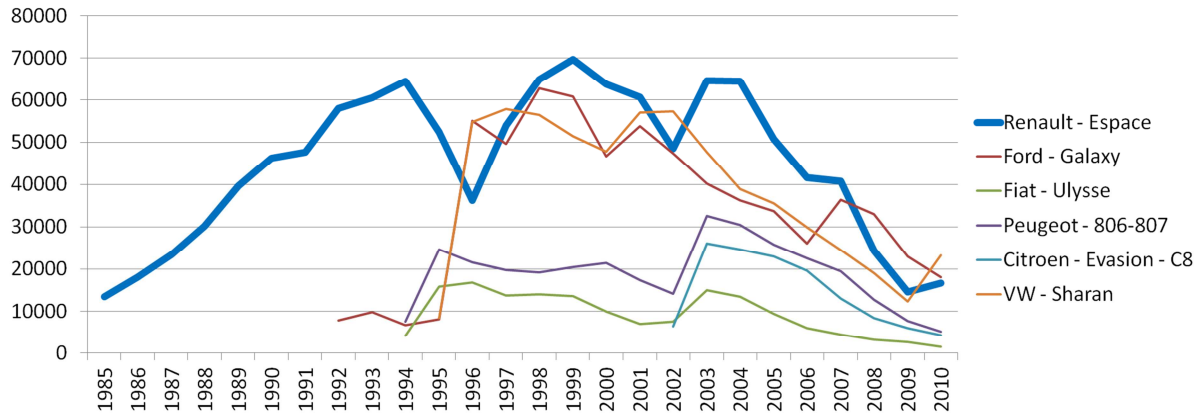

Figure 2 – Volume of sales of MPV-D in Europe

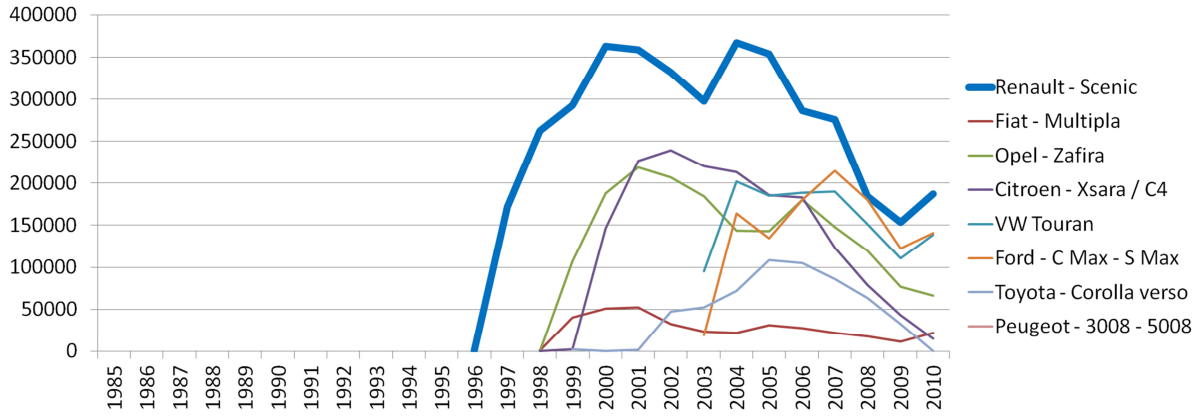

Figure 3 – Volume of sales of MPV-C in Europe

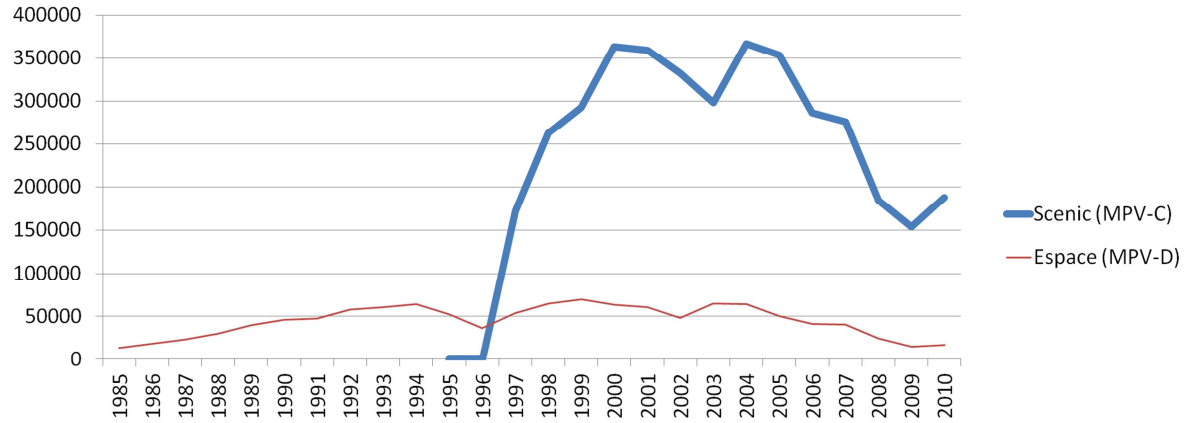

Figure 4 – Volume of sales of Monospace Lineage Renault

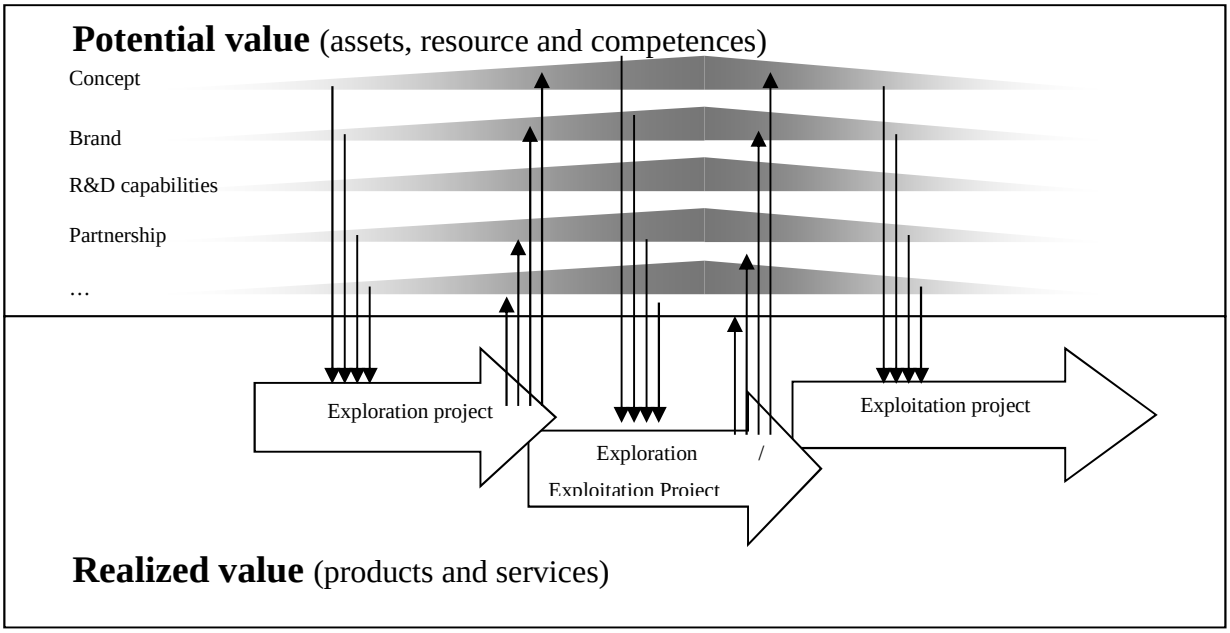

Figure 5 – The value management for exploration project, managing the value potential and value realization process

		Data sources
Space industry	**Space oceanography**	Action research in CNES for 3 years. 25 interviews with project stakeholders (project manager, engineers, head of departments)
Automotive industry	**Renault Espace**	Database Global Insight. Internet. Archives. 5 interviews at OEM (former development team member, marketing manager)
	Toyota Prius 1	(Itazaki, 1999; Nonaka & Peltokorpi, 2006)

Table 1 – Data sources

Initial Exploration Project	**Initial product target**	**Potential value created through the project** (assets footprint inherited from the initial exploration project)				**Realization of the potential value** (Successful products relying on these assets)
		Concept promotion	*Brand promotion*	*R&D / production*	*Partnership*	
Prius 1	Target limited to Japan	"Hybrid products" as a newly understood product concept, a generic market segment, footprinted by Toyota.	Brand value +40% between 2000 and 2008. New brand pillar « environment » with more value than quality.	Toyota Hybrid System. R&D knowledge about power consumption, noise and vibration, materials, weight.	New relationship with politicians (World Environment Forums, local authorities through taxicab fleets…); Star system (e.g. Schwarzenegger).	Prius 2&3 (>2 million units) Usual models sales increased when they proposed a hybrid version: Camry, Yaris, Highlander…
Espace	Niche product for families	"Monospace products" as a newly understood product concept, a generic market segment, footprinted by Renault.	The project fed the brand positioning; cars for living" became the slogan, recognized by customers.	Interior modularity and space optimization Van driving dynamics	-	Twingo (more than 2 million units sold) Scenic 1 (>1.9 million units) Scenic2&3 (>2million units)
Topex / Poseidon	Limited to military applications.	Made the fuzzy "environnement concern" concrete. Oceanography project increased knowledge on oceans dynamic and contributed to climate change concern.	CNES reaffirms its position and capabilities at a worldwide level. Data coming from its satellites are reputed as reliable.	Best in class in altimeter technologies. Creation of a platform for data processing and service provisioning	Increasing number of actors became part of the initiative, from public institutions to private organizations.	Other oceanographic satellites (Jason 1 to 3). Increasing number of commercial applications: fisheries management, offshore activities, tourism, security, etc.

Table 2 – Potential value created by each initial project, and then realized by other projects