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Multiproject lineage management: Bridging project management and design-based innovation strategy

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Abstract

Innovation-based strategies are widely recognized as key drivers to maintain competitive advantage. The design and strategic literature underline the possibility of triggering a multiproduct value-expansion dynamic based on the creation of new concepts dynamically twinned with corporate strategy. However, the multiproject-management literature—portfolio, program, and platform—lags behind and remains focused on ex ante coordination, resource allocation and selectionism. Thus, there are still few indications of the processes that stimulate and orient continuous, profitable multiproject creative expansion. Bridging the multiproject-management literature and design theory, we propose a model of *multiproject lineage management* (MPLM), which focuses on the key processes that drive exploration efforts and shape innovation trajectory. We conduct a multiple longitudinal case analysis in the automobile sector. Based on this analysis, we expose the principles of MPLM, mapping the roles of corporate, program and project management within a global expansion project. Finally, we highlight our contributions to managerial practices and the related literature.

Keywords: Innovation management; Project management; Multiproject management; Project lineage; Automotive industry; Design

1. Introduction

Organizing and managing innovative breakthrough projects from a multiproject, expansive perspective

Academics and managers take an ambiguous approach to disruptive (Bower and Christensen, 1995) and blue-ocean-oriented projects (Kim and Mauborgne, 2004), which create both high risk and high potential values. On the one hand, history has shown the strategic importance of such breakthroughs. The first iPod, Prius, Air Max and Nespresso were risky projects—although sometimes profitable—that eventually opened new business avenues. The management scope of such innovation trajectories includes several projects. A company builds on its first product to launch others, eventually creating a new successful concept and/or segment and completely transformed the firm's very identity.

Our theoretical lenses only partially help us to understand the management principles of such trajectories from a multiproject and organizational perspective.

The project-management literature strongly highlights the importance of a breakthrough project—termed vanguard, skunkworks, or exploration—to activate a critical multiproject-

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learning cycle (Bommer et al., 2002; Brady and Davies, 2004; Lenfle, 2008). The multiproject-management literature—program, portfolio, platform—emphasizes ex ante project selection and coordination to maximize cost-quality, risk-balancing and lead-time performance and to reduce part diversity (Cooper et al., 1999; Cusumano and Nobeoka, 1998; Maylor et al., 2006). Organization-focused theories have only recently tried to adapt the ambidexterity approach to project-based organizations, inviting a mix of structural and contextual forms of ambidexterity to cause dynamic learning (Eriksson, 2013).

If these schools of thought provide useful canvases to frame the question, they only partially account for critical findings coming from the strategy and design theories (Le Masson et al., 2010; Verganti, 2009), which provide a great deal of evidence about the importance of serendipity and reactivity to make a product's conceptual identity expand along a sequence of coherent projects.

To bridge these two approaches—multiproject management and design strategy—we introduce the concept of *multiproject lineage management* (MPLM) to describe the multiproject sequence beginning with a breakthrough project that introduces a new concept of product, and including subsequent projects that which both build on and transform the initial concept.

Based on this framework, this article provides evidence of the management and organizational principles that can drive a continuous, profitable multiproject creative expansion. The goal is to contribute to filling the gap between the strategic necessity for more continuous exploration of disruptive innovations and project rationalization aimed at controlling the golden triangle of new product development.

The first section reviews different, related bodies of literature, making their limitations with respect to the research question explicit and refining the MPLM framework. The second section describes our methodology, which is based on a multiple case-process analysis. We then present empirical material about four cases of project lineage in the automotive industry (Section 3). The results invite the identification of several key attributes of MPLM (Section 4), which are positioned in contrast to the existing literature, highlighting avenues for both practice and future research (Section 5).

2. Literature review: linking innovation strategy with multiproject management

2.1. Innovation- and design-based strategies

Several bodies of literature underline the critical role of emerging strategies and design-based reasoning in the pursuit of a successful innovation path.

The strategic literature provides a great deal of evidence about the fact that top-down strategies can limit innovation possibilities and sometimes endanger a company's survival (Burgelman and Sayles, 1986). As shown by the seminal example of Intel's shift from the RAM to the CPU industry (Burgelman, 1994), companies must rely on both top-down and bottom-up initiatives to define their market orientations and strategic core competences. The strategizing literature, which is rooted in the emerging-strategy literature (Mintzberg and Waters, 1985) largely confirms that corporate strategy should update unexpected events such as the success of exotic products or the construction of unplanned competences.

Although that literature remains quite generic and unattached to a particular product or product range, design theory provides fresh arguments to understand how to initiate a product-expansion process.

By focusing on what a product *means* to customers, the design discipline has recently engaged in a valuable bridging effort with innovation management, showing that successful innovation initiatives actually introduce and develop not only new products but also new *meanings*, which give them a competitive advantage over the long run (Verganti, 2008).

The concept-knowledge design theory provides a framework that uses the notion of *concept* to characterize more precisely how creative impulsion and expansion occur (Hatchuel, 2002; Le Masson et al., 2010). A concept formulates properties that are desired but that has no logical status in existing knowledge (one cannot say whether they are true or false). These propositions can be understood and look appealing for value creation, but no one can say precisely whether they are realistic, and they are very open propositions that can point to very different embodiments. For example, a "flying boat" stands as a concept that both can be attractive to customers and can lead to various forms of innovative boats; each embodiment relies on specific types of competences.

From this departure point, the innovative design process progresses through a dual interactive exploration to expansion of existing knowledge (in knowledge space) to concept specification (in concept space). Ultimately, the concept has been specified into precise propositions (innovative products) that can be tested using the knowledge built through the design activity. This definition emphasizes the exploratory dimension of a *concept-driven project* because the concept involves taking into account the learning process that occurs during the design process.

Here, we see how an innovative product can open new business avenues. Unusual products propose unusual meanings to customers, which in return create new knowledge for a company (in terms of customer acceptance, strategic opportunities, and technological options), thus providing options that top management can choose whether or not to activate. The resulting multi-product sequence stands as a creative product expansion.

Now that we have considered a flexible emerging strategy and a multi-product concept expansion, we turn to the subject of how the project-management and organization literature integrate these principles.

2.2. Models of multiproject management

Traditional single-project management organizes resources to maximize the performance of a single product within a given window of cost, quality and lead-time. Consequently, it has widely been criticized at the corporate level because it neglects several critical strategic aspects, particularly by creating new

elements (technologies, components, market knowledge) that the company is unlikely to reuse. Brady and Davies (2004) thus propose to distinguish projects according to their learning potential, from traditional rational projects that only exploit existing knowledge (in terms of technology, market knowledge, and corporate assets) to exploration projects that emphasize learning content that can be exploited afterwards (Lenfle, 2008) to vanguard projects that balance a project's direct outcome and its indirect learning (Brady and Davies, 2004). The notion of a *skunkwork* project is similar, focusing on how a project can disregard and rebuild new competences and design routines (Bommer et al., 2002). Because the primary focus of these theories remains the initial project, we have minor insights and recommendations about what is to be transferred, to which projects, and from what overall multiproject value-creation perspective.

Multiproject management enlarges this strategic purpose in different directions. Three primary models have been stabilized during the past 20 years: portfolio, platform and program management.

Portfolio management focuses on project selection by balancing global risk, aligning a project with firm strategy and allocating resources among competitive projects (Cooper et al., 1999). It optimizes the ecology of projects, allocating scarce resources as a function of each project's anticipated risk, profitability and strategic alignment with the firm's formulated strategy. This imposes several limits related to the above-cited principles. First, this model does not integrate bottom-up strategizing. Even in mature scoring matrices, scoring models are built to evaluate the coherence of a project using a settled list of criteria that materialize the top-down strategy. Academics have only recently considered that the scoring process should evolve dynamically (Floricel and Ibanescu, 2008; Petit, 2012)—but only because of environmental feedback, not products or concepts that a firm proposes to its customers. Second, the overall performance principle is more a static efficiency of resource allocation than a construction of new, promising businesses. The overall performance principle stands as an ex post selection perspective (Loch et al., 2011) to balance the risks and opportunities of diversified exploration ventures. Third, because it organizes competition and selection among projects to access scarce resources, portfolio management does not stimulate interproject cooperation and learning.

Program management organizes a precise coordination pattern among several dependent projects (Maylor et al., 2006; Smyth, 2009). Program management may be considered a chain of projects that contribute in succession to a specific common goal. Programs are defined as "*a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually*" (PMI, 2008) or "*a framework for grouping existing projects or defining new projects and for focusing on all of the activities required to achieve a set of major benefits*" (Maylor et al., 2006). Here again, the complementarities among the coordinated projects and the global value target are settled at the very beginning of the program. What we lose in terms of learning, we gain in terms of multiproject coordination.

Platform management has emerged as a way to solve the "fat design" problem and maximize partial commonalities and efficient technology transfers across projects (Cusumano and Nobeoka, 1998; Gawer, 2009). The platform-approach performance driver can be analyzed as a specific program-management approach to achieve both cost reduction—through standardization and market-competition effects on components of the offer—and larger diversity in the products offered to end users. Again, we find that this model pays much attention to ex ante coordination rather than to iterative learning. Additionally, even if multiproject learning is a very important pillar of platform management, it focuses on component and module reuse and does not integrate the product concept as a variable of multiproject management.

2.3. Organizing to drive creative-learning tracks

Taking a more organizational perspective, an important stream of research investigates how to both exploit short-term competitive advantages and develop new, more long-term-oriented activities. The so-called ambidexterity literature (Benner and Tushman, 2003; O'Reilly and Tushman, 2004) mostly focuses on traditional exploitation activities—e.g., production, selling—and implicitly regards any new product project as exploration. Academics have only recently distinguished between exploitation projects and exploration projects (Andriopoulos and Lewis, 2009; Lenfle, 2008).

Existing research points to three types of ambidexterity each having its own relevance within project-based organizations.

Structural ambidexterity recommends a distinct exploration unit apart from the exploitation units that uses various mechanisms to coordinate both activities (Ben Mahmoud-Jouini et al., 2007; Benner and Tushman, 2003). This is difficult to implement in project-based organizations because it tends to disconnect the exploration teams from new product-development processes, whereas an exploration project needs development resources and routines to develop and launch its products.

Sequential ambidexterity can help solve this disconnection problem. Related research highlights the organizational forms and processes by which exploration initiatives can transform into exploitation activities (Gupta et al., 2006). Testing, knowledge creation, capitalization, reuse and valuing previous learning are systematized in a fast rhythm and continuous innovative cycle (Venkatraman et al., 2005). Within project-based organizations, this leads, e.g., to institutionalized advanced-engineering projects that can prepare more breakthrough projects and eventually will be managed by exploitation teams (Maniak et al., 2014). However, these organization settings still rarely lead to virtuous learning cycles in PBOs (Eriksson, 2013). Exploitation project constraints tend to remain the number-one focus, making it difficult to connect exploration and exploitation projects and to continue exploring following an exploitation project.

Contextual ambidexterity has been proposed as a way to solve such problems, particularly in project-based organizations (Eriksson, 2013; Gupta et al., 2006). From this perspective, two teams are both exposed to exploitation and exploitation activities within the same project. This causes the learning cycle to take place at the individual and team levels, and the new

knowledge spreads through the various projects later taken up by those teams. This research avenue is promising because it integrates both alignment with a predefined strategy—at the corporate or business unit level—and adaptability to new information that arrives during the activity (Gibson and Birkinshaw, 2004). We still have few insights about the application of contextual ambidexterity from a multiproject perspective, which could help to better understand the mechanisms of the reuse of concrete knowledge and how it embodies a coherent path towards an expansive range of innovative products.

2.4. Literature discussion, research question and framework

Although the multiproject and ambidexterity literatures both have developed powerful models to understand the strategic management of innovation, none fully integrates the principles of the strategic and design literatures—i.e., focusing on the evolution of product concepts along projects and engaging in iterative learning from project to project.

More specifically, multiproject research focuses on selecting the right projects, allocating resources, balancing the cross-sectional view of the portfolio, technology transfer between projects, and finding connections between portfolio success factors and performance. Whereas the design and strategic literature suggests an iterative multiproject model, both the program approach and the platform approach consist of an ex ante coordination that freezes (or at least imposes heavy constraints on) future design decisions on projects (i.e., perimeter, commonalities in components, project processes) in an effort to align a group or chain of projects to a global, deliberate strategy. Ambidexterity and learning from the project literature pay greater attention to the learning cycle, which, however, generally remains at a generic level of knowledge creation and reuse. Without a clear focus on a given product line, we miss the concrete mechanisms of continuous exploration and reuse, or we remain loyal to a technology transfer paradigm in which other projects are mere recipients of previously developed technologies.

Confronting the design and strategic literature with the multiproject-management literature highlights an uninvestigated gap. Surprisingly no study has truly analyzed how the exploration effort is oriented, maintained and reoriented following an expansive and emerging strategy process that accounts for the feedback of successive projects. Nor has any study analyzed the appearance in multiproject management of the path dependencies of product concepts, parent-organizational linkages and involvement in project networks.

Relying on the emerging notion of lineage (Le Masson et al., 2010; Midler, 2013; Midler and Silberzahn, 2008) we define MPLM as a specific type of program management (in terms of interproject coordination) that integrates a willingness to break the established design rules and product-dominant design (such as vanguard and skunkwork projects), a continuous flexibility of the central product concept (as recommended by design theories), and an emerging strategic intent (as recommended by exploration projects and strategizing). Table 1 positions this notion towards existing multiproject management models.

We aim to enlarge the applicability of this notion and identify the organizational and managerial mechanisms that make it efficient. The next section explains how we tackled this issue.

3. Methodology

3.1. Choice of industry

The automotive industry was chosen for three reasons. First, that industry has deeply refreshed its product concepts during the past 20 years: the concepts of hybrids, SUVs, vans, electric vehicles, "revival models" (VW New Beetle, Fiat 500, Mini) have dramatically modified the market. Second, in the past this sector has proven a pioneering sector for managerial innovations. Third,

Table 1
Multiproject lineage management versus other models of multiproject management.

	Portfolio	Platform	Programs	Lineage
Perimeter	Many projects (>10)	Several projects (<20)	Several to many	Several projects (<10)
Performance target	Project alignment to firm strategy, optimizing resource allocation to projects	Investment and cost reduction through product and process commonalities	Grouping of projects to achieve a global target	Innovative expansion and learning efficiency
Performance driver	Competition between projects through regular ex post evaluation of project performances	Ex ante constraints on projects to guarantee platform coherence	Ex ante coordination to define complementary perimeter and efficient communication processes within different projects	Ex ante concept formulation, expansion through projects, ex post cross-project learning and strategizing
Temporality	Sequence of similar static choices.	Ex ante, early constraint.	Ex ante strategy, cross-project adjustments	Emerging strategy, iterative, creating and using options
Project bridging criteria	Project belongs to the same budget unit	Project can share components	Project refers to a global, collective purpose	Project shares the same concept, systematic reuse
Link with organization	Fight among projects for scarce resources	Exploit existing competences and create platform assets	Top-down	Top-down open initiative Bottom-up strategy formulation

we had opportunities to access data because we have conducted research in the automotive industry for 20 years.

3.2. Multiple-case approach

We chose a multiple-case longitudinal analysis. Because we aimed to reveal key management processes, the multiple-case approach appeared natural, and thus, we believe it has superior applicability compared to a single-case approach (Midler et al., 2013). We chose diverse disruptions—including low-cost disruptions (Logan), architecture disruptions (Monospace), technological disruptions (Prius), and new-value disruptions (Prius and Zero-Emission Vehicle)—to improve the diversity of the data sample and the generality of the results. In each case, we chose a process study (Van de Ven, 1992) because we wanted to frame the logical sequence of dependent events within the lineage.

3.3. Case selection

We selected cases for which we had enough data to conduct an in-depth investigation and that were somewhat representative of a multi-product conceptual disruption (i.e., creating new segments from scratch). We finally selected four cases: Renault's "Zero Emission Vehicle", Renault's "Monospace", Renault's "Logan", and Toyota's "Prius". We assume that the empirical sample is oriented towards a single firm, but because the three Renault cases occurred during three different periods (1980s, 2000s, 2010s) and the company dramatically evolved within that timeframe, we consider the results adequately context-independent.

3.4. Data sources

The data-collection process allowed a correct triangulation of the interpretations (Yin, 1994) and the ability to explain the innovation process from the perspective of the firm that launched the initial breakthrough. The following table summarizes the data collected (Table 2).

3.5. Scope of analysis

Each case includes its lineage, which begins with carmaker's first formulation of the concept and its embodiment in a first development project and ends when the concept is adequately stabilized and shared to constitute a new dominant design. The concept lineage includes all of the products that share the conceptual identity of the initial concept (same core concept, same or derivate key attributes) and rely a shared path of competence building (shared technology and/or design rules and/or development teams).

3.6. Dimensions of analysis

For each case, because we aim to better understand how the company organized the transformation of an original initial concept to a product range expansion, we focus our analysis on both the concept dynamic (how did the concept arise and evolve over the long run) and the management and organizational dynamic (how did the organizational setting evolve and what were the project-management principles).

4. Case studies

4.1. The Monospace lineage

4.1.1. Concept—products

In 1980, the Matra company was working on a concept car called the "European Van". Matra built on the success of the van in the US and attempted to adapt the concept for the European market. The goal was to propose extraordinary interior roominess in a one-box car oriented to family life. They proposed several prototypes to carmakers and finally, Renault agreed to work with the Matra team. Renault helped to refine several attributes (modularity, dynamics, etc.) and launched its "Espace" model in 1984. The first version sold 500,000 units.

The "Espace" concept progressively spread as people understood not only the product itself but also a more global product category that integrated "family convenience", "roominess" and "a big car for long trips". In the early 1990s, several competing models appeared. Automotive magazines progressively compared them within a sub-segment of the D-segment called "Monospace", in reference to the word "Espace" and the vehicles' global attributes.

When the company launched the Twingo model (A-segment), numerous insiders and press writers directly linked the model to the Espace as embodying the "one-box" and "convenience" orientation in an urban car. The Espace experience provided credibility to a new area of product positioning for Renault because its top management wanted to avoid cannibalization of existing A-segment models. The immediate success of the product reinforced firm's then-new slogan, which had a clearly people centric positioning: "Voitures à vivre".[2]

In 19967, the company deployed the concept on the C-segment with the introduction of the Scenic model. Magazines and customers highlighted the new affordability of the "Monospace" advantages: interior roominess, driving dynamics, family convenience. Because of the immediate sales boom, competitors quickly appeared. In two years, the "Monospace" concept shifted to the C-segment, where it enjoyed much higher volumes than it had in the D-segment. Renault sold more than 2 million units in 7 years, dominating its competition in terms of volume, margins and press ranking.

In the mid-2000s, the company made a new strategic shift, changing its brand slogan to one with a less family centric orientation and renewing the "Monospace" products from a kaizen perspective.

4.1.2. Management/organization

The independent engineering unit Matra played a key role during the first 10 years of the monospace projects (1980–1990). The team initially formulated the concept, but needed an industrial partner. The product appeared exotic to the OEM in-house functional teams. Thus, the project was coordinated by several engineers and marketing experts, but effectively was developed by the Matra teams based on an existing Renault R20 model. The

[2] This slogan means "Cars to live in/with".

company also produced the Espace in its separate factories. To make this happen, Matra Auto was created as a joint company between the Lagardere Group and Renault.

For 15 years, Matra was a unit separate from the Renault development team. The two interacted but remained radically decoupled. The Espace 1 and 2 were clearly Matra products that carried the Renault brand. Since 1993, all Monospace-related projects have been completely embedded in a typical NPD organization.

Development teams claim to have benefited from their work in terms of benchmarks on modularity and driving dynamics. Based on previous experiences, Renault monospaces remained steadily better in car dynamics and comfort than those of their competitors—i.e., Renault had a design-competitive advantage (monospaces are high, and designing a high car with the dynamic behavior of a sedan was the key in the market). Another key asset was interior modularity, which had been an active field of experimentation since the 1980s Espace. Matra Auto closed in 2003.

4.2. The Hybrid "lineage"

4.2.1. Concept—products

The initial brief of the G21 project (the Prius 1) was "a car for the 21st century". Its initial specifications were as follows: "a small-size car with a large cabin as the most important prerequisite for the 21st-century car. Fuel efficiency is necessary". It was only in November 1994 that hybrids were put on the table as "an easy way to explain fuel economy". The concept was then branded and promoted as the "Prius" and its "hybrid" electric-combustion engine was highlighted.

At first, domestic sales were deceiving. However, the innovative effort was maintained and the media and market success emerged first in America, confirming that the "hybrid" proposition was a key concept that should be promoted. In 2003, the Prius 2 improved the characteristics of the hybrid (consumption, driving dynamic, silence) and Toyota began to brand the "Toyota Hybrid System" independently. Ten years later, Toyota promotes a "hybrid range" of five different models, and has sold 4 million hybrid vehicles as of 2012. Competitors remain far from achieving these sales figures. Customers who ten years ago had no knowledge of "hybrid" cars today are aware of hybrids and their benefits. Toyota still has several years of advances on its competitors with respect to the key hybrid attributes, and all studies show that Toyota is the "eco-friendly" leader. The brand value is twice as high in 2008 as it was in 2000, primarily because of the Prius effect (source Interbrand).

4.2.2. Management/organization

The G21 project was an explicit demand of Chairman Eiji Toyoda. "*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*". He then proposed launching the G21 project ("globe 21st century") as a way to disrupt the complexification of R&D.

Toyoda immediately nominated a young project manager and gave that manager difficult tasks: to launch the G21 product and *"to establish a new method of developing a car through this project (…) You can try out anything you like."* During its 4 years of development, the project chose people from different development centers, consistently disregarding traditional design patterns.

For example, car was designed through a global design contest that included the company's all design facilities worldwide. The research department was closely associated in a very unusual way, pulled in by the program's technical and scientific problems.

After the launch of the Prius 1, the OEM progressively embedded the hybrid-concerned team into its traditional development organization. A brand new "Hybrid Vehicle Engineering" unit was created in the company's core development division, with counterparts in every other division.

4.3. The Entry lineage

4.3.1. Concept—products

The initial brief formulated by the Renault CEO in 2000 was simple: a "modern, 5000€ car for the Eastern European market". At that time, the price was 30% cheaper than any modern car proposed by an established car manufacturer worldwide. The X90 project finally reached its target, and the Dacia Logan rapidly became a commercial success in several Eastern European countries (330,000 units per year in the first 3 years). This opened a deployment to other markets that had not been anticipated at the beginning, resulting in even higher sales (1 million units in 7 years). The positioning of the Logan was not the same in every country: it was billed as low-cost in Western Europe, home-country-made affordable comfort in Eastern Europe and North Africa, young and trendy in other countries. The OEM decided to brand it as either Renault or Dacia, depending on the country. Between 2007 and 2012, as the company expanded the "Logan-based" product range (Sandero, Duster, Lodgy), customers and magazines progressively shifted the identification of the initial concept from Logan to the Dacia brand. Eventually, the "Entry segment" concept was stabilized in minds and magazines: it was a new word, a new segment, with a new meaning (that was different in each country).

The global sales of the Entry lineage reached more than 1 million in the year 2012, more than ten times the forecasts for the initial product.

4.3.2. Management/organization

The emerging phase of the project began in late 1995 with CEO's strategy formulation. The 4-year emergent phase of the concept was strongly supported by the CEO against management's general skepticism. The motivation for launching the project was essentially a strategy. During the 1990s, Renault relied on a R&D capability focused on middle-end products, with development, production and marketing centered on Western Europe. The Logan project was a way to expand to new, growing markets, tackling a new range of products despite the lack of a prior clear vision on how that would happen.

The success of what originally appeared as an unrealistic target was achieved by a typically heavyweight project management team, coordinating selected people from functional departments and systematically transgressing the usual

design rules of the corporate. The commercial phase of the Logan project also benefited from the project team's ability to learn and react with great agility to many surprises that occurred in what was for Renault completely new countries and customer targets. Third, deployment was implemented through an Entry program-management structure that took its lead from the initial Logan project team. The program team had the same autonomy to continue with its initial killing-cost strategy but the new context (a multiproduct range, industrial deployment in various continents) imposed an extensive redesign of the initial product to cope with new varieties and logistic imperatives.

The linkages between the "Entry" R&D organization and the central Renault R&D organization remains a lively issue, primarily because the development routines created by the Entry program to nurture the Entry products (*metarules* specifically formalized and institutionalized) are very different from Renault's corporate routines. Today, the same people are in charge of a new program, inspired by the Entry saga.

4.4. The Zero-Emission lineage

4.4.1. Concept—products

The Renault Zero-Emission Program is not the first attempt to launch an electric vehicle. However, it is the first to invest several billion dollars based on a concept-based "Zero Emission Vehicle" with a 4-model product plan. Fluence, the sedan model, was developed based on an existing platform and model. Kangoo, the utility model, also already existed, and targeted the professional fleet market. Zoé, a brand-new electric compact model, was specifically designed to meet urban and suburban mobility needs and optimize the specificities of the electric power train. Twizy, an ultra-compact electric four-wheel vehicle that stepped into the electric-product planning, is positioned between a car and a motorcycle.

We have little historical insight about this lineage because its products were just being launched on the market in recent months. Thus, it is difficult to know the next direction for this lineage. What we can tell at this point is that the initial concept will evolve given the feedback—sometimes very surprising—from its first customers.

4.4.2. Management/organization

The starting point was a meeting between the CEO of Renault, Nissan C. Ghosn, and Israel's President, Shimon Peres, during the 2007 Davos World Economic Forum. Israel wanted to develop an electric initiative sponsored by an Israeli-Californian start up: Better Place. This initiative provided an incentive to pull together advanced EV projects and product planning and to build a coherent product planning on which the company could focus as a corporate strategy.

From the beginning, the Electric Program has been governed by a specially appointed, heavyweight program-management structure. This structure is geographically and hierarchically embedded within the corporate development organization. The overall process of program management is the same as in every program. However, the development program raises important challenges that oblige the company to stabilize new design patterns.

The technical challenges have been numerous, from component consumption to telematic services, charging sequences, and quick drop mechanics, requiring the extensive involvement of the research and advanced engineering departments from a "pull" perspective, rather than in the usual "push" tradition.

On the marketing side, the program quickly realized that it was necessary to promote the concept not only to customers but also to public entities, municipalities, and suppliers of electrical equipment. The OEM created a dedicated business-development unit in charge of this activity, complementing the traditional marketing department. At the time of this writing, this expanded form of program management is still in place.

5. Results and discussion

The previous section provides insights into four cases framed as multiproject lineages, highlighting how the product concepts and underlying managerial practices evolved. This section discusses the ingredients of MPLM as they arise from the data, and positions these ingredients towards existing literature and models. We first expose a transversal analysis of the cases and then formalize the management principles that arise.

5.1. A first storytelling of MPLM

The initial concept appears as a key driver to point an appealing, out-of-the-box target: to call for transgressions of existing norms and knowhow. This concept can be formulated in different terms, including "a European van", "a 5000€ modern car for Eastern Europe", and "a 21st century car". It is the result of a strategic analysis that mixes socioeconomic megatrends (in our cases: alter-consumption, environmental concern, the evolution of family structures…) and firm-specific willingness to change (brand repositioning, geographical expansion or refocus, and specific resources and competences already existing in-house…).

The initial concept widely disrupts product-process technological capabilities and calls for intense R&D investment and technological explorations (e.g., in alternative power trains and car architecture). It also questions the way a company develops products—i.e., the traditional design rules—and thus, the initial project both explores what to do and how to do it.

The first launch is an incarnation of the initial concept, which helps to test and refine the hypothesis in terms of key attributes, customer segmentation, and geographical targeting. Toyota initially targeted interior roominess as the ultimate attribute of the 21st-century car, next emphasized energy consumption and environment, and finally realized that silence was the key complementary criterion. Whereas the initial plan was to sell primarily in Japan, the company quickly reoriented its efforts towards the US, which showed tremendous interest.

The conceptual process does not stick to the initial brief. The critical aspect of the cases set forth above was their ability to extract out of their first product a new concept that both captured the ex post perceived identity of the first creative move and reopened possibilities for new expansion. Therefore, from the very first move, reconceptualization appeared as the central learning process—not merely a simple carryover of components or a copy of what was successful during the first trial, but a new abstraction that accounted for what was learned from the first

product launch. The Espace product was reformulated into the general attributes of the "Monospace" concept, linked with the family experience inside the car, and potentially able to be deployed on various segments. The Logan was translated into an "Entry segment" identity. This semantic work appeared as a key step to identify and capitalize what appeared ex post as the generic key characteristic of the initial project and to stabilize that new conceptual identity into a form that could drive expansion into additional products.

On the technical side, the new, expansive projects called for the reengineering of existing products, to prevent divergences in the global program: standardization imposes not only the reuse and carry-over of components for new products but also the "carry back" of new, better-engineered solutions. With respect to the Hybrid lineage, the technical side of the system expanded to both the Lexus division and the low-end segments, which implied a deep reengineering of technical solutions that once fit the Prius-specific body. The Entry lineage shifted from a monosite production process to an international multi-site production system.

First attempts also reoriented market strategy, leading to unusual and pragmatic geographical market expansion strategies —e.g., by first attacking small-but-favorable geographical markets and systematically progressing on the product range and geographical deployment. The Entry lineage management succeeded to grow its credibility and reach targets that would have been immediately killed if they had initially been described as an explicit ex-ante strategic plan. For the Prius, overseas deployment was not part of the initial plan, but appeared as a necessity after several months, and so the team quickly implemented a new "mini-development team" to develop a derivative version of the Prius for foreign markets. For the Logan lineage, other than Romania, the initial Eastern European markets appeared far less favorable than initially believed. The program immediately reoriented towards the Maghreb, Colombian and Western European markets, the latter residing outside the scope of the initial strategy.

Considering learning transmitted from the lineage to the rest of the firm, the cases provide contrasting pictures. From this perspective, the history of the Toyota Prius can be seen as an emblematic success story. The Prius project was born with the target of producing a new car while creating a new development routine, which eventually improved the entire company (in terms of both technological capability and brand). The Monospace did the same, with its architecture-specific R&D competences spreading throughout the company and the Monospace becoming a critical brand attribute. Conversely, it is questionable whether learning from the Entry program has spread beyond Dacia to the rest of the Renault group. The Entry lineage created its identity by challenging and transgressing the mother firm's common design rules, and it is difficult—even after a brilliant success—to expect a retrofit.

Finally, the life cycle notion can be used to characterize the evolution of lineage, which ends when an expansion effort declines. At that point, the firm stabilizes the evolution of the concept using a sustaining "kaizen" exploitation strategy. The exploratory dimension gives a place to platform strategy based on a stabilized theory of the market segment as the architecture and components of the product. Renault's late-1990s strategy for the Monospace concept is typical of such stabilization; each Monospace launched embodied the same identity and set of attributes, but did so a little bit better each time.

5.2. MPLM as a process of conceptualization and reconceptualization

Based on these observations, we can describe MPLM as the dynamic management of three dimensions. The first dimension is concept—the underlying concept of the lineage evolves and expands from the initial out-of-the box brief to the stabilization of a generic product range with original attributes (Table 3). The second dimension is that of design rules—the lineage demands to formalize specific development routines or "meta-rules" (Jolivet, 2003), allowing the development of products that fit the concept. The third dimension is that of technological assets—the ability to truly develop the products implies the ability to conduct ambitious technological roadmaps linked to the multi-product expansion.

Three layers of management appear to drive this exploration and exploitation journey (Table 4).

5.2.1. The corporate role

Top management frames the initial breakthrough concept (e.g., a "car for the 21st century", "a modern 5000€ car"). It legitimates the corresponding vanguard project(s) and authorizes it (them) to break the existing design rules. It also orchestrates the lineage concept with brand positioning, allowing the brand to evolve dynamically in accordance with the concept's success (e.g., Monospace became a brand attribute of Renault, and ecology became a brand attribute of Toyota) or creating a new brand (Dacia was created for the Entry concept). At a competency level, top management organizes the linkages between existing and emerging concept-specific design rules, deciding whether new routines should have an impact on the usual routines. Top management also empowers strategic technological areas related to the concept (e.g., batteries) and allows the new technological capabilities to irrigate products that do not belong to the lineage.

5.2.2. Program management role

Program management articulates a chain of projects by focusing on autonomy and expansion. Based on the information gathered during the program, program management reformulates the concept at a generic level (Entry, Zero Emission Vehicle, Hybrid, and so on) and formalizes its key attributes and next opportunities. Program management explores how to enlarge concept applicability and how to attack new segments or markets. To help the various projects to efficiently embed a new concept, program management formalizes concept-specific design meta-rules, and determines how to standardize components and integrate platform constraints. Finally, to move into technologically related areas (e.g., batteries, power train), program management activates different research projects required for the concept and secures core technologies, e.g., intellectual property.

5.2.3. Project management's role

Concept-related projects have a typical vanguard project mission. Their role is to surpass traditional dominant designs and

routines and explore how to maximize the value of a concept in a particular market segment. Concept-related projects embody a concept into specific, appealing products (e.g., the Prius, the Logan, the Twizy). They explore pragmatic ways to develop products, taking into account the meta-rules defined by the lineage program. They closely interact with research projects, which help them to fulfill their ambitious targets.

The manner in which companies conduct this exploration–exploitation journey at these three levels of coordination is clearly unstable. The Hybrid lineage took a long sequential approach, taking time to build assets and meta-rules and to expand the product line. The Monospace lineage was quite similar, taking more than a decade to rebound from its first shot and then progressively introducing the "Monospace" spirit in other products (e.g., the Scenic). The Entry and ZEV lineages embodied a more compact, concurrent exploration approach and involved simultaneous projects. The company could quickly decide to orient the MPLM towards exploitation, formalizing the successful metarules, arresting conceptual exploration, and empowering platform rationalization. It also could continue to operate the exploration levers on the same lineage, keeping the conceptual, design rules, and technological learning cycles activated.

The organizational settings are coherent with the lineage morphology. The Prius began with a tiger team and progressively became an autonomous, institutionalized program in the Toyota organization. The Zero Emission Vehicle program, which relied on a massive investment and four parallel projects, was required to be fully embedded within the R&D mother organization to leverage that organization's existing and emerging capabilities. The Entry program began with a tiger team composed of experienced engineers from the corporation that today—10 years after the first Dacia kickoff—keeps the concept moving. The tiger team remains separate from the corporation's units and routines. The Monospace lineage began as an "extra" project led by pirate engineers from Renault and Matra. As it became a core concept of the brand and Renault's products, traditional development teams progressively took the lead in developing the lineage's various products (Espace, Scenic, and so on).

6. Conclusions and future research

What is the best way to manage a multi-product, conceptual, profitable expansion? This article provides some evidence. We propose the notion of *MPLM* as a general framework for managing a multi-product sequence aimed at creating a new, original product range.

Given the diversity of the trajectories observed, we cannot establish a clear, sequential, "one-size-fits-all" model. However, we describe a mapping of the management levers that involves a three-layer management system—corporate, program, project—and characterize its role in the MPLM.

We identify three dimensions of learning that must be managed by this three-layer management system. The first dimension involves the critical task of deep work on the concept: working hard on the semantic formulation and reformulation of the underlying lineage concept given top-down strategy and bottom-up feedback and following a dynamic of conceptualization and reconceptualization. The second dimension involves a continuous formalization of the specific design rules that make a product original, making the meta-rules of a lineage explicit and evolving, maintaining their originality compared to competitors. The third dimension involves having a technology roadmap and investments oriented in coherence with the lineage program, and having the ability to articulate critical research projects related to lineage expansion.

Each instance of coordination plays a role, both in terms of exploration and exploitation, along the lineage. The manner and sequence in which each company chose to activate a given exploration or exploitation role at a given coordination level remains open for discussion.

The resulting MPLM model feeds and articulates various bodies of literature and different management models.

First, it links the design and strategizing literature with the multiproject-management literature, showing a form of program management that pragmatically and continuously frames, coordinates and selects projects. The model shows how the corporate level can both address creative programs and dynamically reformulate strategy in light of the lineage's related events.

Initiating and pursuing such expansive trajectories demands use of the classical ingredients of vanguard project management: an autonomous or semi-autonomous team, top-management support, and autonomy from established design rules. In that respect, concept-driven projects invite us to rediscover the roots of project management (Lenfle and Loch, 2010) from a multiproject perspective.

The concept-based approach feeds the learning-by-project literature (Brady and Davies, 2004). It specifies how a vanguard project's knowledge spillovers can be reused and pursued (Bommer et al., 2002; Brady and Davies, 2004). Lineage management is not just a matter of shifting from an initial exploratory project to subsequent exploitation projects or a question of project-to-project learning because all of the projects of a lineage potentially contribute to the global learning dynamic. Lineage management also creates a general frame into which the notions of technology transfer and platform rationalization can be fit to contribute to global expansion.

The concept-based approach also contributes to the ambidexterity literature, complementing recent findings in project-based-organizations (Eriksson, 2013). Our results confirm that both structural and contextual forms of ambidexterity are relevant to expand a lineage. Ultimately, the critical issue is consistency among the three coordination layers (project, program, corporate). For example, a structural differentiation between the lineage organization and the traditional organization is relevant if the company intends to have two brands.

On the practical side, this article identifies a new frontier for project-based organizations that wish to develop ambitious innovation strategies. It calls to overcome the typical project-by-project routines and program and platform processes, to implement post-launch processes that can realize the full potential of the company's initial move. This calls for another dialog about firm strategy with the lineage management team, from top-down control and selection of projects to dialectic control between the emerging

strategy and project–generated knowledge. Otherwise, companies will only see risky projects, not realize them, or stop them at the very moment when they could be expanded.

This article and its proposed model open wide avenues for future research. The MPLM model goes far beyond the automotive industry, the empirical basis of this article. The model could be explored. For example, the case of pharmaceutical industry seems very challenging: each development is generally managed as a stand-alone project with a complete reset of the process as soon as there appears a deviation from the therapeutic hypothesis. The MPLM could invite pharmaceutical firms to go beyond the one-time approach. It would also be interesting to study very exotic paths that show more intense, continuous expansion. The consumer-electronics industry could be a good candidate for such a study, given its fast pace of product and concept renewal.

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Appendix A

Table 2
Data sources.

	Secondhand data	Database (sales)	Interviews
Monospace	Internet; archives	Database global insight	5 Interviews at OEM
Hybrid	Literature (Itazaki, 1999)	Database global insight	–
Entry	Literature (Midler et al., 2013)	Database global insight	40 Interviews at OEM Internal documents
Zero-Emission Vehicle	Internet; archives; literature (Midler et al., 2010)	Database global insight	Action research since 2007 [2]

[2] A collaborative research with the firm has been conducted by the authors and research team. Since the initiation of this disruptive project, the purpose has been to experiment and evaluate new management methodologies that appear necessary to implement it.

Table 3
Concept dynamic: a conceptualization and reconceptualization process.

Initial brief	Identity of first product	Generic concept	Other products of the lineage
Car of the 21st century	Prius	*Hybrid*—having a hybrid saves the planet	Prius 1, 2, 3; Corolla, Yaris; Highlander
An American van for Europeans	Espace	*Monospace*—cars families love to live in	Twingo; Scenic 1, 2, 3; Espace 2
A modern, safe and reliable car for 5000€ for Eastern Europe	Logan	*Entry*—robust cars with only the necessary features	Sandero; Duster; Stepway; Lodgy
Electric-vehicle project	Fluence, Kangoo	Zero-emission cars	Zoé, Twizy

Table 4
MPLM management principles.

Dimension of MPLM	Level of management	Corporate-specific activity	Program-specific activity	Project-specific activity
1—Concept	Exploration	Formulate a strategic, out-of-the-box conceptual brief (“car for the 21st century”, “a modern 5000€ car”)	Explore how to enlarge the concept applicability and how it can attack new segments and markets	Vanguard project, exploring how to make the concept break down the dominant design
	Exploitation	Articulate the lineage concept with the brand concept	Reformulate the concept at a generic level (Entry, Zero Emission Vehicle, Hybrid) and formalize its key attributes and later opportunities	Embody the concept into a specific, appealing product (Prius, Logan, Twizy)
2—Design rules	Exploration	Authorize the program to break existing design rules	Formalize concept-specific design meta-rules	Explore pragmatic ways to develop the product
	Exploitation	Orchestrate the linkages between existing and emerging concept-specific design rules	Standardize components, integrate platform constraints	Translate the concept-specific meta-rules at a product level
3—Technological assets	Exploration	Empowering strategic technological areas related to the concept e.g., batteries	Activate, coordinate and ocxxrient different research projects required for the concept	Make explicit the technological requirements, pull the research projects
	Exploitation	Cause the new technological capabilities to irrigate products that do not belong to the lineage	Secure the core technologies, e.g., intellectual property.	Quickly integrate the research outputs and quickly prove technologies

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