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Contributions of Design Thinking to Project Management in an Innovation Context

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ABSTRACT

Researchers have long recognized that standard approaches to project management are ill-suited to address changes in the environment or business needs, particularly in innovative contexts characterized by uncertainty and complexity. Instead of being concerned with the efficient implementation of a deliberate strategy, a project in such a context becomes a process for strategy formulation. Three imperatives for project management arise as a result: managing the explorative phase, managing the involvement of stakeholders in the project, and managing the project in relation to the strategizing process of the firm. We propose that design thinking, a recent evolution in the field of design, can make some important contributions to these imperatives. Design thinking has been highlighted by practitioners as well as academia as a novel methodology that is potentially valuable for improving innovative outcomes, whether they are products, services, or strategies. We examine and articulate these possible contributions through 10 propositions that could form an agenda for future experimentation and empirical research on innovation project management.

KEYWORDS: project management; design; innovation; uncertainty; design thinking

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INTRODUCTION

The literature and professional guidance on project management have long remained rooted in a mechanistic paradigm of control, explicitly assuming that project management only begins once the requirements are defined. In this paradigm, project management is a set of concepts, tools, and techniques on how to execute projects on time, within budget, and to required customer specifications within the context of an explicit company strategy (Morris, 2013).

This approach to project management is ill-suited to address changes in the environment or in business needs (Morris, 2013; Shenhar & Dvir, 2007). Researchers (Brady & Davies, 2004; Brady, Davies, & Nightingale, 2012; Lenfle, 2008; Loch, De Meyer, & Pich, 2006) point out that in innovative contexts where uncertainty is prevalent, such as in large and complex projects or new markets, this approach results in poor performance. In such contexts, problems are initially ill-structured and neither technologies nor customer requirements are necessarily known at the start. Hence, the basic assumptions of standard project management do not hold. This is particularly problematic, because in a world characterized by rapid change, intensive innovation, and increasing complexity, such uncertain contexts are becoming the norm rather than the exception.

Therefore, in such contexts, the role, the basic assumptions, and the purpose of project management are fundamentally redefined: From the efficient implementation of a deliberate strategy, the project becomes a process for strategy formulation. From operative, it becomes creative.

Three streams of work have emerged in the project management literature to redefine project management in such contexts: (1) A first stream has highlighted the importance of an exploration phase in projects to allow requirements and specifications to emerge through learning and trial and error (e.g., Atkinson, Crawford, & Ward, 2006; Lenfle, 2008); (2) a second stream has highlighted the critical role of stakeholders and the need to mobilize them to build the political context in which the project will develop (Eskerod, Huemann, & Savage, 2015; Eskerod & Vaagaasar, 2014; Morris, 2013); and (3) a third stream has highlighted the need to link project management to firm strategizing by, for example, replacing project management within the broader concept of knowledge creation through multiproject portfolio selection approaches (Artto & Kujala, 2008; Cooper, Edgett, & Kleinschmidt, 2001; Korhonen, Laine, & Martinsuo, 2014; Midler, 2013; Midler & Silberzahn, 2008; Petit & Hobbs, 2010; Teller, Koch, & Gemuenden, 2014).

Yet, relatively little work has been done on the practical approaches and tools that should be used in this renewed perspective. We argue in this article that recent developments in design theories and practice, especially design thinking, can address this gap and make a valuable contribution.

Design thinking has been highlighted in practitioners' publications (e.g., Brown, 2009; Kelley & Littman, 2006; Liedtka & Ogilvie, 2011; Martin, 2009) as well as in academic ones (Glen, Suciu, & Baughn, 2014; Gruber, de Leon, George, & Thompson, 2015; Johansson-Sköldberg, Woodilla, & Çetinkaya, 2013; Liedtka, 2014; Seidel & Fixson, 2013) as a novel methodology and a potentially valuable practice for improving innovation outcomes, whether those outcomes are products, services, or strategies. Design thinking is a structured process of exploration for ill-defined problems. According to Lockwood (2009), it is "a human-centered innovation process that emphasizes observation, collaboration, fast learning, visualization of ideas, rapid concept prototyping, and concurrent business analysis."

Its practice and thought process aim to bring designers' principles, methods, and tools to management and business strategy (Brown, 2008). We intend to illustrate how design thinking can provide project management with new perspectives for addressing innovation challenges; by doing this, we highlight and address the following gap: both fields have experimented parallel trajectories and yet did not engage in any conversation despite the proximity of the questions addressed. Both fields emerged from practice. Project management has now developed into an academic field of its own, and design thinking is following the same path. Although most articles developing theory on design are still found mainly in design journals, articles on the topic have started to appear in management journals such as the *Journal of Product Innovation Management*, *Creativity Innovation Management,* and the *Academy of Management Journal*. Design thinking has been attracting the interest of management scholars only since the beginning of the 2000s (Johansson-Sköldberg et al., 2013). In fact, 80% of management publications that mention the term *design thinking* in their abstracts date from after the year 2000.

Design thinking and project management are both evolving rapidly as transformation factors and processes in firms and the economic landscape change. Both fields are anchored in a practice characterized by methods and tools, but they are moving beyond that operational perspective toward a strategic one. Academics and practitioners view the two fields as a way to manage organizations: managing by projects and managing by design. They are both highly associated with knowledge workers: Designers and engineers are either integrated within a firm or act as independent consultants. In both cases, professional associations play a critical role in the development and diffusion of the practice. Both design thinking and project management are integrative approaches and both claim to enhance and improve organizational outcomes as related to innovation.

Such dynamics create opportunities for fruitful cross-learning between the two fields in terms of tools and methodologies. As project management more and more comes to address creative issues in the upstream of projects, design approaches can be mobilized. As the design field grows from being centered on individual creative tasks to engaging in collective design through small teams and incorporating more strategic innovation issues as part of the firm's scope, its contribution to multiproject and firm levels develops as well.

Yet despite these similarities and the potential for mutual learning between the two fields, one finds no cross-references between them. The few articles in project management peer-reviewed journals (e.g., *International Journal of Project Management*, *Project Management Journal*®, and the *International Journal of Managing Projects in Business*) that address design deal with construction and architecture specifically and not design thinking or design management. On the other hand, of the 110 articles from management peer-reviewed journals that mention design thinking in their abstracts, only 10 mention project management and, generally, it is done only in a generic sense. In this article, we intend to launch a conversation between design thinking and project management within an innovation context.

The article is organized as follows: We start by highlighting the specific imperatives for project management in the context of innovation. Then, we examine design thinking through three different perspectives: cognitive, social, and organizational. Based on this examination, we propose how design thinking can make valuable contributions to address the imperatives of project management in innovative contexts and suggest future research that should empirically investigate these propositions.

The Challenges of Project Management in an Innovation Context

The Limits of the Standardized Approach of Project Management in Innovative Situations

Project management is a performance-oriented practice aiming at the constitution, coordination, and control of activities within a project (Blomquist, Hällgren, Nilsson, & Söderholm, 2010). Project management was gradually developed and formalized in the 1950s by shifting from the singularity of individuals (architects or engineers) to standardized rationalization.

The same methods were then applied to many complex projects in the fields of defense, space, construction, information technology, and so on. Thus, project management became a management model where differences

between sectors were perceived as less important than common values such as meeting tight deadlines, coordinating a large number of contributors, controlling costs, and so forth (Söderlund & Lenfle, 2013). The model involves methods and techniques that were mainly developed and mastered by engineers (Pinney, 2001; Scranton, 2015). It distinguishes between two main phases: planning and implementation. Planning consists of a specific delimitation of the project scope: the tasks, the resources required, the budget, the scheduling, the risks, and so on. Implementation involves the identification of deviations from the planned budget and schedule using a set of measures (task execution and earned value management). In the project management view, resources should be optimized for a stated goal, and clearly defined specifications are assumed not to change during the course of a project.

This approach to project management, which is based on a predictable, relatively simple, and rational model, is largely decoupled from changes in the environment or in business needs (Morris, 2013; Shenhar & Dvir, 2007) and has been challenged by researchers, who observe that in contexts where uncertainty is prevalent, such as large projects or new markets, it has resulted in poor performance. This is because in such contexts, problems are initially ill-structured and neither technologies nor customer requirements are necessarily known at the start, so the basic assumptions of standard project management do not hold. In today's world, characterized by rapid change, intensive innovation, and increasing complexity, uncertain contexts are becoming the norm rather than the exception.

Projects and Exploration

Klein and Meckling (1958) highlighted the limits of the project management's optimization perspective with projects in uncertainty. Midler (1995) and Lundin et al. (2015) pointed out that for projects in an uncertain situation, management is about balancing learning about the project with executing decisions through in a limited time process. Turner and Cochrane (1993) suggested that projects should be distinguished on the basis of how well the goals and the methods of achieving them are defined. In the specific case of product development projects, Clark and Wheelwright (1992) argued for the necessity of adapting project management methods according to the extent of change in product and process.

Boutinet (2004) characterized projects as a specific human way of dealing with future and uncertain actions, and showed how the project approach could be applied to many different domains of human activity, from construction and industrial projects to social and political ones. Acknowledging this diversity, contemporary research on project management (Loch et al., 2006; Shenhar, 2001) criticized the one-size-fits-all approach. Shenhar and Dvir (2007) proposed a typology of projects based on novelty, technology, complexity, and pace, highlighting the innovation dimension.

Loch et al. (2006) and Lenfle (2008) went beyond the classification perspective and suggested specific project management methods for projects with high uncertainty—that is, "exploration" projects, for which neither technologies nor customer requirements are known at the start. Exploration projects, referred to by Atkinson et al. (2006) as "soft" projects, are characterized by experimentation in uncertainty, and their primary objective is knowledge creation.

Lenfle (2008) showed how this type of project challenges the standard "rational" view of project management as the accomplishment of a clearly defined goal in a specified period of time and within budget and quality requirements in five distinct ways: (1) Exploration projects are emerging and strategically ambiguous; (2) there is no explicit demand and therefore no clearly identified client; (3) there are no specifications, nor a clearly defined objective at the start of the project; (4) the team will have to explore and develop new knowledge; and (5) these projects have a specific temporality that mixes objectives to be achieved on short term as well as long term horizon. There are necessarily managerial implications for such projects. Lenfle (2008) pointed out that: (1) Experimentation and concurrent exploration play a central role, as opposed to scheduling and task breakdown, which are impossible with constantly changing objectives; (2) there are two different dimensions of performance (the value of the products and the accumulated knowledge explored) to take into account (Maniak, Midler, Lenfle, & Le Pellec-Dayron, 2014); and (3) a reformulation of the objectives is allowed along the way. Broadly speaking, in this context, project management moves toward an approach that is much more creative and open-ended than optimizing. But little conceptual work has been done in the project management field to define how this might be done.

Project Strategy and Project Stakeholder Management

As the previous section has suggested, an important development in the project field is the enlargement from an engineering view to a broader business and strategic perspective. In general, as a result of a recent reorientation of strategy research on the everyday activities of strategists (Jarzabkowski & Spee, 2009), there is a need for research to provide intellectual ground for bringing strategizing and project management closer together. Projects may constitute the action needed to realize intended strategies. The need to improve the link between projects and strategy is highlighted by recent research (e.g., Cattani, Ferriani, Frederiksen, & Täube, 2011; Kaplan & Orlikowski, 2013; Manning & Von Hagen, 2010; Sicotte, Drouin, & Delerue, 2014).

This development of strategy in project management has two different implications. The first is the need to

introduce a strategy perspective into the management of a single project. Artto and Kujala (2008) show that, depending on its situation in the environment, a project cannot always be the vehicle for implementing its parent strategy. In a complex environment with an unclear governance scheme (especially for megaprojects), a project's strategy is self-originated and related to its own governance (Floricel & Miller, 2001; Flyvbjerg, Bruzelius, & Rothengatter, 2003; Miller & Lessard, 2001).

The ongoing development of the literature on project stakeholder management (Eskerod et al., 2015; Eskerod & Vaagaasar, 2014; Eskerod & Jepsen, 2013; Jepsen & Eskerod, 2009), and project governance (Müller, 2012) within the academic project community reflects such "upstreaming" dynamics of project management to strategic issues.

Project Business and Projectification to Address Strategic Issues

The second implication is the recognition of the importance of projects and project management to the business strategy of firms or modern organizations. In fact, projects are the core business matrix for many sectors, such as construction, consulting, and engineering. In mass-production sectors such as manufacturing, innovation-based competition creates a context where the number of projects increases their importance as a strategic capability.

Since the 1990s, the development of the project management field has expanded beyond the project manager–centric and single-project approach to a perspective where projects are managed within organizations and society (Lundin et al., 2015; Morris, 2013). Morris's (1997) book, Lundin and Söderholm's (1995) paper on temporary organizations, and Midler's concept of the projectification of the firm (1995), as well as the literature on complex projects (Hobday, 2000; Miller & Lessard, 2001) and project business (Artto & Wikström, 2005; Davies & Hobday, 2005), all constitute landmarks in this domain. They analyze how project-based firms are structured to cope with project business specificity (Söderlund & Tell, 2009, 2011).

This perspective goes beyond the project to address links between projects (which are temporary) and the permanent organization. Research addresses the connection between the management of projects and a firm's strategy with developments such as program management (Maylor, Brady, Cooke-Davies, & Hodgson, 2006) for better multiproject coordination, organizational learning within and through projects (Brady & Davies, 2004; Lundin & Midler, 1998; Schüßler, Wessel, & Gersch, 2012), and project management offices (Hobbs, Aubry, & Thuillier, 2008). The concept of project lineage management, inspired by CK design theory (Le Masson, Weil, & Hatchuel, 2010) was introduced (Midler, 2013; Midler & Silberzahn, 2008) to address the issue of managing a sequence of projects associated with a firm's strategizing process.

Conclusion

We identified three streams of work that have emerged in the recent project management literature to improve project management in innovative contexts: (1) A first stream has highlighted the importance of an exploration phase in projects to allow requirements and specifications to emerge during the life of the project through learning and trial and error; (2) a second stream has highlighted the importance of the stakeholder dimension and the need to mobilize stakeholders to build the political context in which the project will develop; and (3) a third stream has highlighted the need to link project management to strategizing at the firm level.

These three streams, however, lack effective methodologies, tools, and professional attitudes that could enable the implementation of these recommendations. In the following section, we examine how the field of design can help address this lack.

Design Thinking: From a Problem-Solving Method to an Innovation Capability

In the following sections, we examine the field of design with a focus on one of its recent developments, design thinking, because of its ambition to contribute to the field of management in general.

Design as the Field of Innovation

According to Simon (1969), design is the process by which we devise courses of action aimed at changing existing situations into preferred ones through the creation of artifacts—objects created by humans through creative reasoning. Design is concerned with innovation: It is the science of the artificial (Simon, 1969). In this sense, it is different from other cognitive approaches such as decision making because it requires us to define the options among which the choice and the optimization is realized.

For a long time, design was considered the creative activity whose aim was to determine the formal qualities of manufactured objects (Maldonado & Cullars, 1991). Loewy renewed this perspective by emphasizing the functionality dimension through industrial design. The Bauhaus (Droste, 2002), a landmark in the academic field of design that was founded in 1919 by Walter Gropius, is generally considered the birthplace of design that went beyond the pure aesthetic and artistic perspective. It was based on the union of all arts and crafts. Gropius developed a craft-based system of teaching that aimed at developing skills, resulting in the creation of useful and beautiful artifacts for mass-production products that achieved functional and aesthetically satisfactory design. In Gropius's thinking, designers were to integrate the materials and colors as well as the artistic, the visual dimension, and, progressively, the technology. They were encouraged to produce their own creative designs based on their subjective perceptions. Though the Bauhaus school existed for only 14 years, it had

a strong influence on design and structured the field's future practice.

Beyond form, aesthetic, and functionality, design is also about sense-making and meaning: "Something must have form to be seen but must make sense to be understood and used" (Krippendorff, 1989, p. 14). Hence, to design is to make sense of things (Verganti, 2009).

Design moved progressively from the world of products to other situations that involve humans and require the understanding of their behaviors, attitudes, and emotions. Therefore, the outcome of a design process can be a graphic, a shape/form, a product (tangible or intangible), a system, an interaction, an interface, or an experience. Whatever the outcome is, it is designed to solve a problem and answer any dislikes experienced by users.

Design methods can be compared to and contrasted with the models of reasoning and the processes adopted by engineers in their own design activities (Chakrabarti & Blessing, 2014), such as parametric design, rooted in the German engineering community for complex machines, and systematic design (Pahl & Beitz, 2006) for "science-based products" such as electrical machines (Le Masson et al., 2010). They suggest a sequential process: an initial step to clarify the task, a second phase of conceptual design, a third phase of "embodiment," and a last step of detailed design (Ulrich & Eppinger, 2004). This rigorous sequencing can be seen as a way to focus on the specificity of the problem to be addressed—in other words, complex assembly designing. Increasingly, however, engineers have to deal more and more with ill-defined problems characterized by high uncertainty (related to either technology or the market), such as with smart cities or electrical vehicles. Le Masson, Hatchuel, and Weil (2011) designate these situations as "innovative design situations" that require a specific design process that acts as an interplay between two spaces: the space of concepts (C) and the space of knowledge (K) (Hatchuel & Weil, 2002, 2009). This design theory (CK) goes beyond traditional problem-solving models by proposing an analytical formalism for open-ended exploration reasoning, where knowledge as a space for exploration expands during the process. This relatively recent theory has rapidly expanded within the engineering design academic community and has generated applied developments in various sectors of industry (Chakrabarti & Lindemann, 2015; Le Masson et al., 2010).

Defining Design Thinking

Simultaneously to the development of this design theory (CK), design thinking originally developed with the objective of "bringing designers' principles, approaches, methods, and tools to problem solving" (Brown, 2009). However, design thinking has conceptual foundations. It was opposed to linear and analytical problem-solving approaches that are unlikely to resolve "wicked" problems (Rittel, 1972) that lack both definitive formulations and solutions and are characterized by high uncertainty and ambiguity. These situations require an uncertainty reduction strategy that can be achieved through a learning-focused, hypothesis-driven approach (Beckman & Barry, 2007; Owen, 2007; Schön, 1982); this learning associates abstract reasoning with action in order to launch a "reflective conversation with the situation" (Schön, 1982).

According to Liedtka (2014), design thinking "is a hypothesis-driven process that is problem, as well as solution, focused. It relies on abduction and experimentation involving multiple alternative solutions that actively mediate a variety of tensions between possibilities and constraints, and is best suited to decision contexts in which uncertainty and ambiguity are high. Iteration, based on learning through experimentation, is seen as a central task."

Design thinking simultaneously addresses the desirability of the solution, its technical feasibility, and its viability—that is, its ability to be converted into customer value and market opportunity (Brown, 2008). According to Brown (2008), design thinking is a system of spaces rather than a predefined series of orderly steps. Design projects pass through three spaces: inspiration, ideation, and implementation. Projects will loop back through these spaces—particularly the first two—more than once as ideas are refined and new directions taken.

For Lockwood (2009), design mobilizes diverse and practical approaches such as observation, collaboration, fast learning, the visualization of ideas, rapid concept prototyping, and concurrent business analysis. Finding needs and dislikes especially relies on a variety of ethnographic research techniques, such as participant observation, job-to-be-done analysis, and journey mapping. Following Liedtka (2014), we will focus on three phases that occur iteratively in cycles: (1) an initial exploratory phase focused on data gathering to be inspired, identifying user needs, and defining the problem as a hypothesis to be explored; (2) a stage of ideas and concepts generation; and (3) prototyping to experiment and implement the concepts proposed as an answer to the hypothetical problem. Table 1, inspired by the work of Liedtka (2014), presents the common design thinking tools and the tasks they achieve.

Design thinking moves design upstream in the innovation process and involves players other than designers, such as users and other stakeholders. It aims to go beyond the design of artifacts and to contribute to the organization's strategy. It is, therefore, of interest to all managers (Lafley, Martin, Rivkin, & Siggelkow, 2012; Liedtka, King, & Bennett, 2013; Liedtka & Ogilvie, 2011; Martin, 2009).

The Three Perspectives of Design Thinking

From the literature, design thinking can be presented through three

Visual or narrative elements: charts and graphs, storytelling, use of metaphor and analogies, and so on
Deep understanding of users: observing and interacting with them in their native habitat (ethnography, qualitative research methods, participant observation, interviewing, journey mapping, job-to-be-done analysis, and so forth)
Structured collaborative work: mind mapping to facilitate drawing insights from ethnographic data and to create a "common mind" across team members, using collaborative ideation such as brainstorming and concept development techniques
Identifying assumptions: assumptions around value creation, execution, scalability, and defensibility that underlie the attractiveness of a new idea
Prototyping: techniques that facilitate making abstract ideas tangible (storyboarding, user scenarios, metaphor, experience journeys, business concept illustrations, and so on)
Field experiments: testing the key underlying and value-generating assumptions of a hypothesis in the field with stakeholders

Table 1: Common design thinking tools and the tasks they achieve (Liedtka, 2014).

perspectives: (1) a cognitive perspective referring to the creative and explorative activity of design, (2) an organizational perspective referring to the stakeholders involved in the design process, and (3) a strategic perspective referring to the strategic process of the organization and more generally to a managerial capability.

Cognitive Perspective

The first perspective focuses on the learning dimension of the design process. Intensive innovation contexts characterized by high complexity and uncertainty require going beyond an analytical problem-solving approach and call for creative processes that enable the exploration of new domains and the acquisition of new knowledge. They are a class of social problems with a fundamental indeterminacy without a single solution (Buchanan, 1992). Design thinking proposes a hypothesis-driven process that is problem, as well as solution, focused and is based on conducting research to inspire better hypotheses to test.

Going beyond the learning and hypothesis-driven approaches in characterizing the cognitive perspective, Liedtka (2014) claims that design thinking improves design outcomes because its tools and attitudes address and mitigate the cognitive biases that strongly impact any creative process and represent flaws that can result in failures. More specifically, she identifies nine biases sorted into three categories.

The first relates to decision makers' inability to see beyond themselves and escape their own pasts (projection bias), their current state (hot/cold gap), their personal preferences (egocentric empathy gap), and their tendency to be unduly influenced by specific factors (focusing illusion). Collecting deep data and improving the ability to imagine the experiences of others can help mitigate this category of biases.

The second category relates to the inability of users to articulate their future needs and provide accurate feedback on new ideas, making it difficult to develop value-creating ideas for them (say/do gap). Through journey mapping and participant observation, for instance, design thinking helps improve users' ability to identify their own needs.

Finally, the third category of biases relates to flaws in decision makers' ability to test the hypotheses they have developed. By working with multiple options and reflecting on the results of real experiments, design thinking can help mitigate such biases.

Organizational Perspective

Design is not just a cognitive activity; it is also a collective one that involves and accommodates the participation of different stakeholders. These stakeholders may be internal (within the team and more broadly within the firm) or external. Hence, the social dimension is critical for design. Krippendorff (2006) observes that design relies on two types of intertwined understanding: of the artifact being proposed and of stakeholders' understanding of this artifact. Krippendorff (2011) also emphasizes the fact that artifacts are created in networks of stakeholders among which the "end user" is one stakeholder among others. Indeed, the stakeholders can be representatives from several specialties involved in the creative process. According to Krishnan and Ulrich (2001), designing an artifact involves making decisions about aesthetics, technology, and meaning, all of which require strong interactions between design, marketing, and technology within the new product development team (Perks, Cooper, & Jones, 2005). Research has highlighted that strong interactions between R&D, marketing, and designers and the designation of multidisciplinary team results in successful processes and innovative products (Borja de Mozota, 2003; Crawford & Di Benedetto, 1991; Hooge & Dalmasso, 2015; Ulrich, 2011; Veryzer & Borja de Mozota, 2005).

A key aspect of design thinking's explorative potential comes from the fact that it relies on empathy (Brown, 2008): the ability to imagine the world from multiple perspectives—those of colleagues, clients, end users, customers (both current and prospective), and all parties involved.

Stakeholder involvement is achieved through various tools and practices: ethnographic studies, the early realization of prototypes to test design hypotheses, the setting up of so-called "living labs" where real-life situations are simulated

and observed to create insight into users' needs and expectations, and so on. Space is also an important way to ensure stakeholder mobilization. The seminal experience of the Bauhaus school (Droste, 2002) highlighted the importance of diverse teams mixing artistic and technical profiles and being located in the design studio, a key space for exchanging visions and knowledge and challenging creative propositions. This is why an important development in design is taking place around "spaces" such as co-working places, fablabs, and living labs (Fabbri & Charue-Duboc, 2013; Magadley & Birdi, 2009).

Strategic and Management Capability Perspective

Product design was largely ignored by management scholars for many years (Bloch, 2011). More recently, research on product design has highlighted how design can provide firms with a differentiation factor and value driver (Borja de Mozota, 2003). Empirical evidence has shown the positive impact of design on performance and value creation (Chiva & Alegre, 2009; Hertenstein, Platt, & Veryzer, 2005). Krippendorff (2006) and Verganti (2009) show that design has the ability to provide new meanings to artifacts, which is also an important driver in value creation. As a result, the integration of design as a business capability of a firm is now increasingly being investigated. Recognizing this strategic role, researchers point out the importance of diffusing design practices and orientation throughout the firm, beyond the specific scope of innovation (Borja de Mozota, 2003; Gorb, 1990; Vervaeke, 2009). Design is becoming more a culture attribute than a specialized expertise.

Recent developments in design thinking claim that it needs to move "upstream," where strategic decisions are made (Brown, 2009). Brown (2009) calls for design to be dispersed throughout the organization and beyond the sole designers: "design has become too important to be left to designers."

Indeed, scholars interested in design such as Simon (1969), Schön (1982), and Hatchuel and Weil (1995) have long shown the analogy between designing and managing. Along this same line of thought, Boland and Collopy (2004) argued that managers are designers as well as decision makers. Managers need to adopt a "design attitude" that complements analytical perspectives and methods. Indeed, managers and especially executives have to deal with decisions under circumstances of uncertainty and ambiguity: They address messy and ill-structured situations for which analytical thinking is not suitable and, therefore, they can benefit from design thinking as a way to approach indeterminate organizational problems (Martin, 2009). This approach has led to the creation of a toolkit for managers (Liedtka & Ogilvie, 2011) that can be applied in several situations (Liedtka, King, & Bennett, 2013) such as post-merger integration, rethinking strategic planning, industry collaboration, and so forth.

Conclusion

As we have noted, design thinking addresses complex problems in uncertain contexts and mobilizes tools and attitudes to that end.

Design thinking is a problem "defining and solving" approach that deals with ill-structured situations where the problem is not articulated and is considered a hypothesis where action stimulates thoughts to inspire better hypotheses.

Design thinking emphasizes the need to involve the various stakeholders in the innovation process and proposes methodologies, tools, and processes for easing their interactions.

Design thinking is a strategic capability that contributes to value creation based on a generic managerial competency.

With all this in mind, we now examine the extent to which design thinking could, through these perspectives, contribute and help address the challenges encountered by project management in innovative situations.

Contribution of Design Thinking to Project Management in Innovative Situations

The first section of this article identified three major challenges and limitations that project management encounters in innovative situations: exploration, stakeholder involvement, and firm strategizing.

The second section presented design thinking as following three perspectives: a cognitive one referring to the creative and explorative activity of design, an organizational one referring to the stakeholders involved in the design process, and a strategic one referring to the strategic process of the organization and more generally to managerial capability.

We suggest that design thinking can strongly contribute to addressing the three challenges encountered by project management and presented in the first section. In the following sections, we will examine how design thinking can provide significant contributions and we present propositions calling for further research to investigate these potential contributions empirically.

Exploration

Lenfle (2008) characterized projects in an innovation context as exploration projects and highlighted their ambiguity and the absence of an established problem formulation. This characterization is very similar to situations in which the design thinking process is specifically well suited. It is best suited to decision contexts in which uncertainty and ambiguity are high (Liedtka, 2014).

> *Proposition 1: Exploration projects or projects characterized by high uncertainty are wicked problems similar to those for which design thinking is relevant.*

Research on project management (Atkinson et al., 2006; Loch et al., 2006)

has highlighted the critical role of learning and knowledge acquisition through experimentation in order to reduce the uncertainty of situations. Lenfle (2008) pointed out the need for iteration and rearticulation of project objectives along the way. McGrath and MacMillan (1995) suggested that managing an exploratory project is a discovery-driven approach that consists of identifying and articulating hypotheses that will be transformed into validated knowledge through experimentation (Conforto et al., 2014).

Because of its emphasis on learning and knowledge acquisition to identify and articulate several hypotheses that will further be tested, design thinking is well suited for managing exploration projects.

Proposition 2: Through its focus on learning, hypothesis identification, and articulation regarding the problem before searching for solutions, as well as its emphasis on experimentation, design thinking can contribute to the exploratory dimension of projects.

Proposition 3: Through its tools supporting deep data collection and idea generation that encourage managers to work with multiple options such as generating and evaluating multiple hypotheses and moving multiple solutions into active testing, design thinking represents an effective and practical approach to manage the exploratory dimension of projects.

Design thinking tools are an effective way to frontload problem and risk detection (Thomke, 1998).

Stakeholder Involvement

Managing projects in an innovation context requires the adoption of a specific stakeholder management approach to identify stakeholders dynamically. Innovations developed within ecosystems and platforms (e.g., Gawer & Cusumano, 2002) put a strong emphasis on this issue. Identifying and involving the relevant stakeholders in the upstream phase of a complex and uncertain project has been recognized, by project management scholars, as one of the key challenges to avoid drifts of projects. Design thinking is a user-centered approach that includes a wide perspective of stakeholders, be they internal (within the team and more broadly within the firm) or external.

Proposition 4: Based on its strong and wide user-centered orientation, design thinking can help address stakeholder management within the exploration project phase.

Design thinking emphasizes the iterative identification of stakeholders and promotes frequent and rich interactions with them, involving several artifacts such as stimulators to develop empathy (Ben Mahmoud-Jouini, Midler, Cruz, & Gaudron, 2014). Design thinking tools involve qualitative methodologies, visualization, ethnographic approaches, journey mapping, and personae characterization that help the players involved in the design process better imagine and apprehend the experiences of the stakeholders, which can help mitigate the effects of the say/do gap (Liedtka, 2014).

Proposition 5: Through the use of tools that enable rich and multiple interactions with users (personae) and favor empathy, design thinking represents an effective and practical approach for achieving stakeholder identification and involvement in exploration projects.

Design thinking also emphasizes the mobilization of a multidisciplinary team in order to develop a wide understanding of the problem and to favor interaction and knowledge combination, resulting in innovative ideas. Through the use of rapid prototyping that results in demonstrators, design thinking enables effective dialogue and understanding to reveal the unstated needs and expectations of stakeholders. It also highlights the critical role of colocation and sharing a common physical space, which favors interactions and quick communication, as in design studios (Schön, 1982). In such spaces, interaction between stakeholders is eased.

Proposition 6: By emphasizing the diversity of the team involved in the design process well beyond the designers, the artifacts, and the space they share, design thinking represents an effective and practical approach for managing stakeholder interactions in exploration projects.

Strategizing

At this level, we are concerned with the challenge of project strategy formulation. Artto and Kujala (2008) introduce four types of strategies for a project (obedient servant, independent innovator, flexible mediator, and strong leader) depending on two dimensions: the project's independence and the number of strong project stakeholder organizations. The challenge of project strategy formulation is to analyze the project context, formulate the type that fits the environment, and structure project governance and management in line with the chosen type. Artto and Kujala (2008) show that in a complex environment with an unclear governance scheme (especially for megaprojects), project strategy is often self-originated. Design thinking is a hypothesis-driven process that is problem, as well as solution, focused, which means that it does not define the problem to be solved at the outset. Defining the problem to solve—and thereby articulating the project's strategy—is indeed a critical task for design thinking.

Proposition 7: By starting with a problem definition phase, design thinking can contribute to the articulation of the project strategy.

In addition, through the collection of deep data and the articulation of multiple assumptions to be tested simultaneously, design thinking ensures that multiple options are considered before the problem to be addressed is articulated.

Proposition 8: Through its tools and the attitudes it promotes, design thinking

ensures that multiple options will be considered and tested. Because of this, it represents an effective and practical approach for defining and articulating the project strategy.

Modern strategy emphasizes learning processes as a key dynamic capability of a firm. How this capability can be developed, however, is not well addressed. Project management is clearly an interesting candidate for bridging this gap. But to do so, it needs to develop a larger perspective on strategic issues. Design thinking can provide inputs in this perspective. It provides a method for creating knowledge on strategic orientation through, for example, needs findings and inspiration. This knowledge is documented and capitalized within the design studio where the process usually takes place—in other words, beyond the projects themselves.

Proposition 9: Design thinking tools provide a firm-level capitalization vehicle that enables the reuse of knowledge from one project to another.

Finally, by addressing the key issue of meaning (Verganti, 2009) in the innovative effort, and thus enlarging value from a functional to a symbolic dimension, design thinking contributes both to strategy orientation and strategy formulation.

Proposition 10: Design thinking complements the traditional project management analytical and functional perspective by emphasizing the meaning of the innovative project. By doing so, it makes an important contribution to strategy orientation and formulation.

The recognition that design is an important driver for value creation has led to its integration as a business capability of firms. Recognizing this strategic role, researchers have pointed out the importance of diffusing design practices and orientation throughout the firm, beyond the specific scope of innovation (Borja de Mozota, 2003; Gorb, 1990; Gruber et al., 2015; Vervaeke, 2009). The idea is that design is more a cultural attribute of a firm than a specialized expertise: It needs to move upstream, where strategic decisions are made (Brown, 2009). Yet, for the firm-level stakeholder dimension, design thinking has not developed tools and concepts to go beyond a generic imperative, and little research exists that explores the strategic contribution of design thinking at the firm level in relation to innovative project management.

Hence, design contributes most to two particular project management challenges: the exploration challenge and the stakeholder challenge. Potential contributions also exist for addressing the strategy formulation challenge, although such contributions need to be more specified and call for further research.

Conclusion

The aim of this article was to examine how design thinking can contribute to the limitations of project management in innovative situations. We analyzed design thinking along three dimensions: a cognitive dimension referring to the creative and explorative activity of design thinking, a social dimension referring to the stakeholders involved in the design thinking process, and a strategic dimension referring to the strategic process of the organization and more generally to managerial capability. We showed how design thinking can provide significant contributions to the challenges encountered by project management in terms of exploration, stakeholder involvement, and firm strategizing. We formulated 10 propositions that can form the basis for an agenda for further experimentation and empirical research crossing project management and design thinking approaches in innovative situation contexts.

Such results make sense given that, as we have noted, design thinking and project management share many similarities. Yet for all of design thinking's potential contribution to project management, the link between the two is still under-researched. In addition, the contribution of design thinking does have limits. Proponents of design thinking claim that it is suited to address organizational and strategic issues, but this claim remains to be substantiated and supported by conceptual and empirical research. To date, empirical evidence shows that design thinking has mainly been applied at the project level. As we have argued, design thinking is well suited to addressing the exploration and stakeholder involvement efforts required in projects confronted with complexity and uncertainty. It helps frame ill-defined issues and develops them into clearly defined problems around which key stakeholders can be mobilized. As far as strategy formulation is defined, however, design thinking has yet to develop its ability to contribute. In this regard, project management is still the main dominant paradigm for addressing large, complex projects.

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