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A Conceptual Framework on the Role of Creativity in Sustaining Continuous Innovation in New Product Development

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Abstract

If creativity and innovation are viewed as assets in any business, they represent for some a key survival factor imposed by their industry on a daily basis. In such a context of continuous innovation, the pace of innovation is accelerated. This article focuses on how creativity helps sustain continuous innovation in new product development. We develop a conceptual framework that highlights the key factors that lead to continuous new product development: information management, project management, and the integration of the two distinct processes of creativity and innovation. Using the context of the video game industry, we then show how this framework can clarify the key concerns held by industries that operate under intense pressure to sustain continuous innovation. Lastly, we discuss the theoretical and managerial implications of this study.

Keywords: innovation; creativity; new product development; creativity factors; creativity mechanisms; innovation management; organizational practices; new product creativity; continuous innovation; project management; knowledge management; video game industry

1. Introduction

Innovation and creativity are topics that have grown in importance in research in recent years, and are increasingly considered as significant factors in the development of a competitive edge. For some industries, the capacity to generate continuous innovation has not only become a key success factor, but a requirement for survival. Even though creativity and innovation are viewed as key elements in some industries, there appears to be insufficient understanding of the factors that influence these elements or the management of related processes (Lempiala, 2010).

More specifically, there is still confusion regarding the distinction between creativity and innovation. One main issue is that, even in the literature, the two concepts are often associated and even interchanged. For example, Carrier and Szostak (2014) noted the fact that several authors associate creativity and innovation in the titles of their articles, whereas only the factors that foster innovation are actually investigated. The link between both is indeed natural. Therefore, the problem does not have to do with the capacity to link both elements, but rather to distinguish between them (Carrier and Gélinas, 2011).

If creativity could be considered as the production of the raw material—the ideas— the innovation process could be described as the transformation and the development of this material into something concrete, such as a process or product. However, the relationship between creativity and innovation is neither simple nor clear. The problem lies in the fact that this confusion may introduce non-optimal process management of both. This

ambiguity creates ambivalence for both researchers and practitioners and leads to confusion about the conditions required to foster creativity and innovation, as well as the effects of established practices on individuals and the environment in general. In industries requiring continuous creativity and innovation from its actors, efficiency in these processes becomes a key competitive advantage. The context of continuous innovation of certain industries deemed "creative" is particularly interesting, given some fundamental paradoxes such as the routine/creativity couple (Caves, 2000; DeFillippi, Grabher and Jones, 2007).

In this article, we attempt to explain how firms can combine creativity and innovation processes to sustain continuous innovation in new product development. To do so, we have chosen to explore the video game industry literature. The profitability of this industry depends heavily on its ability to protect itself from competition and innovate constantly, despite strong pressure from internal and external environments (Grantham and Kaplinsky, 2005). Moreover, this type of product stands apart through the disparity of its components, the interaction and interdisciplinary efforts present in the design and an open development process formed by constant iterations (Tschang, 2005). The difficulties inherent to this field guide the need for an innovation management mechanism that effectively processes the conversion of creative ideas into commercially successful products on an on-going basis.

After defining creativity and innovation, we shift the discussion back to our main findings about creativity and innovation as they apply to new product development in a continuous innovation context, namely, the video game industry. We then propose a conceptual framework that integrates both processes based on previous work to suggest future research directions. We conclude on implications for practice. From a managerial point of view, the framework developed in this paper provides an integrated process summary that can be used as a management tool by project managers. The main advantage of this model is that it develops a holistic vision of the transformation stages of creativity into innovation and its organizational practices.

2. Creativity and innovation: definition of the concepts

To fully understand the relationship between creativity and innovation, it is important to emphasize their distinct definitions. According to Sternberg (2006), creativity at work refers to the production of novel and potentially useful ideas to be applied in different strategic areas of the organization such as products, practices, services or procedures. It is also stated that: "ideas are considered novel if they are unique relative to other ideas currently available in the organization and [...] are considered useful if they have the potential for direct or indirect value to the organization, in either the short- or long-term." (Shalley et al., 2004).

The concept of innovation, in contrast, refers to the development and implementation of the ideas, or, simply stated, their transformation into a concrete organizational element, which may be a product or a process. Hulsheger et al. (2009) effectively demonstrated the existence of this causality link between creativity and innovation. Creativity is the way to

generate ideas which, in turn, will be utilized in the innovation mechanism as they are selected, assembled, rearranged and synthesized toward the emergence of an output or a novel product, for example. Innovation itself can be described as radical or incremental, or as a product or a process. The degree of radicalization or incrementation depends heavily on previously used practices, both in terms of creativity factors and structuring mechanisms (Damanpour and Gopalakrishnan, 2001). As a rule, the resulting innovation is associated with either a form of product or process that is new or improved (Çokpekin and Knudsen, 2012).

As presented in Table 1, the process of creativity differs from that of innovation in several respects. The resources, facilitating factors, transformation mechanisms, tensions and the results are different in each case. However, we have noted that the results of the creative process serve as basic resources for the innovation process. Consequently, these two concepts are used to achieve different but complementary goals. Creativity is used to generate ideas, which are then structured and concretized within the innovation process in order to become tools used to solve various technical problems and productivity issues, while conferring an added value to the products (Grandadam et al., 2011). The perspective adopted in this article is that creativity, in the process of new product development, is at the service of continuous innovation by providing conceptual resources (Anderson et al., 2014; Ward, 2004).

Please insert Table 1 here

2.1 Dimensions of creativity

Creativity is divided into three categories by most authors (Amabile, 1997; Çokpekin and Knudsen 2012): individual creativity, group creativity and organizational creativity. This division appears to be dictated by the authors' reductionist functionalist approach. According to this view, the elements of a system are characterized by their functional roles and the fact that they explain the overall behaviour of the system (Pacherie, 1995).

The conceptual model of Amabile (1983) covers several significant individual factors. It is predicted that certain personality traits such as curiosity, persistence, energy and intellectual honesty are factors that influence the creative process, as do intrinsic motivation, enjoyment, satisfaction and stimulation. Cognitive skills, such as problem solving abilities, a propensity for risk-taking, expertise and social intelligence are also not to be neglected. Certain attributes are inhibitory, such as demotivation, lack of expertise and inflexibility. In a subsequent study, Amabile (1997) also describes independence, self-discipline, tolerance for ambiguity, perseverance in the face of frustration and a relative lack of interest in social approbation as other personal characteristics that positively influence creativity. However, more recent studies suggest that the pattern of relationships between personality and any resulting creativity may be more complex than initially thought. The contextual conditions are a potential integrating factor and should be relevant to the analysis of individual creativity (Anderson et al., 2014, Mumford, 2012).

As for group creativity, Amabile et al. (1996) consider that the individual and group processes are similar since they involve the cognitive process of generating and testing new ideas. Woodman et al. (1993), in their conceptual framework, add that group creativity is a function of individual contributions to creative behaviour, interactions between the individuals involved, the characteristics of the group, and contextual influences. Recent studies have put forward team reflexivity (Schippers et al., 2014; De Dreu, 2002), shared mental models (Edwards et al., 2006), physical proximity (Cummings and Kiesler, 2005) and the level of internal communication (Cross and Cummings, 2004) as important determinants of success in group creativity. On the other hand, Lempiala (2010) identified obstructive practices for out-of-the-box creativity in groups, namely, the misuse of humour, silencing ideas, and overemphasis on proof and detail. In their theoretical framework, Cirella et al. (2012) propose an integrative perspective where teams are micro-social systems in which different inputs (team size, functional diversity, low separation, transformational leadership, supportive supervision) through processes and emergent states (divergent thinking, team climate, team learning) can lead to team creativity. These components would influence and be influenced by the macro-social system composed of the organizational climate, rules, norms, culture, and resources in a nonlinear process made of loops, feedbacks and cycles.

Organizational creativity can then be described as the idea conceptualization emerging from the negotiation of multiple, and potentially constrained, interests between different communities and groups within the organization (Amabile and Mueller, 2008; Drazin et al., 1999). The development of an individual creative framework cannot be achieved in a context of social isolation; it is influenced by interactions with others who are directly or indirectly involved in similar efforts. From this view, it is possible to determine that factors such as peer-group pressure, leadership, management strategies, and organizational integration would have a significant effect on organizational creativity (Runco, 2007).

3. Creativity in a context of continuously innovative new product development

When developing her creativity framework, Amabile (1988) proposed two parallel processes. The creative process begins with the presentation of a task, followed by preparation (gathering information and resources), the generation of ideas, their validation, and the evaluation of the results. The innovation process is very similar, but more formal, in its approach to tasks. It begins with the preparation of the agenda, with the mission and vision in mind. Then, preparation is done with a statement of general goals, the gathering of resources, establishment of the work context and market research. The third step, the production of ideas, is directly related to the creativity process. The testing and implementation phases include market development testing activities, in which ideas are considered across the organization. Lastly, results are reviewed. Conscious reflection on team methods and functioning resulting in the success or failure of an idea (i.e., team reflexivity) leading to the development and implementation of more effective processes or procedures has been shown to be associated with team innovation performance (Schippers et al., 2015).

The description of these two processes embodies the classic vision of creativity and product innovation that demonstrates linearity and clear barriers between the steps described above. The framework put forward by Amabile (1988) is still relevant today, as it appears to encompass the most important steps of the implementation process. More recent studies, on the other hand, point out that management innovation "needs to be fashioned in a holistic and integrated schema"(Grantham and Kaplinsky, 2005: 207). For example, in the innovation process, the outcome of the evaluation process is dependent on the output of the creativity process. The quality of the ideas to have been implemented is the result of the quality of the available ideas and the quality of the selection process (Rietzschel et al., 2010). This, once again, shows how both the creativity and innovation processes are integrated. Completion of the testing phase results in a decision being made. The innovation is accepted, rejected or sent back to be modified. All of these choices eventually bring the process back to its beginning, thereby emphasizing the need for continuous innovation. If creativity factors are in place and the bank of ideas is sufficient, the evaluation and selection stages can be directly followed by a return to the ideas. This shorter path generally includes feedback.

The vision of Baba and Tschang (2001), illustrated by a spiral where interactions are constant, seems to provide the most realistic contribution. Tschang and Szczypula (2006) later described an emerging approach to new product development based on a constructivist view. The conceptualization and use of creativity, in this model, are present throughout the development process. This can be contrasted with the traditional model of Amabile (1988), in which the generation of creative ideas happens only at the beginning of the process, while all further actions are linked to problem solving. For the construction of the innovative artefact, the Tschang and Szczypula (2006) model suggests recombination and incorporation activities, drawing concepts from various sources. It is different from the new product development vision as a system built according to principles known in a specific area (Andriopoulos and Lewis, 2009; Ekvall, 1993). Finally, this model shows the artefact as an object that cannot be defined only by a degree of innovation (incremental, radical or absent) since it is in constant evolution throughout the continuous integration of ideas. This suggests that change occurs through the transfer and mutation of knowledge through the minds of individuals. The innovation process is not static; it is constantly evolving, even in its definition.

Innovation is the beginning and the end of the new product development process and results in an enviable reputation, better problem-solving mechanisms, product differentiation and improved products and processes (Hulsheger et al., 2009). Two forces influence the result of innovation. First, there are success factors, which include the quality of labour and organizational relationships, a culture of creativity, as well as the adequacy between projects and individuals (Cohendet and Simon, 2007). The second category relates to constraints and includes cost, short lead times, market volatility, rapid technological change, ill-defined expectations of consumers, and the complexity of the product (Allen and Kim, 2005; Guérin et al., 2006; Prabhu et al., 2008, Schilling, 2003).

This ability to develop new products and introduce them on the market represents a source of competitive edge (Kobe, 2010). Lakemond et al. (2010) emphasize the importance of looking at both motors and obstacles to creativity that lead to innovation. A recent literature review by Graner and MiBler-Behr (2012) on new product

development underscores success factors for such projects: a defined new product development process, top management support for the development project, cross-functional integration and collaboration during the development process, user integration in new product development/open innovation, short time to market/duration of the new product development project, and strong project management. They also examined a total of 516 new product development methods, broken down into six categories: customer integration or market research methods, research and development methods, methods focused on quality and logistics, methods focused on purchasing, project management methods, and shared methods. They concluded that companies using new product development methods are more successful and achieve better innovation performance. These effects are moderated by the method chosen and the proficiency in which they are applied. In fact, they observed that a large number of companies did not know about such methods or how to use them.

4. Conceptual framework

Figure 1 presents a conceptual framework for the role of creativity in sustaining continuous innovation in new product development, which incorporates the findings presented in this article.

Please insert figure 1 here

The means of achieving the goal of innovation, and doing so on a continuous basis, are essentially found through **creativity factors** that fall into three categories of practices: management practices, motivational practices and resource management practices. These factors were selected according to the importance they were given in the literature reviewed and the proven correlations (Cohendet and Simon, 2007). There are infinite variations and categorizations associated with each of these factors but, for the purposes of this conceptual framework, they are presented under major themes. These practices must be implemented right from the pre-production phase, as the creativity factors serve as the basis for the development process.

A clear and common vision is a significant unifying factor among individuals in an organization (Simon, 2005). They include the corporate mission, the rules of functioning and common goals (Parmentier and Mangematin, 2009). Then, understanding the tasks and roles incorporates the clarity of the goals and their validation (Grantham and Kaplinsky, 2005; Tschang, 2005). The management of communities refers to the need to take into account the various collectives within an organization, such as the creation communities (Grandadam et al., 2011). The resulting collective knowledge generates many opportunities for innovation and is developed through teamwork (Baba and Tschang, 2001). Communities also support specialized and complementary skills to be accessed on an as-need basis (Cohendet and Simon, 2007). Lastly, the evaluation system

includes stimulating tasks and goals that assign value to work, creativity, and innovation (Parmentier and Mangematin, 2009). Such a system must be fair and include an adequate reward system, individual accountability, and frequent feedback mechanisms (Guérin, 2006).

Motivational practices include sharing, work flexibility, attitude toward corporate risk-taking, and a sense of belonging. Internal and external sharing refer to an openness on the part of the organization and its groups toward internal and external activities, as well as sharing among the organization's elements and underlying or parallel cultures (Baba and Tschang, 2001; Kohashi and Kurokawa, 2005). Flexibility refers to the possibility of completing a task using a method of one's choice and a positive attitude toward experimentation, error and explicit valuation of innovation (Parmentier and Mangematin, 2009). A sense of belonging is linked to climate as a factor that extends to the work environment per se, a climate of confidence within that environment, cohesion among the various parties, and a willingness to cooperate among the organization's units, groups and individuals (Guérin, 2006, Grandadam et al., 2011; Parmentier and Mangematin, 2009).

Resource management practices include budget, material, time, and knowledge management. The availability of resources has a significant influence on creativity (Parmentier and Mangematin, 2009; Simon, 2005). Materials (technological tools, training material, etc.) are also useful to individuals within an organization. Time as a practice describes the allocation of periods during which creative tasks and activities are fulfilled (Grandadam et al., 2011).

Knowledge management is of particular significance and refers to activities that strongly influence the generation of ideas, namely documentation, access to information, networking, questioning, experimentation, and diversity. These activities all feature two-way communication (Simon, 2005). They create tools for sharing meaning among the individuals within an organization, as well as internal and external groups and communities (Baba and Tschang, 2001). Diversity within the organization and its teams also influences the generation of ideas (Grandadam et al., 2011). The management of communities is related to the management of knowledge, since they are also an important tool for knowledge retention, transmission, and management both within and outside the organization, through various entities (businesses active in similar fields, interest groups, etc.) (Cohendet and Simon, 2007).

The most important structuring mechanism is **project management**. Project managers play a decisive role in managing tensions and are instrumental in structuring ideas (Baba and Tschang, 2001). It is their role to coordinate activities related to the development process, to make important decisions (and, at times, delegate the decision-making responsibility to subordinates), and to provide support to employees (Guérin, 2006; Kohashi and Kurokawa, 2005; Tschang, 2007).

Another structuring mechanism is **planning**. This mechanism brings together transparency in the process, target milestones, measurable goals, and control. Other activities are referred to by several authors as serving to reduce uncertainty related to a complex development process and involving multi-functional and sometimes disparate teams (Cohendet and Simon, 2007; Parmentier and Mangematin, 2009;).

The **conversion of ideas** mechanism, which includes the selection, assembly, recombination, and synthesis of ideas, represents a set of idea management practices (Grandadam et al., 2011). It is through an innovation management mechanism that effectively converts creative ideas into commercially successful products on a continuous basis that companies that depend on continuous innovation can survive (Grantham and Kaplinsky, 2005).

Lastly is the **open process**. In some industries, the fact that the products are an assemblage of disparate but interdependent components requires an iterative learning mechanism that is shaped by experience, uncertainty (the impossibility of using test measures before reaching a fairly advanced stage in the creative process), and decentralized decision making (Tschang and Szczypula, 2006). This type of development allows the creative and innovation processes to sustain significant openness for a very long time throughout its progression. Development therefore progresses through design by repetition and trial-and-error, as opposed to the linear progression seen in the design of simpler products (Baba and Tschang, 2001; Tschang and Szczypula, 2006). These structuring mechanisms are fundamental to the transformation of ideas into innovations.

5. Applying the conceptual framework within the context of the video game industry

One good example of a context in which continuous innovation is crucial is the video game industry. Indeed, creative industries such as video game development companies live in a continuous loop of innovation, and the creation of new products is their core activity.

Since the inception of the industry in 1961 with the creation of the first interactive computer game, Spacewar, the constant evolution in gaming consoles has allowed video games to go from simple two-dimensional table tennis games to three-dimensional virtual worlds (de Vaan et al., 2015; Johns, 2006). New generations of consoles emerge every five to six years, along with a plethora of accompanying software (Johns, 2006). According to recent data (ESA, 2015), 155 million Americans alone play video games. Video games represented US$15.4 in total sales in 2014. The most important factor influencing the decision to purchase a video game is an interesting story/premise. New games must therefore be differentiated from others "by introducing radically new game mechanics, new perspectives, and enhanced graphics as well as by crafting new genre combinations and new narrative strategies of character development made possible by (and, in turn, further stimulating) new technological capabilities" (de Vaan, 2015:1156). Taken together, these features present a picture of an industry for which understanding the factors underlying continuous innovation in new product development is critical.

In the video game industry, balancing new product portfolios with respect to both market and technological innovativeness of individual projects is important for ensuring continuous innovation (Urhahn and Spieth, 2013). The product development process is based on interactions between communities, and work is structured into projects. These two aspects turn innovation into a highly non-linear process (Kijkuit and van den Ende, 2007; Parmentier and Mangematin, 2009; Storz, 2008; Tschang, 2007). Project management practices put at risk in this kind of non-linear process environment are formality and explicitness, review frequency, transparency, and information availability. This less structured environment may not be a bad thing, however. Kobe (2010) suggests

that, in fact, procedures can cause paralysis and that they should be allowed to simply emerge.

With all this complexity and the pressure to innovate, organizational culture plays a critical role. Selection of team members and leaders must be done so as to foster a culture that inspires creative team learning. Teams with shared knowledge (Krauss and Fussell, 1990) must be able to together convert their practical knowledge into explicit knowledge through reflexivity (Gherardi and Nicolini, 2001) in order for the innovation process to evolve at an accelerated pace.

The management of the knowledge generated is also of great importance to the video game industry. Grandadam et al. (2011) describes creation communities as an informal gathering of people who share an area of expertise and a passion for a joint project. These communities promote the generation and exchange of knowledge. They stimulate innovation and creation and generate healthy competition, in addition to promoting exploration mechanisms by easing adaptation and focusing skills (Parmentier and Mangematin, 2009). The knowledge dispersal and sharing within creation communities can also increase creativity through the accumulation and production of knowledge in areas of specialized practices (Cohendet and Simon, 2007). Moreover, teamwork among different functions can contribute to innovative capacity, especially in establishing a cooperation framework through which new practices and routines can emerge. Still, in the software industry, Koc (2007) warns against a full integration of specialist groups within the organization, as opposed to the use of multifunctional project teams. Indeed, a complete integration of the various business functions would increase the complexity of the decision-making process, resulting in product development delays. Moreover, because of the specialized nature of each function, conflicts could arise, since each group wants to be guided by strategies that are compatible with its own point of view, to the detriment of a unified organizational vision. The strength of the communities, therefore, is in establishing an environment that is conducive to learning and to the exchange of knowledge among actors in the organization without creating a "ghettoization" of specialties (Simon, 2006).

Four types of tension complicate processes of product development in this type of context: 1) exploitation versus exploration, 2) practical versus artistic identity, 3) order versus chaos, and 4) integration versus differentiation (Cadin and Guerin, 2006; Parmentier and Mangematin, 2009; Tschang, 2007). Exploration activities are those that focus on novelty and on the production of radical innovation through experimentation, while exploitation activities support incremental innovations on existing products and processes (Andriopoulos and Lewis, 2009). The tension between artists' practical and artistic identities comes from their need to express themselves while simultaneously having to deal with practical constraints (budget, time, etc.) (Cohendet and Simon, 2007). The tension between incremental and radical innovation is directly reflected in the product (or process) chosen to be developed (Parmentier and Mangematin, 2009); it is generally easier to generate an incremental innovation than a radical innovation. The tension arises from the concurrent needs for control in the materialization of the innovation and for flexibility and freedom.

Table 2 presents the elements of the video game industry through the lens of the conceptual framework developed in this research. This context, where continuous innovation is a prerequisite for survival and growth, provides a showcase for the need to have a deeper understanding of the constituent processes and factors leading to innovation.

Please insert Table 2 here

6. Implications for practitioners

The management of innovation in a continuous innovation-based industry presents many challenges. Indeed, there is a visible dichotomy between the practices boosting organizational creativity and the channelling of this creativity toward product innovation. There is an opposition between divergent and convergent thinking, or a tension between enforcing control and the pursuit of creative chaos (Andriopoulos and Lewis, 2009). However, it is the union of these antithetic activities that leads to successful innovation, as effective innovation management needs to be measured for progress to be fair and sustainable (Grantham and Kaplinsky, 2005). Gotsi et al. (2010) argue, on the other hand, that only the interdependence of the parties may reconcile the contradictions inherent to creativity. They suggest that this strain must take its course through integration and differentiation strategies. According to Andriopoulos and Lewis (2009), integration strategies encourage individuals to enter a mental model in which the functions and tensions are seen as interdependent, while differentiation strategies separate them in time and space.

If bureaucracy reduces creativity and alienates inspiration (Amabile and Khaire, 2008), planning, on the other hand, guides creative expression and secures the creation of a valuable product (Andriopoulos and Lewis, 2009). Such a finding also leads to the assumption that only one feature of the work environment is insufficient to push the advancement of different types of innovation and that a duality of practices is necessary to the development of effective products (Çokpekin and Knudsen, 2012).

To create an environment where everyone feels confident about sharing their ideas, a climate of trust, respect and openness must be established (Amabile and Khaire, 2008; Runco, 2007). To do so, it is especially recommended to give free rein to experimentation and to accept errors in a positive light (Parmentier and Mangematin, 2009). This should not be interpreted as a lack of discipline, but rather as an understanding that iterations may occur and that mistakes are an integral part of the development process. This approach contributes to motivation enhancement. By reflecting, planning, acting, and adapting to different circumstances together, teams reduce the occurrence of information-processing failures and can increase their innovation performance (Schippers et al., 2014). Edmondson et al. (2009) go further by underscoring the challenges and benefits of learning in work teams. Motivation practices include sharing, flexibility at work, a risk-taking attitude, and a sense of belonging. First, internal and external sharing refers to openness on the part of the organization and its groups to internal and external activities, as well as sharing among the various elements of the organization and underlying or parallel groups (Mesmer-Magnus and DeChurch, 2009; Simon, 2006; Runco, 2007). The search for collective pleasure, through the organization of activities both in and out of the

workspace, could help generate a sense of belonging and increased motivation and engagement. Looking for creative opportunities also appears to be related to the exchange of knowledge and openness to the outside. The influence of these two variables is much easier to measure at the operational level. Openness to the outside, in particular, is important in the case of radical innovations in that it helps blend the skills within the organization and market needs to create an effective product (Aronson et al., 2008).

Flexibility is defined as an organization's ability to change its operating procedures during the innovation process (Parmentier and Mangematin, 2009). At the pre-production stage, for example, too much control or excessive restrictions may affect employee creativity. During production, on the other hand, these practices help define innovation and increase worker efficiency. Çokpekin and Knudsen (2012) have shown a positive correlation between allowing time for employees to perform creative tasks and the level of innovation in the organization. Such practices would reduce the negative pressure that employees may experience in a competitive environment (Sundstrom and Zika-Viktorsson, 2009). Several researchers advocate greater freedom in the workplace, especially in the choice of means to perform a task (Beugelsdijk, 2008). However, some care should be taken in accepting this assertion, since Çokpekin and Knudsen (2012) found a negative correlation between the freedom to choose how to accomplish given tasks and innovation.

The tensions found in many of the practices mentioned above can be described as either inclusive (creating a common mental model, information sharing, cooperation, etc.) or dissociative (project diversification, glorification of innovative behaviour, strong leadership, etc.) (Andriopoulos and Lewis, 2009). If cohesion (integration), in a state of imbalance, feeds mutual understanding, learning and efficiency, it can also stifle individuality and hinder the decision-making process. However, diversity (differentiation) fosters creativity and radical innovations, but can also promote insulation, reduce confidence, and play a role in the rejection of common goals. There is also an identity tension inevitably created by the paradoxical role that an individual plays in a team, as one's contribution may not be reflected in the final, collective product (Guerin, 2006).

6.1 Knowledge management: a key to accelerating the process

Knowledge management refers to activities such as training, accessing information, networking, experimentation, and diversity that strongly influence the generation of ideas. These activities provide tools to accumulate knowledge and share meaning among individuals both within and outside the organization (Aoyama and Izushi, 2003; Dyer et al., 2009; Hirst et al., 2015).

Knowledge management is a complex but essential theme in the field of product development. Individuals and teams need to have access to informative and creative resources and have the ability to share them. Many authors agree on the influence of collective knowledge on innovation (Aoyama and Izushi 2003; Koc, 2007; Yang and Rui, 2009). However, others suggest that too much factual or quantitative information can hinder the creative process, unlike suggestive and qualitative information, which facilitates it (Collado-Ruiz and Ostad-Ahmad-Ghorabi, 2010; Yang and Rui, 2009).

6.2 Implementation of the processes: The project manager as a “tightrope walker”

Facing this tension and duality, the first and most important structuring mechanism is project management, where the project manager plays a decisive role in the management of tensions and is instrumental in the structuring of ideas (Andriopoulos and Lewis, 2009; Aronson et al., 2008; Dyer et al., 2009; Gumusluoglu and Ilsev, 2009). It is the project manager’s role to coordinate activities related to the development process, to make important decisions (and, at other times, to delegate decision-making to subordinates), and to provide support to employees (Bartel and Garud, 2009; Carmeli and Schaubroeck, 2007).

The project manager plays an important role in the product development process and his or her personality can have a direct effect on the outcome. Through self-awareness and emotional stability, the manager can control uncertainty in the context of innovation (Aronson et al., 2008; Mumford, 2012). Emotional stability, in particular, can help reduce the stress associated with uncertainty and allows teams to work together over long periods of time, thus increasing the likelihood of a radical innovation. In this regard, Lopez Cabrales et al. (2008) also noted that, in the case of radical innovation, teams have a greater need for cohesion and focus, which can be ensured by a competent manager. The manager is also well positioned to adequately assess the personalities and skills of his or her employees, and thus put together teams and assign projects in an informed manner.

Lastly, the manager is described as having a similar profile as an entrepreneur, as he or she encourages the emergence of a collective authority fostering creativity in the development process by incubating ideas and projecting them into the innovation process, while maintaining concerns for relationships by assuming various roles, such as coach, teacher and leader (Carmeli et al., 2013; Mumford, 2012). Stenmark et al., (2011: 78) stated that: "[...] in order for leaders to effectively and efficiently manage innovation, they must be able to recognize and adapt to the varying requirements. Leaders must manage the process in a series of planning stages. For instance, early stages of the process require a leader with a high level of technical expertise, while middle and later stages of the process require a leader with a high level of social and political skills to serve as a champion for the project."

To ensure creativity, managers must balance the moments when they keep a low profile to maintain an egalitarian atmosphere, which is needed to facilitate effective collaboration among specialists from different backgrounds, and the moment they act as supervising producer in the implementation of development activities and exercise a degree of control over the progress (Mumford, 2012). The consequences of an aversive or aggressive style of leadership seem to have a direct negative effect on the creativity process and should be avoided (Choi et al., 2009).

7. Directions for future research

Looking at the ideas and the innovative product as outputs in a hexagonal shape, it becomes clear that they result from the various creativity factors and innovation mechanisms. The ideas are a function of management, motivation, resource factors and knowledge management. Direct links, as illustrated with a solid arrow, indicate that these elements have an observable influence on the output or among themselves. The dashed lines illustrate means of control of particularly important but parallel elements that include knowledge management, tensions, and the project manager. In the case of the first two, their importance can be explained through their role as influencing forces for the creativity factors or the structuring mechanisms. The project manager, as a central figure in the innovation process in video game development, is both an influencing force and a means of control as he or she oversees the structuring mechanisms of the pre-production and production phases.

The ideas output should go through the structuring mechanisms: planning, idea conversion and the open process. The output should be an innovative product that can be qualified in terms of its level of innovation. It will be tested for consistency and quality to make the final decision as to whether it is approved, in need of modification or refused. Refusal should bring the process back to the ideas input stage.

In a context of continuous innovation, the processes of creativity and innovation, although distinct, are interdependent and share certain phases. As mentioned above, the processes are interdependent but based on different conditions. Where creativity requires freedom, space and chaos, innovation also requires planning and control. Given the pace of innovation in creative industries, this finding is significant. It is therefore crucial that we focus on the practices and strategies that enable these paradoxes to be managed. Future research could explore best practices and structuring mechanisms to conciliate creativity's need for freedom, space and chaos with innovation's need for planning and control within organizations.

Information management is fundamental and is carried out, in particular, through the creation and management of communities. It would be interesting to learn more through future studies about how project managers can maintain, manage and convey knowledge among members of the innovation community, as well as the indicators organizations should use in the selection process of ideas as a creative output.

The project manager controls the balance between the various tensions and the processes of creativity and innovation. The increased importance of a project manager in a creative industry justifies further investigation into the specific characteristics such individuals should possess to be successful at striking a balance between the tensions inherent to the structuring mechanisms of creativity and innovation. The identification criteria of

potential creative leaders as well as the stimulation of their creativity remain to be developed. The best control and performance measures to be used in a creative context and how they should be applied at each stage of the innovation process would be interesting and relevant subjects of further research.

8. Conclusion

The purpose of this article is to present an analysis of the issues surrounding creativity and innovation management in the context of a creative industry. After discussing the literature on innovation and creativity, we presented a conceptual framework on the role of creativity in sustaining continuous innovation in new product development. We then presented a more specific discussion of the video game industry context. After sketching out the process of continuous innovation, we noted practical implications for success in continuous innovation and pointed out some concerns that would require more in-depth investigation through future research.

In light of the literature review on both the creativity process and the innovation process leading to new product development, this paper provides a conceptual framework to illustrate how firms can combine creativity and innovation processes to sustain continuous innovation in new product development. This issue is particularly crucial in creative industries where firms must continuously generate creative ideas that lead to innovative products in order to survive. Therefore, based on research on the video game industry, this paper explains the applicability of the model in a managerial context. The conceptual framework can also provide guidance to managers who seek to improve their organizational practices to meet the continuous innovation challenges of their industry. The proposals presented in this article are intended to inspire further empirical studies on large samples of firms from various creative industries to validate the best practices in efficient and effective continuous innovation.

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Table 1 A Comparative View of the Creativity and Innovation Processes

	Creativity	**Innovation**
Raw Materials	Skills, Expertise, Motivation (Amabile, 1997)	Ideas (Amabile, 1996; Shalley and Zhou, 2008)
Enhancing Factors	Managerial Practices, Motivation, Resources (Amabile, 1997; Carmeli and Schaubroeck, 2007; Runco, 2007)	Leadership, Control Mechanisms (Grandadam et al., 2011; Parmentier and Mangematin, 2009)
Inhibiting Factors	Excessive Structures (Amabile, 1997)	Lack of Direction (Choi et al., 2009; Tschang, 2005)
Transformation Mechanisms	Structuring through Management, Motivation and Resources (Amabile et al., 1996; Cokpekin and Knudsen, 2012; Parmentier and Mangematin, 2009; Sundstrom and Zika-Viktorsson, 2009)	Prototyping through the Project Manager, Planning, Ideas Conversion and an Open Process (Simon, 2005; Tschang, 2005)
Inherent Tensions	Exploration/Exploitation, Order/Chaos, Practical/Artistic Identity (Andriopoulos and Lewis, 2009; Grandadam et al., 2011; Parmentier and Mangematin, 2009)	Incremental/Radical, Integration/Differentiation (Andriopoulos and Lewis, 2009; Parmentier and Mangematin, 2009)
Results	Ideas (Amabile, 1996; Shalley and Zhou, 2008)	New Product or Process Anderson et al., 2014; Ward, 2004).

Table 2 Application to the Video Game Industry

Key concepts	Application to the video game industry
Creative need	The most important factor influencing the decision to purchase a video game is an interesting story/premise. New games must therefore differentiate themselves from others "by introducing radically new game mechanics, new perspectives, and enhanced graphics as well as by crafting new genre combinations and new narrative strategies of character development made possible by (and, in turn, further stimulating) new technological capabilities" (de Vaan, 2015:1156).
Actors involved	Each game requires a team of creators, including a development team of designers, programmers, and artists (Mollick, 2012). Core team size ranges from 1 to 395 employees with a mean of 52 people. In specialized firms, they may produce dozens of games per year.
Pre-production: creativity factors	
Motivational practices	Motivational practices in the video game industry are the conduit through which creativity is applied to the product, but also ensure that the teams remain intact in an intensely competitive environment. Optimal management practices are related to a creative organization. They should be implemented from the launch of an original game idea to the building of game levels in development, and be based on a democratic approach that includes designers, programmers and managers, internal communication among the teams and practitioners of various trades, and flexibility in managing their work schedules or assigned duties.
Resource management practices	Video game workers find themselves in a high-stress environment given the resources required to complete a project that is subject to a very volatile audience and rapid technological changes. Access to resources, such as the latest programming tools, and the attention given to the needs of individuals by providing them with calm workspaces and areas in which to share, reduce the physical insecurity related to hectic work schedules and a constantly changing environment. The performance of teams working toward the common goal of completing the game is affected by a decentralized decision-making system and coordination that is shared, in particular, among the game designer, the artistic director, and the product manager for high-level design and the project manager, the designer, and the programmer for each game component they are assigned. The sense

	of control over the final product is also a motivational factor.
Knowledge management	The innovation potential is rooted in the generation of ideas, such as the components of the scenario, stylization or action programming, and knowledge management, whether it concerns technical aspects such as programming tools or creative dimensions such as ideas for scenarios, characters, sets or organizational factors such as the adequacy of individuals or the corporate culture. Video game companies use creation communities as catalysts of knowledge that are defined as: "… an informal grouping of individuals who share an area of specialization and a passion for a joint project. It aims to promote the sharing of knowledge to foster the emergence of a collective intelligence and the development of new content and, as a result, stimulate innovation." (Grandadam et al., 2011)
Production: structuring mechanisms of creativity and innovation	
Tensions	The video game industry carries inherent tensions. During production, tensions often come from the respective key roles of producers, who are responsible for ensuring the project is completed on time and on budget, and of the designers, who are the innovators (Mollick, 2012). For video game creators, there is always a balance to be struck between the generation of new intellectual property (radical innovation) and the continuation of a given series (incremental innovation) (Tschang, 2007). The choice between novelty, which is guided by passion and vision, and familiarity, which is guided by financial concerns, is an issue designers face on a daily basis. This results in the promotion of contradictory activities. 1) Exploratory activities are those that focus on novelty and the search for radical innovations through research and experimentation, such as using a completely different concept or new technology. Exploitation activities, on the other hand, support incremental innovation based on existing products and established processes, as in the case of a game franchise (Andriopoulos et Lewis, 2010). 2) An identity crisis emerges between artistic identity and the practical identity related to more down-to-earth considerations, such as the management of time and money. In the video game industry more specifically, this translates into the tension between artistic ideas (game environment, characters or actions that can be programmed) and feasibility (programming complexity, time taken,

	client appreciation) in a context of time and budgetary constraints. 3) The process of innovation includes a dichotomy between creative chaos (the free-flow of ideas and constant trial and error) and control measures (periodic examination of the work with regard to the project parameters and critique) (Chaos and Order). 4) The disparities among various trade specialties may provoke differences in the proposed solutions according to the company's communities. For example, the technical teams and management teams have distinct ultimate aims (Drazin et *al.,* 1999). Obstacles may subsequently emerge to the integration of ideas and the activities of each group, or to the perception of the relevance of information or practices originating outside their own practices (Bartel and Garud, 2009). Integration strategies encourage the different trade teams to perceive themselves as a single unit working to achieve a common final goal – creating the game. Differentiation strategies, on the other hand, separate a project, or its components (such as a level), in time and space. For example, a team may be tasked to create a game level. It must differentiate itself from the other teams (working on other levels, characters or sets) to express its own creativity (integration and differentiation).
Project management	In an attempt to reduce the uncertainty related to a complex development process that includes multifunctional and at times disparate teams, project managers must implement practices based on a rational development process that includes planning and thorough documentation of rules and procedures, establishing regular milestones and controls, and exercising strong leadership. They therefore play an important role as facilitators, providing both support and vision. Generally speaking, they serve as work models with the technical knowledge required to assist their teams (for example, they may revise code or help resolve bugs), and set time and quality objectives as well as control mechanisms. They also support the group's work and encourage individual potential. Project managers are also uniquely positioned to link designers and programmers through a common vision.
Planning	This mechanism combines transparency in the process, the establishment of milestones as well as measurable objectives and control, all of which foster the implementation of creative ideas into the video game. With video games, planning starts with the creation of game components. Based on the scenario, the work can be

	divided into creating characters, sets, game levels, soundtrack/sound effects, actions, etc. All these components are inter-related and planning is essential to their final implementation. For example, it is essential that the sound effects match a character's actions.
Idea conversion	The idea conversion mechanism applies directly to the creative components of the game (characters, sets, actions, etc.) and includes the selection, assembly, recombination, and synthesis of these components. Given that a video game is an emotional product, every idea must be thought through in terms of its own impact, as well as any irrational reaction that its interaction with sound and movement may trigger (Baba et Tschang, 2001). Conversion is therefore a very complex process with video games.
Open process	Lastly, the open process is specific to the video game industry. Game creation is characterized by linear or sequential visualization of the content to be tested (Tschang, 2005). It also involves an assembly of disparate components. For example, characters and their possible actions are individual components, as are sound, game levels, sets, and even textures. However, these components are also interdependent. This requires an iterative learning mechanism shaped by experience, uncertainty (the near-impossibility of having the opportunity to test the product before the project's completion), and decentralized decision making. (Guérin, 2006; Tschang, 2005). Furthermore, the use of prototypes at every game creation milestone is necessary to obtain financing in the initial stages (Tschang, 2005) and to subsequently ensure the product does not deviate from the strategic vision.
Post-production	
Evaluation and decision about the innovative product	This involves checking the consistency and quality of the basic components, programming code, game design, and artistic content (Tschang et Szczypula, 2006). The quality of the game is therefore evaluated. A game will please its audience through its design, artistic qualities, playability, and absence of problems (or bugs).

Figure 1

A Conceptual Framework on the Role of Creativity in Sustaining Continuous Innovation in New Product Development