

Reconceptualizing Innovation as a Social and Knowledge-Based Phenomenon*

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**RECONCEPTUALIZING INNOVATION AS A
SOCIAL AND KNOWLEDGE-BASED PHENOMENON**

Abstract

This paper contributes to the innovation literature by re-examining both the outcome and process perspective of organizational innovation from a knowledge-based perspective. First, we reconceptualize innovation as a duplicable, new and useful knowledge outcome. Building on the notion that knowledge is inherently social in nature, we then develop a model of organizational innovation as a process of knowledge creation and recombination that results from a complex interplay of both knowledge substantiation and social substantiation processes.

Keywords: innovation, innovativeness, knowledge creation, social processes

INTRODUCTION

Innovation is a complex organizational phenomenon that is at the heart of value creation in today's global and knowledge-driven economy. Managers must have an understanding of the innovation process to enable them to take action and create value. Many prior studies have outlined mechanisms and processes involved in innovation, particularly with respect to product development (Dougherty & Hardy, 1996; Hargadon & Sutton, 1997) and the management of technology (Burgelman & Maidique, 1988). However, a number of authors have called for a greater integration of the innovation and knowledge literatures (Fiol, 1996; Gopalakrishnan & Bierly, 2001). Without a clear link between the creation of knowledge and the outcome and process of innovation, managers' ability to optimize the speed and effectiveness of organizational innovation will be limited.

Several models of a knowledge-based process of innovation can be found in the literature (e.g., Galunic & Rodan, 1998; Nonaka, 1995). These models explore the characteristics of knowledge and their impact on the knowledge creation process whose output is implicitly viewed as an innovation. Similarly, Tsai and Ghoshal (1998) and Tsai (2001) present models of organizational innovativeness that draw a parallel between knowledge creation and innovation. However, while these models highlight the role of various processes of knowledge creation and recombination for the generation of new knowledge, they usually fail to establish whether this new knowledge can be directly considered an innovation. As such, existing knowledge-based models of innovation are, for example, unable to specify which knowledge processes are more likely to generate a radical innovation or to accelerate the implementation of an innovation.

At the same time, the innovation literature has a long history of linking various organizational characteristics to organizational innovativeness and, in doing so, viewing

innovation as an output (e.g., Daft, 1978; Duncan, 1976; Damanpour, 1991). However, this perspective on innovation is quite distinct from a knowledge-based conceptualization. While innovation scholars recognize the importance of knowledge in organizational innovativeness (see Sulanzki, 1996), it is usually considered as an additional element to be considered in the innovation process rather than an element inherent to the nature of an innovation or the innovation process. Furthermore, the perspective adopted in most innovation studies is to understand the organizational context that maximizes the adoption of innovation and not the creation of innovations which, again, is quite distinct from what models of knowledge creation would suggest.

The previous arguments thus identify three key discrepancies between the traditional innovation literature and a knowledge-based perspective, namely 1) the existence of a knowledge-based conceptualization of the innovation process without any link to a knowledge-based innovation outcome, 2) viewing knowledge as an attribute of innovation versus regarding knowledge as the essence of innovation, and 3) the focus on the adoption of an innovation versus the creation of knowledge. We argue that only a knowledge-based perspective of innovation is suitable to fully understand the organizational innovation process and, therefore, that innovation as an outcome should be reconceptualized from a knowledge perspective. Creating this link will enable researchers and practitioners to investigate the relationship between different configurations of the process and its outcomes.

By reconceptualizing the innovation outcome from a knowledge-based perspective, we also highlight the existence of interlinked social and knowledge dimensions in both the innovation process and outcome. These social processes are present in Nonaka's (1994) model but are not related to innovation as an outcome. While other researchers have established a link between social processes and creativity at the individual level of analysis (Perry-Smith, 2006;

Perry-Smith & Shalley, 2003; Burt, 2004), the literature on organizational innovation, while considering factors such as organizational structure or communication patterns, largely ignores the role of social components.

We develop our arguments for a knowledge-based organizational innovation process in four key sections. The first section presents our rationale for conceptualizing innovation as a process and as an outcome, highlighting their interaction. The second section presents a new definition of innovation as an output from a knowledge perspective, emphasizing both its knowledge and social components. Subsequently, we develop a model of the organization innovation process based on different knowledge and social components. We argue that organizational innovations result from creative ideas being substantiated through an iterative process of building knowledge in a social context. We conclude by discussing the model's implications for innovation research.

INNOVATION AS A PROCESS AND INNOVATION AS AN OUTCOME

Innovativeness can be defined as the capacity of the organization to produce innovations continuously (Galunic & Rodan, 1998) and is considered to entail important organizational outcomes. For example, evidence suggests that the generation of innovations leads to a dominant competitive position (Banbury & Mitchell, 1995; Bates & Flynn, 1995) and that new product innovations are a key driver of firm performance (Lee, Smith, & Grimm, 2003). Additionally, an organization's capacity to continuously generate innovations is considered a primary source of sustained competitive advantage (Lengnick-Hall, 1992; Porter, 1990). We will show that in the innovation literature, innovation is usually defined as both a process and an outcome, in which a knowledge component is often included but not central to the conceptualization. On the other hand, articles following the knowledge-based perspective on innovation propose that knowledge

is the essence of the innovation process. However, the models proposed focus on the process of knowledge creation and do not link it to a specific innovation outcome (see Table 1).

- Insert Table 1 about here -

We argue that the missing conceptualization of innovation as an outcome in the knowledge literature, and more specifically, the missing link between the process of knowledge creation and the outcome of the process diminishes the potential impact of these models on our understanding of organizational innovativeness.

Defining innovation

Based on the seminal work by Schumpeter (1934), innovation has been defined as the first introduction of a new product, process, method, or system. This definition highlights the dual nature of innovation as both a process and an outcome. Myers and Marquis (1969) have described innovation as a complex activity that progresses from the conceptualization of a new idea to the solution of a problem and the actual utilization of economic or social value, thus emphasizing the notion of activity and therefore of a process composed of phases which each have specific outcomes. Likewise, Kanter (1984: 20) highlights the dual nature of innovation by defining it “as the process of bringing any new problem solving ideas into use”. Finally, West and Farr (1990: 9) define innovation as “the intentional introduction and application within a role, group, or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization or wider society”. Again this definition conceptualizes innovation as a process but retains criteria that characterize innovation in output terms. As such, innovation can be generally defined as the introduction of ‘something’: a product, process, software, idea, concept, etc., considered new in

the environment into which it is introduced (Damanpour, 1991; Dougherty, 1992; Howell & Higgins, 1990; Marcus, 1988; Pennings & Harianto, 1992).

Stages of innovation

Innovation as a process. At least two phases are typically recognized in the innovation process: the idea generation phase and the implementation phase (Clark & Guy, 1998; Axtell et al., 2000). The idea generation phase includes all the steps from idea creation to the decision of implementing the idea (Amabile, Conti, Coon, Lazenbi, & Herron, 1996). The implementation phase is seen as an experimentation process, where trial and error is repeated in an effort to achieve an innovative result (Eisenhardt & Tabrizi, 1995). There is a link between the idea generation phase and the idea implementation phase as an increased number of ideas during the idea generation phase leads to an increased number of innovations being implemented (Clegg, Unsworth, Epitropaki, & Parker, 2002). Commercialization or diffusion phases have also been added to the innovation process by some authors, and often refer to products or services for which a commercial gain is expected (Rogers, 2003; Strebel, 1987). Finally, Kanter (1988), while recognizing the two main phases, proposes a four stage model (idea generation, coalition building, prototype building, and implementation or diffusion), which highlights two components of the innovation process, the social components (coalition building) and the knowledge creation component in the other phases. In developing our model, we will build on the proposed phases.

We also retain from Kanter's (1988) writings the notion that an innovation process is composed of both knowledge and social processes. The presence of social processes can be noted in early definitions of innovation. For example Fennell (1984: p 3) states that "Innovation adoption as used here means a political process through which decisions are made to commit slack resources to new programs", and Van de Ven (1986, p1) indicates that "Innovation is

defined as the development and implementation of new ideas by people who over time engage in transaction with others within an institutional order.” Further depth of this distinction will be provided during the third section of this paper. In our terminology, we will name these two processes Knowledge Substantiation and Social Substantiation.

Innovation as an outcome. Several categories of innovation have been created in order to better understand the innovation process. These categories emphasize the perception of innovation as outcome. Damanpour (1991) presents three well-established categories of innovation: technical versus administrative, product versus process, and radical versus incremental, each of which focuses on innovation as an outcome. For example, the distinction between incremental and radical innovation is represented by the difference in novelty between the innovation and the existing product or process that it improves (Dewar & Dutton, 1986; Henderson & Clark, 1990).

The operationalization of innovation also emphasizes its conceptualization as an outcome. One of the most common constructs used in the operationalization of innovation is the number of patents and their derivations (patent citations, active patents)¹ (Archibugi, 1992; Coombs, Narandren, & Richards, 1996; Hull & Hage, 1982; Narin & Olivastro, 1988). Coombs et al. (1996) present an alternative to patent measures of innovation with the literature-based

¹ While patents constitute an output they have been criticized to represent an inventive output rather than an innovative output (Pavitt, 1988). Patents are also highly unrepresentative of economic activity as the majority of patent activity is concentrated in particular industries. Research and development expenditures have also been used as an indicator of innovation, but have been criticized for being only a partial explanation of the innovation process because they only represent a portion of the inputs in this process (Coombs et al., 1996).

innovation output indicator. However, this indicator is still mainly based on the conceptualization of innovation as an outcome. At an organizational level, other measures have been used, which are mostly based on counting the number of innovations adopted during a certain time period (Aiken & Hage, 1971; Ettlie et al., 1984) and therefore represent the capacity of the organization to adopt innovations (Damanpour, 1991), rather than to generate innovations. Machlup (1962) criticized the use of adoption measures to represent the innovativeness of an organization. He argued that the adoption of an innovation should be termed an imitation. We will present this argument in more depth later in the paper.

Knowledge and innovation in the knowledge literature

While the literature on knowledge is sometimes difficult to distinguish from innovation literature, we consider the knowledge literature to generally have a greater focus on discussions of what the concept of knowledge represents to organizations, processes of knowledge creation and mechanisms by which knowledge relates to innovation.

Defining knowledge in organizations. There is ambiguity in the definition of knowledge and the distinction between information and knowledge when developing relationships between knowledge and innovation. Knowledge, information, ideas and skills are often equated (Woodman, Sawyer, & Griffin, 1993). This ambiguity in conceptualization is particularly problematic if our understanding of the innovation process includes creative processes. As creativity is a cognitive process, differentiating between existing knowledge versus incoming information or ideas impacts how we conceptualize the mechanisms involved. Similarly, whether knowledge is purely an individual phenomenon or can exist at group or organizational levels has implications for how we view multi-level effects within the innovation process.

When knowledge is defined, there are major differences between approaches in the knowledge literature. Analyses of organizational knowledge can view knowledge as an objective commodity (Bohn, 1994; Bollinger & Smith, 2001) or as a socially constructed process (Blackler, 1995; Cook & Brown, 1999). These different viewpoints can be considered to be in conflict because of differing epistemological assumptions (Empson, 2001). There is also considerable theoretical debate about the definition of knowledge and organizational knowledge within both camps (Alvesson & Karreman, 2001; Tsoukas & Vladimirou, 2001). Nonaka (1994) uses an individual model of knowledge focused on tacit and explicit types, and the relationships between these types serves as the core basis of his model of innovation. Glynn (1996) uses an individual model of knowledge as part of individual creativity, which serves as the starting point for organizational creativity. The social capital perspective (Nahapiet & Ghoshal, 1998), which stresses collective interaction in innovation, tends to use a more complex view of knowledge that includes some form of collective knowledge. The definition of knowledge used in this literature often coincides with the level of analysis and the perspective taken in the innovation model.

Knowledge in the innovation literature. Knowledge has been described to have several characteristics and categories that influence its management. Usually, scholars perceive a distinction between tacit and explicit knowledge. For Nonaka (1994), explicit knowledge is defined as formal and systematic, easily communicated and shared, whereas tacit knowledge is personal, hard to formalize and difficult to communicate, rooted in practice and in the context surrounding the individual. Tacit knowledge has two components: the know-how (technical part) and a cognitive dimension (the mental models, beliefs and perspectives) (Nonaka, 1994). The knowledge literature differs in its approach to the scope of the innovation process. Machlup (1962; 1980) presents a model of the inventive process and represents it as the flow of ideas through four stages: research, invention, development and application. In this inventive process

the innovation process is only the last stage of application and only where this application is not imitation. In contrast, work in organizational creativity sees organizational creativity as a subset of innovation, which is in turn a subset of organizational change (Woodman et al., 1993). In this view, innovation “can also include the adaptation of preexisting products or processes, or those created outside of the organization” (Woodman et al., 1993: 293), implying that imitation is part of the innovation process whereas creativity is developing knowledge that is new to the world. Part of the issue with this lack of clarity as to what should be considered innovation is not only the breadth of the process, but that the level of analysis under consideration is often not clearly differentiated.

The knowledge literature identifies that existing knowledge is a pre-requisite for the innovation process to occur, making path-dependency a critical issue. For example, absorptive capacity is equated to a firm’s innovative capability and this is seen as a function of prior knowledge (Cohen & Levinthal, 1990). A very low level of knowledge can cause innovative capability to be “locked-out” if the level of knowledge is so far behind that it becomes uneconomic to accumulate the necessary path-dependant knowledge. Existing knowledge is also linked to creativity: “The prior possession of relevant knowledge and skill is what gives rise to creativity, permitting the sorts of associations and linkages that may have never been considered before” (Cohen & Levinthal, 1990: 130).

While knowledge is a pre-requisite for innovation it is not generally considered to be the initiator of the innovation process. Nonaka (1995) pictures innovation that begins with an organization creating and defining problems. Similarly, Machlup (1962: 180) sees the initial process being driven by a combination of existing knowledge and “scientific problems and hunches”. Interestingly, these hunches are also the output of initial research. That is, basic inquiry into particular hunches generates further problems, hunches, and ideas that then feed the

beginnings of other innovative explorations. These initial ideas are often considered to be sourced from outside the organization (Cohen & Levinthal, 1990; Tsai & Ghoshal, 1998). This view of innovation beginning with a problem is consistent with the development of tacit knowledge. This is well summarized by Polanyi (1967: 24):

“Tacit knowing is shown to account (1) for a valid knowledge of a problem, (2) for the scientist’s capacity to pursue it, guided by his sense of approaching its solution, and (3) for a valid anticipation of the yet indeterminate implications of the discovery arrived at in the end.”

When innovation begins with a problem, then tacit knowledge becomes critical, partly from the impact of path dependency, but also because it acts to direct the further development of knowledge or anticipate the ultimate solution.

Mechanisms Linking Knowledge and Innovation

Explanations of the mechanisms by which knowledge and innovation are linked vary widely in the knowledge literature. Mechanisms are often left unspecified (Williamson, 1999) and are often not dynamic or reflective of interaction effects (Nissen, 2002). Despite these downfalls, some literature provides an initial structure that these mechanisms might take. Theoretical models in organizational learning, while not specifically targeted to the processes of innovation, have incorporated the interaction effects that occur in the development of knowledge and learning toward the broader goal of organizational change (Crossan et al., 1999; Kim, 1993). These mechanisms have identified social interaction (Nonaka, 1994; Woodman et al., 1993) or political processes (Lawrence, Mauws, Dyck, & Kleysen, 2005; Menon & Pfeffer, 2003) as critical to knowledge development.

The mechanisms relating knowledge and innovation are also initially explored in discussions of the knowledge-based view of the firm. Kogut and Zander (1992) argue that a

firm's combinative capability drives innovation. That is, the firm's dynamic capability to synthesize and apply knowledge in combination with "the unexplored potential of the technology" (Kogut & Zander, 1992: 391) allows a firm to generate new applications from existing knowledge. Similarly, Grant (1996) argues that the integration of knowledge is critical to competitive advantage and that this integration occurs through direction, routines and a hierarchy of capabilities.

In empirical studies in the knowledge literature, knowledge and innovation are often seen as moderating or mediating variables for more generic models of performance. For example, Yli-Renko, Autio and Sapienza (2001) view knowledge acquisition as a mediator between social capital and new product development. Cohen & Levinthal (1990) utilize absorptive capacity as a moderating variable in their model of R&D expenditure. Other approaches such as dynamic capabilities (Eisenhardt & Martin, 2000; Teece et al., 1997), core competence (Prahalad & Hamel, 1990) or core capabilities (Leonard-Barton, 1992; Stalk, Evans, & Shulman, 1992) focus primarily on strategic issues. As such, they do not directly link knowledge and innovation, although the implication of these approaches is that knowledge is the antecedent to capability and strategic advantage comes in the form of providing innovative products, services or processes in a rapidly changing industrial context.

This section introduced the idea that there is a gap between traditional innovation studies, which conceptualize innovation as both a process and an outcome, but often operationalize innovativeness as adoption and not creation of innovation, and knowledge-based conceptualizations of innovation which have focused on the process of knowledge creation which is only loosely related to innovation as an outcome. The next section will therefore propose a knowledge-based reconceptualization of innovation in order to link knowledge based innovation

models to an outcome. By doing so, we will also place special attention in including the social processes which are inherent to knowledge studies.

RECONCEPTUALIZING INNOVATION AS AN OUTCOME FROM A KNOWLEDGE-BASED PERSPECTIVE

The dominant perspective in the knowledge literature is to consider that an innovation comes from a process of knowledge exchange and recombination (Galunic & Rodan, 1998), which is also consistent with the model developed by Nonaka (1998). This includes the re-use of existing knowledge and capabilities in a new application setting (Hargadon & Sutton, 1997; Henderson & Clark, 1990). However, Galunic and Rodan's (1998) model falls short of defining what the outcome of a process of knowledge exchange and recombination is and how this outcome relates to innovation. Similarly, the model of knowledge creation developed by Nonaka (1998) implies the creation of new knowledge, but we know little about how this new knowledge relates to innovation. Is all new knowledge, created either through exchange and recombination or by the various methods proposed in Nonaka's (1994) model, an innovation?

In this section, we attempt to clarify the link between knowledge creation and innovation by presenting a reconceptualization of the innovation outcome from a knowledge-based perspective. We will do so in two steps: First, we argue that innovation as an outcome can be reconceptualized from a knowledge-based perspective by showing that an innovation outcome is, in essence, new knowledge. Second, we propose attributes of innovation as an outcome that enable us to distinguish between an innovation and new knowledge.

Innovation as New Knowledge

Innovation has long been conceived as knowledge intensive in the innovation literature (Kanter, 1988), and knowledge has been recognized to play an important role as an organizational attribute in fostering innovation. In the knowledge literature, models of innovation detail the type of knowledge processes that facilitate the creation of knowledge. However, they either do not identify clearly what the outcome of their innovation process is, or this outcome is related to a product-based conceptualization of innovation and not to a knowledge-based conceptualization of innovation.

We argue here that an innovation is in essence new knowledge, and therefore that it is possible to conceptualize innovation as an outcome from a knowledge-based perspective. Schumpeter (1934) proposes the following characteristic of the creative response (i.e. innovation):

“from the standpoint of the observer who is in full possession of all relevant facts, [the creative response] can always be understood ex post; but it can practically never be understood ex ante; that is to say, it cannot be predicted by applying the ordinary rules of inference from the pre-existing facts” (Schumpeter, 1934: 150).

In other words, this characteristic implies that an innovation is a result that cannot be foreseen, but that the process that led to an innovation can be understood once the innovation has been generated. From a knowledge perspective, this means that an innovation process (the generation of an innovation) is characterized by the creation of the knowledge needed to understand how the innovation was generated. From this, we can infer that an innovation does come from a process of knowledge creation. We can also infer that an innovation as an artifact contains the knowledge needed in order to understand how it has been created, and thus how to create it again. As such, it is possible to say that the knowledge that is created during the innovation process and that allows the process to be understood is the essence of the innovation

process and it defines the innovation as an outcome. We label this process of creating knowledge in order to reach an innovation outcome a knowledge substantiation process.

The main difference between this conceptualization and the existing models of knowledge creation is the emphasis on the creation of knowledge as a process in itself regardless of the form in which the knowledge was created. As such, the process of knowledge creation is defined by its outcome: it is a process that creates new knowledge. And this knowledge cannot have been conceived before having gone through the innovation process. The link between the process of knowledge creation and its outcome highlights the need to conceptualize the innovation outcome from a knowledge-based perspective (new knowledge), as this conceptualization will in turn influence the conceptualization of the innovation process conceptualized from a knowledge based perspective.

At this stage, the existence of a link between new knowledge and innovation can be assumed, as we have argued that an innovation is, in essence, new knowledge. However, we argue that not all new knowledge should be termed an innovation and that specific characteristics should be added to a knowledge-based conceptualization of innovation as an outcome in order to differentiate between new knowledge and innovation.

Innovation Characteristics

Based on the above, we start our knowledge-based reconceptualization of innovation by defining it as *new knowledge*. In the following paragraphs, we will explain the characteristics that we add to this definition to conclude that innovation should be considered as ***duplicable knowledge considered new by a group of experts and demonstrated useful in practice***. An innovation, or knowledge creation, process may or may not lead to an innovation, depending on the existence of these characteristics.

Demonstrated useful in practice. Usefulness relates to the capacity of an innovation to improve on an existing situation. This characteristic can be used to differentiate between an innovation and an invention. An invention can be new, but it will not necessarily improve existing processes or situations. Usefulness is a defining characteristic of innovation because it relates to the implementation decision. Following Machlup (1962), an entrepreneur has to take the decision to invest in an invention to turn it into an innovation; the entrepreneur is therefore expecting a return on his/her investment. While an innovation is not a guarantee of a successful investment, the implementation decision cannot occur if the invention or idea is not useful or anticipated to be useful. This perspective has been emphasized in existing literature, for example in Dougherty and Hardy's (1996: p 2) definition of innovativeness: "We define sustained product innovation as the generation of multiple new products, as strategically necessary over time, with a reasonable rate of commercial success", which alludes to the notion of usefulness by including a criteria for a "reasonable rate of commercial success". Additionally, usefulness is not attributed theoretically to a product or an idea; it is constructed through the application of the invention in practice. Finally, we want to emphasize that the demonstration of the usefulness of an innovation is a process that has a large social component, as individuals need to be convinced in order to make a decision. This element should be included in a model of organizational innovation.

Schumpeter (1934) explained the difference between an inventor and an entrepreneur through the ability of the entrepreneur to "get things done" (Schumpeter, 1934: 152). For Schumpeter, an invention belongs to the realm of ideas and an innovation is a practical implementation of these ideas. While we adopt this distinction and include it in our definition, we would like to note that an innovation should not be reduced to being an object. As an example, new theories provoking paradigm changes could be termed innovations, depending on their implications for practice.

Duplicability. Duplicability is another characteristic that should be considered in the definition of innovation. It is already implicit in our conceptualization of the innovation process: the innovation process leads to the creation of knowledge that allows an understanding of how the innovation has been created. Therefore, it should permit the replication of the result of the innovation process without having to repeat the knowledge generation process itself. For example, once a product has been created, the engineers who created it should have gained the knowledge needed to create a second product very similar to the first one. This knowledge could also be used to replicate the product in another organization or in another situation. As such, an innovation should be replicable.

Novelty and the unit of analysis. Novelty is at the heart of a definition of innovation. In essence, an innovation is something new. There are two main discussions around novelty: how new is the innovation and to whom is the innovation new. These two issues are related. It is likely that a radical innovation will be new to the world, while an incremental innovation may be new only to the unit of analysis, but this is not necessarily always the case.

Most definitions of innovation propose that the individuals constituting the environment into which the innovation is introduced should judge its novelty (Damanpour, 1991; Dougherty, 1992; West & Farr, 1990). This is clear in Markus' (1988: p. 1) definition "Innovations are ideas, formulas, or programs that the individuals involved perceive as new". However, this leads to a problem when the innovation is new to the unit of analysis but not to the rest of the world. Van de Ven (1986: p. 2) handles the issue by mentioning that: "As long as the idea is perceived as new to the people involved, it is an "innovation", even though it may appear to others to be an imitation or something that exists elsewhere." Similarly, Daft (1978: p. 5) suggests that: "the idea can be old with regard to other organizations so long as the idea has not previously been used by the adopting organizations".

This can be explored and justified from a knowledge perspective. As suggested earlier, we perceive the innovation process as being defined by the creation of the knowledge that embodies the innovation. As such, if the innovation has been created elsewhere, then the knowledge that embodies the innovation has also been created and it is thus possible to replicate the innovation without having to create the knowledge again. The key element however, is not the existence of the knowledge linked to an innovation, but its availability to and use by the unit of analysis. If the knowledge exists, but the unit of analysis is unaware of it or does not use it (for example if it is very difficult to replicate the knowledge in another context or situation), then the unit of analysis will have to go through the process of knowledge creation and will have thus created an innovation, even if the result were identical to a pre-existing innovation. Therefore, we distinguish between the creation of an innovation and its adoption or imitation in terms of whether the knowledge needed to replicate the process is available to and used by the group considered before starting the innovation process. If the knowledge was available beforehand and used, then the group has replicated or adopted an innovation. If the knowledge was not available beforehand or not used, then the group has created an innovation, even if the innovation had been created previously in another environment.

The issue of the unit of analysis in our case can thus be limited to one of creation versus imitation or adoption of innovations (This would be different for the allocation of a patent for example, where it is the novelty to the world which is being assessed). As this paper focuses on the creation of innovations, we will only consider the cases when the innovation is new to the world or when the unit of analysis does not have access or is not using the knowledge needed to replicate the innovation, thus creating an innovation themselves. With this in mind, we follow Kanter (1988) in conceiving the innovation process, while containing individual and organization-level elements, as mainly group-based. As such, the primary unit of analysis for an

innovation should be the group. Ideas and inventions are generated by specific individuals who work in defined group settings. These individuals, present their ideas or inventions to managers who have the authority to make the decision of allocating the resources to pursue an innovation. In most cases these managers are the local experts who are asked to judge of the usefulness (and novelty of the innovation). Drawing on the knowledge nature of our conceptualization of innovation, we follow the arguments of Wilcox, King and Zeithami (2003) and Housle and Nelson (2005) who consider that managers are the better-placed individuals to recognize and articulate organizational knowledge and thus new knowledge in general. When the unit of analysis is an organization or a division, it is suggested that the group level results should be aggregated at an organizational or a divisional level. However, it should be recognized, as Dewar and Dutton (1986) express it that the level of knowledge (familiarity and experience) of the managers will be likely to influence their judgment of the novelty of an innovation. The use of managers to measure organizational innovativeness has already been used in the literature (see Dougherty, 2001).

Having defined what an innovation is from a knowledge perspective, we will now present a model of innovation as a knowledge-based process. This model will take into account the characteristic of an innovation.

A PROCESS-MODEL OF ORGANIZATIONAL INNOVATION

Building on our definition of innovation, we argue that the process of innovation should consists of two interacting dimensions, a social dimension and a knowledge dimensions. The next sections will outline a process model of innovation (see Figure 1) that evolves across different phases and conceptualizes innovation as developing through a complex interplay of knowledge substantiation and social substantiation.

- Insert Figure 1 about here -

The innovation phases vary in their relative importance of knowledge and social aspects of substantiation and are subject to different influences. We will begin by describing three phases in terms of the importance of knowledge substantiation and social substantiation. In a second step, we will elaborate in more detail on the determinants of the substantiation process.

Three Phases of Organizational Innovation

Specifically, we propose a three-phase substantiation-based process of innovation. Building on the ideas of Kanter (1988), we label the three innovation phases as (1) coalition building, (2) idea realization and implementation and (3) organizational acceptance. In addition, taking into account the creativity literature we conceptualize creative behavior as preceding the organizational innovation process and leading to the generation of ideas. This argument is conceptually similar to Kanter's (1988) notion of an idea generation phase. Implicit to our argumentation is the idea that social substantiation and knowledge substantiation processes co-evolve in leading to a final innovation outcome and that the three innovation phases are marked by the respective intersection points of the knowledge substantiation and the social substantiation graphs. Although Figure 1 essentially demonstrates a one-directional process, we are aware that the process, in reality, will be rather emergent and iterative. For example, a partially realized idea that cannot be further substantiated into an innovation due to a lack of social support may feed back into the coalition building phase and re-start the process.

Creative behavior. Existing research views the generation of ideas as the initial input for innovation (Amabile et al., 1996). Ideas constitute a novel content of cognition (Walsh, 1995, Weick, 1979). Ideas, in turn, are the result of creative behavior of an individual; we conceptualize

this creative behavior as preceding the innovation process and thus serving as a key input. While we are aware of recent contributions of the organizational creativity literature (Drazin, Glynn, & Kazanjian, 1999; Ford, 1996; Woodman et al., 1993), we distinguish between idea generation as a mainly cognitive process and organizational innovation as interplay of both cognitive and social processes. The creativity literature discusses different antecedents of creative behavior. While the traditional psychological approach focuses on the role of individual characteristics and propensities to engage in creative behavior, other studies have examined contextual and organization-level influences on individual creativity (for a review see Drazin et al., 1999; Woodman et al., 1993). In addition, scholars acknowledge the relevance of an individual's knowledge and abilities for creative behavior. For example, Amabile (1988) derives not only creativity-relevant skills such as cognitive skills and personal traits but also domain-relevant skills that encompass the knowledge, technical skills and talent required to be creative. Pre-existing knowledge is thus a pre-requisite for the innovation process to begin. More recent research has highlighted the social perspective of creativity by deriving various social network characteristics that facilitate creative behavior (Perry-Smith, 2006; Perry-Smith & Shalley, 2003). While these social aspects help an individual with the generation of an idea, they initially do not provide any social substantiation of the idea beyond the context of the individual. Therefore, we view creative behavior as primarily leading to an initial level of substantiated knowledge in the form of a generated idea. Importantly, as creative behavior is a cognitive process we can expect that idea generation, to a certain extent, occurs consciously and thus provides some knowledge of how the individual was able to generate that idea. We therefore understand a generated idea as containing an initial level of knowledge substantiation and some view of the potential applicability to practice.

Coalition building. Once the idea is introduced into the individual's organizational unit, further knowledge substantiation is temporarily deferred. Rather, social substantiation processes begin to unfold, as the idea needs to be defended against resistance from colleagues, vested interests, competing ideas and other organizational impediments. For example, Lawrence et al. (2005), identify that power and politics influence the institutionalization of new ideas. When a new idea is introduced in a group, it effectively enters a different context and is subject to each additional individual's existing knowledge and social perspectives. These social processes determine whether an actor can generate sufficient support to further pursue the idea.

Idea realization and implementation. Once this acceptance has been reached, the idea is further developed and transformed. From this point, knowledge substantiation rather than social substantiation processes take place as the individual and his/her immediate work team further refine and specify the idea and, in doing so, create new knowledge. The idea realization and implementation phase ends with the idea being transformed into a potentially applicable product, process or concept that is new to its environment and is replicable.

Organizational acceptance. The final phase of the innovation process is also characterized by differences in the relative importance of knowledge substantiation and social substantiation. With the realization and implementation of the idea a major part of the knowledge needed to create an innovation has already been substantiated. The final stage of the innovation process still contains elements of knowledge substantiation in terms of establishing usefulness and commercial success of the implemented idea but we would assume a decreasing level of new knowledge substantiation. At the same time, social substantiation becomes relatively more important again as the invention now needs to generate organizational acceptance and commercial value (Dougherty & Hardy, 1996). Others must see value in the knowledge and its ability to solve the original innovation problem, often by a tacit understanding that moves beyond

an individual's existing context. This acceptance process is partially influenced by how the implemented idea is described, by its metaphor (Crossan et al., 1999) or its design characteristics (Hargadon & Douglas, 2001). Through social and political influence actors seek to obtain the support required to push the idea to its final outcome. Based on our previous arguments, we propose the following:

Proposition 1: The innovation process is characterized by a co-evolution of knowledge substantiation and social substantiation processes with their relative importance changing over time. Knowledge substantiation is relatively more important than social substantiation for creative behavior resulting in the idea generation and in the idea realization and implementation phase. In contrast, social substantiation is relatively more important than knowledge substantiation in the coalition building phase and in the organizational acceptance phase.

The previous discussion has conceptualized the innovation process as the interplay between the two dimensions of knowledge substantiation and social substantiation. We now turn our attention to specific determinants of these two dimensions of substantiation.

Determinants of Knowledge Substantiation

The process of knowledge substantiation is contingent upon two main factors, namely a group's knowledge, skills and abilities (KSAs) as well as its access to knowledge resources that are rooted elsewhere in or outside of the organization.

KSAs. KSAs constitute the accumulated knowledge that is available among a group of individuals involved in the innovation process and they provide an important basis for knowledge substantiation. While individuals are generally able to generate new knowledge without much prior technical understanding of a given matter, path-dependent knowledge and thus prior

understanding of the inherent intricacies of a problem or a condition will facilitate the generation of new knowledge (Cohen & Levinthal, 1990). A high level of individuals' related KSAs will provide them with a better understanding of how an initial idea could possibly be implemented, i.e. which processes and actions may be required to further substantiate this idea. It is therefore more likely that the individuals, in retrospect, are able to generate an adequate understanding of how the innovation has been created. Along similar lines, Ellis, Hollenbeck, Ilgen, Porter & West (2003) show that ideas are subject to certain team characteristics such as a group's attentional capacity, constructive controversy and truth-supported wins. Accordingly, knowledge substantiation in an innovation team is likely to be affected by the team's ability to process information. In general, we would expect that the level of related KSAs not only determines *to which extent* knowledge substantiation occurs but also impacts the speed with which an idea can be transformed into an innovation and thus *how fast* knowledge substantiation will take place. Thus:

Proposition 2a: The knowledge, skills and abilities of an individual or an innovation team positively influence the level of knowledge substantiation in an initial idea.

Proposition 2b: The knowledge, skills and abilities of an individual or an innovation team positively influence the speed of knowledge substantiation.

Access to knowledge resources. Extant KSAs of a team involved in the innovation process may not be sufficient to substantiate the new knowledge required to create an innovation. The resource-based view of the firm emphasizes the role of accessing and recombining heterogeneous resources and their bundling into capabilities for organizational innovation (Eisenhardt & Martin, 2000; Rodan & Galunic, 2004; Wernerfelt, 1984). In this regard, knowledge-based resources in particular are regarded as instrumental for initiating a modification

and transformation of more tangible resources into an innovation output (Galunic & Rodan 1998; Kogut & Zander, 1992; Teece et al., 1997). Consequently, the process of knowledge substantiation is facilitated by tapping into diverse knowledge repositories that are rooted at different levels in and beyond an organization and recombining and integrating these diverse resources into new knowledge. At the same time, the lack of resource access and recombination may impede the substantiation completely. Similarly, we would expect knowledge substantiation to occur faster, if knowledge-based resources elsewhere in the organization can be activated and recombined with available resources and KSAs of the individuals that are most immediately involved in the substantiation process.

Proposition 3a: Access to knowledge resources in and beyond the organization positively influences the level of knowledge substantiation.

Proposition 3b: Access to knowledge resources in and beyond the organization positively influences the speed of knowledge substantiation.

Determinants of Social Substantiation

Our discussion has also highlighted the role of social and political processes with regard to the substantiation of ideas into innovation outcomes. Extant related literature has discussed the role of social influence with regard to creativity (Perry-Smith, 2006; Perry-Smith & Shalley, 2003), organizational learning (Lawrence et al., 2005) and innovation (Powell, Koput & Smith-Doerr, 1996). Below, we will discuss three distinct determinants of social substantiation resulting from social processes in organizations: social network characteristics, power and institutionalized norms.

Social network characteristics. Social network research builds upon the assumption that individuals are embedded in a system of social relationships that are interlinked and influence

their behavior (Brass, Galaskiewicz, Greve, & Tsai, 2004). We would expect social networks to be relevant across all three stages of the innovation process. For example, a study by Ruef (2002) suggests that organizational members perceive their ideas to be potentially more innovative if they sustain diverse networks and weak tie contacts. Similarly, Perry-Smith (2006) shows that network centrality in combination with few ties external to the organization and weak ties positively influence individual creativity. There is also evidence that ideas from managers who sustain structural holes in their social networks are more likely to be evaluated as valuable and thus accepted in the organization (Burt, 2004). Finally, research indicates that networks of inter-organizational scope influence the transformation of inventions into innovation outcomes. A study by Yli-Renko et al. (2001), for instance, demonstrates that a firm's interaction with its main customers has a positive impact on the development of products that are considered useful. Again, we would expect social network characteristics such as network centrality, range, weak ties and structural holes not only to influence the degree of social substantiation but also its speed. Therefore:

Proposition 4a: Social network characteristics such as network centrality, range, weak ties and structural holes positively influence the level of social substantiation.

Proposition 4b: Social network characteristics such as network centrality, range, weak ties and structural holes positively influence the speed of social substantiation.

Power. Related to aspects of an actor's social network characteristics are issues of power. Indeed, social network research indicates that central network positions increase an actor's power base and influence in an organization (Brass, 1984; Brass & Burkhardt, 1993). Along similar lines, there is evidence that organizational members occupying peripheral or minority positions within an organization face increased challenges of establishing social influence (Gruenfeld,

Martorana, & Fan, 2000) and social network ties (Mehra, Kilduff, & Brass, 1998). Power can be understood as the ability to overcome potential resistance in order to achieve a desired outcome (Astley & Sachdeva, 1984). Several researchers link organizational power structures to innovation in organizations. Ibarra (1993), for example, finds support for the role of different sources of power for involvement in innovation projects. Additionally, Dougherty and Hardy (1996) demonstrate that personal power needs to be linked with organizational resources and processes in order to enhance acceptance of an innovation.

Given that organizations dispose of limited financial resources to back innovation projects, different individuals and organizational units compete for the necessary resources. The ability of a unit to legitimize an idea or invention and gain organizational acceptance is thus highly dependent upon its position in the intra-organizational network and the organizational influence of its key actors. With this argument, we draw upon a political perspective on innovation that views organizations rather than individuals as adopting an innovation (Kanter, 1988; Van de Ven, 1986). This perspective assumes that individuals in an organizational context need to persuade others of the value and mobilize support for acceptance of an idea or invention. These findings point towards the importance of an innovator's or an innovation team's organizational power for the scope and speed of legitimization of innovation in the organization as power is instrumental in controlling resources necessary to substantiate ideas into innovations. We therefore posit:

Proposition 5a: An innovator's or an innovation team's organizational power positively influences the level of social substantiation.

Proposition 5b: An innovator's or an innovation team's organizational power positively influences the speed of social substantiation.

Institutionalized norms. Institutional theories of the organization indicate that organizational behavior is strongly influenced by societal expectations and results in specific organizational actions that are likely to achieve a fit and thus become isomorphic with the organization's institutional environment (DiMaggio & Powell, 1983; Meyer & Rowan, 1977). This leads us to assume that not only power structures become institutionalized over time but also that the criteria of what constitutes useful, duplicable and new knowledge may become socially pre-determined. For example, ideas that are more distant from existing approaches within the firm or that draw on knowledge that is not within existing schemas of the organization will be more difficult to realize (Hargadon & Douglas, 2001). As a result, it may be more difficult and more time-consuming for innovators to socially substantiate ideas and inventions and achieve acceptance against institutionalized norms prevalent in the organization.

Proposition 6a: Institutionalized norms negatively influence the level of social substantiation.

Proposition 6b: Institutionalized norms negatively influence the speed of social substantiation.

To summarize, the previous discussion suggests that an innovator's or innovation team's existing KSAs, their access to both internal and external knowledge resources, the characteristics of their social networks, their organizational power as well as existing institutionalized norms affect both whether and how fast an idea can be transformed into an innovation. Drawing together our arguments, we can derive three additional implications. First, we have shown that not only all of the aforementioned determinants of knowledge substantiation and social substantiation exert a distinct influence on the innovation process but also that they impact the time the innovation process takes. The duration of the innovation process is thus a function of

both the determinants of knowledge substantiation and the determinants of social substantiation. Second, we have stated earlier that the innovation process inherently consists of the *interplay* between both dimensions of substantiation. As a result, both dimensions are required for innovation outcomes to occur which is why we propose a multiplicative relationship between the two.

Proposition 7: Knowledge substantiation and social substantiation influence the duration of the innovation process in a positive multiplicative manner.

Finally, we acknowledge that the innovation process is essentially a chaotic process that entails unexpected and unpredictable elements, particularly at the initial idea generation stage (Cheng & Van de Ven, 1996) and in situations where causal innovation determinants act in an interdependent and non-linear fashion (Dooley & Van de Ven, 1999). Given that we propose a multiplicative relationship between the derived determinants of social substantiation and knowledge substantiation, chaotic elements are likely to exist throughout the whole innovation process and will slow it down. To account for this effect, we include a negative error term in each of the two substantiation functions (see Figure 1). Accordingly:

Proposition 8a: Unexpected and unpredictable events negatively influence the level of knowledge substantiation and social substantiation.

Proposition 8b: Unexpected and unpredictable events negatively influence the speed of knowledge substantiation and social substantiation.

CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

Our conceptual results entail several implications for future research. First, the distinction between innovation and new knowledge, and the absence of reference to technology or product in our definition of innovation, should facilitate the study of non-product innovations and open the

possibility to analyze innovations generated at any place in an organization. This might also enable the study of innovation in services, currently underrepresented in the innovation literature (Gadrey, Gallouj, & Weinstein, 1995). Additionally, by giving clear parameters this definition might allow the adoption of alternative and more comprehensive methods of measuring innovation and innovativeness. For example, a measure of innovativeness that could be related to this definition is the literature-based innovation output indicator (Coombs et al., 1996; Walker, Jeanes & Rowlands, 2002), which is comparable to the measures currently used to measure innovativeness in universities (Garfield, 1986; Liebowitz & Palmer, 1988; Stigler & Friedland, 1975).

Second, while we have discussed the innovation process without any reference to the respective level it occurs on we believe that, implicit to our conceptualization of innovation, is the notion that the process evolves across different levels. For example, the idea generation stage is most likely to be located at the individual or work group level. Ideas originate in the creative behavior of one or more individuals, which is influenced by group-level processes (Amabile, 1988). These individuals may or may not be part of the same group or work unit. Accordingly, some of the factors affecting the knowledge substantiation of the idea such as available KSAs and detectable resources and capabilities may differ depending on the group and its organizational environment the idea generator is embedded in (Galunic & Rodan, 1998). Likewise, individuals are usually part of different groups and their expertise in terms of existing KSAs may differ according to their membership. To substantiate a given idea, it may thus be necessary to tap into more capabilities external to the immediate work group. In a similar vein, Fernandez and Gould (1994) show that individuals' membership in multiple groups entails different group-specific social network characteristics and social influence that are thus likely to affect social substantiation. In addition, the fact that individuals and organizational units compete for scarce

resources in order to gain acceptance for an idea or invention may also require the involvement of socially more influential individuals occupying higher positions in the organizational hierarchy or the cooperation with work units located in other parts of the organization. In this case, the innovation process may become completely detached from the initial idea generator or generating team. Another important levels issue arises when we focus our interest on the level the innovation outcome is to be rooted. For example, we can think of innovation outcomes that can be similarly created at different groups within an organization that do not interact and thus do not exchange the knowledge necessary to create an innovation. While each outcome may be innovative at the group level, the organizational level would only consider one outcome as an innovation and the other as an imitation of the respective innovation. However, if innovativeness, which we have defined as an organization's capacity to innovate, is the focus of analysis rather than innovation itself, it will be important to trace innovation activity at different work units without considering whether the final outcome is uniquely innovative.

Third, while we acknowledge that the ultimate acceptance and value of an innovation are determined by the market the innovation is introduced to, we have focused our interest on the process of achieving initial social acceptance in an organizational setting. Our model thus explicitly differentiates between the social substantiation of an innovation as a process within the organization and the commercialization or diffusion of an innovation as external to the organization. We would encourage future research to more explicitly integrate both processes.

Finally, we would expect that there are both formal and informal aspects of social substantiation. For example, there can be both formalized processes of evaluating ideas in an organization (e.g., in product development teams) as well as informal processes that are driven by politics and vested interests. We have alluded to the latter but future research would benefit from an explicit consideration of the interplay of these two types of social substantiation.

Adopting a knowledge-based approach to innovation we have proposed an alternative perspective on the organizational innovation process. We have argued that although existing literatures on knowledge and innovation are inherently related, traditional definitions of innovation do not reflect this link. We therefore derived a different definition that understands innovation as the creation of new knowledge necessary to replicate the process leading to the innovation outcomes. In our understanding, this knowledge needs to be duplicable, considered new by a group of experts and demonstrated useful in practice. We further modeled this creation of new knowledge as a process of substantiation that comprises both social and knowledge components. Finally, we developed a three-stage model of the organizational innovation process that conceptualizes the innovation process as the interplay of knowledge substantiation and social substantiation and we discussed the determinants of that substantiation. We hope that this model encourages further research linking the knowledge and innovation literature.

REFERENCES

- Aiken, M. & Hage, J. 1971. The organic organization and innovation. *Sociology*, 5: 63-82.
- Alvesson, M. & Kärreman, D. 2001. Odd couple: Making sense of the curious concept of knowledge management. *The Journal of Management Studies*, 38(7): 995.
- Amabile, T. M. 1988. A model of creativity and innovation in organizations. In B. M. Staw & L. Cummings (Eds.), *Research in organizational behavior*, vol. 10: 123-167. Greenwich, CT: JAI Press.
- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. 1996. Assessing the work environment for creativity. *Academy of Management Journal*, 39(5): 1154-1184.
- Archibugi, D. 1992. Patenting as an indicator of technological innovation: A review. *Science and Public Policy*, 19: 357-368.
- Astley, W. G., & Sachdeva, P. S. 1984. Structural sources of intraorganizational power: A theoretical synthesis. *Academy of Management Review*, 9(1): 104-113.
- Banbury, C. M. & Mitchell, W. 1995. The effect of introducing important incremental innovations on market share and business survival. *Strategic Management Journal*, 16: 161-182.
- Bantel, K. A. & Jackson, S. E. 1989. Top management and innovations in banking: does the composition of the top team make a difference? *Strategic Management Journal*, 10: 107-124.
- Blackler, F. 1995. Knowledge, knowledge work and organizations: An overview and interpretation. *Organization Studies*, 16(6): 1021-1046.
- Bohn, R. E. 1994. Measuring and managing technological knowledge. *Sloan Management Review*, 35(1): 61-73.
- Bollinger, A. S., & Smith, R. D. 2001. Managing organizational knowledge as a strategic asset. *Journal of Knowledge Management*, 5(1): 8.
- Bates, K. A. & Flynn, E. J. 1995. Innovation history and competitive advantage: A resource-based view analysis of manufacturing technology innovations. *Academy of Management Journal, Best Paper Proceedings*: 235-239.
- Brass, D. J. 1984. Being in the right place: A structural analysis of individual influence in an organization. *Administrative Science Quarterly*, 29(4): 518-539.
- Brass, D. J. & Burkhardt, M. E. 1993. Potential power and power use: An investigation of structure and behavior. *Academy of Management Journal*, 36(3): 441-470.
- Brass, D. J., Galaskiewicz, J., Greve, H. R. & Tsai, W. 2004. Taking stock of networks and organizations: A multilevel perspective. *Academy of Management Journal*, 47(6): 795-817.
- Burgelman, R. A. & Maidique, M. A. 1988. *Strategic management of technology and innovation*. Homewood, IL: Irwin.

- Burt, R. S. 2004. Structural holes and good ideas. *American Journal of Sociology*, 110(2): 349-401.
- Camison-Zornoza, C., Lapiedra-Alcami, R., Segarra-Cipres, M. & Boronat-Navarro, M. 2004. A meta-analysis of innovation and organizational size. *Organization Studies*, 25(3): 331-361.
- Cheng, Y. & Van de Ven, A. H. 1996. Learning the innovation journey: Order out of chaos? *Organization Science*, 7(6): 593-614.
- Clark, J. & Guy, K. 1998. Innovation and competitiveness: A review. *Technology Analysis & Strategic Management*, 10(3): 363-395.
- Clegg, C., Unsworth, K., Epitropaki, O. & Parker, G. 2002. Implicating trust in the innovation process. *Journal of Occupational and Organizational Psychology*, 75: 409-422.
- Cohen, W. M. & Levinthal, D. A. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1): 128-152.
- Cook, S. D. N. & Brown, J. S. 1999. Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing. *Organization Science*, 10(4): 381-400.
- Coombs, R., Narandren, P. & Richards, A. 1996. A literature-based innovation output indicator. *Research Policy*, 25: 403-413.
- Crossan, M. M., Lane, H. W. & White, R. E. 1999. An organizational learning framework: From intuition to institution. *Academy of Management Review*, 24(3): 522-537.
- Damanpour, F. 1991. Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34(3): 555-590.
- Dewar, R. D. & Dutton, J. E. 1986. The adoption of radical and incremental innovations: An empirical analysis. *Management Science*, 32(11): 1422-1433.
- Dewett, T. & Jones, G. 2001. The role of information technology in the organization: A review, model, and assessment. *Journal of Management*, 27(3): 313-346.
- DiMaggio, P. J. & Powell, W. W. 1983. The iron cage revisited: Institutional isomorphism and collective rationality. *American Sociological Review*, 48: 147-160.
- Dooley, K. J. & Van de Ven, A. H. 1999. Explaining complex organizational dynamics. *Organization Science*, 10(3): 358-372.
- Dougherty, D. 1992. A practice-centered model of organizational renewal through product innovation. *Strategic Management Journal*, 13: 77-92.
- Dougherty, D. & Hardy, C. 1996. Sustained product innovation in large, mature organizations: Overcoming innovation-to-organization problems. *Academy of Management Journal*, 39(5): 1120-1153.
- Drazin, R., Glynn, M. A. & Kazanjian, R. K. 1999. Multilevel theorizing about creativity in organizations: A sensemaking perspective. *Academy of Management Review*, 24(2): 286-307.

- Eisenhardt, K. M. & Martin, J. A. 2000. Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10-11): 1105-1121.
- Eisenhardt, K. M. & Tabrizi, B. N. 1995. Accelerating adaptive processes: Product innovation in the global computer industry. *Administrative Science Quarterly*, 40(1): 84-110.
- Ellis, A. P. J., Hollenbeck, J. R., Ilgen, D. R., Porter, C. O. L. H. & West, B. J. 2003. Team learning: Collectively connecting the dots. *Journal of Applied Psychology*, 88(5): 821-835.
- Empson, L. 2001. Introduction: Knowledge management in professional service firms. *Human Relations*, 54(7): 811.
- Ettlie, J. E., Bridges, W. P. & O'Keefe, R. D. 1984. Organization strategy and structural differences for radical versus incremental innovation. *Management Science*, 30(6): 682-696.
- Fernandez, R. M. & Gould, R. V. 1994. A dilemma of state power: Brokerage and influence in the national health policy domain. *American Journal of Sociology*, 99: 1455-1491.
- Fiol, C.M. 1996. Squeezing harder doesn't always work: Continuing the search for consistency in innovation research. *Academy of Management Review*, 21(4): 1012-1021.
- Ford, C. M. 1996. A theory of individual creative action in multiple social domains. *Academy of Management Review*, 21(4): 1112-1142.
- Galunic, C. & Rodan, S. 1998. Resource recombination in the firm: Knowledge, structures and the potential for Schumpeterian innovation. *Strategic Management Journal*, 19(12): 1193-1201.
- Gadrey, J., Gallouj, F. & Weinstein, O. 1995. New modes of innovation: How services benefit industry. *International Journal of Service Industry Management*, 6(3): 4-16.
- Garfield, E. 1986. The 250 most-cited primary authors in the 1984 SCI. Part 2. Most cited works. *Current Contents*, 46: 4-13.
- Glynn, M. A. 1996. Innovative genius: A framework for relating individual and organizational intelligences to innovation. *Academy of Management Review*, 21(4): 1081-1111.
- Gopalakrishnan, S. & Bierly, P. 2001. Analyzing innovation adoption using a knowledge-based approach. *Journal of Engineering and Technology Management*, 18(2): 107-130.
- Grant, R.M. 1996. Toward a knowledge-based theory of the firm, *Strategic Management Journal*, 17 (Winter Special Issue): 109-122.
- Gruenfeld, D. H., Martorana, P. V. & Fan, E. T. 2000. What do groups learn from their worldliest members? Direct and indirect influence in dynamic teams. *Organizational Behavior and Human Decision Processes*, 82(1): 45-59.
- Hargadon, A. & Sutton, R. I. 1997. Technology brokering and innovation in a product development firm. *Administrative Science Quarterly*, 42(4): 716-749.
- Hargadon, A. & Douglas, J. Y. 2001. When innovations meet institutions: Edison and the design of the electric light. *Administrative Science Quarterly*, 46(3): 476-501.

- Henderson, R. M. & Clark, K. B. 1990. Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly*, 35(1): 9-30.
- Howell, J. M. & Higgins, C. A. 1990. Champions of technological innovation. *Administrative Science Quarterly*, 35(2): 317-330.
- Hull, F. & Hage, J. 1982. Organizing for innovation: Beyond Burns and Stalker organic type. *Sociology*, 16(4): 565-577.
- Ibarra, H. 1993. Network centrality, power, and innovation involvement: Determinants of technical and administrative roles. *Academy of Management Journal*, 36(3): 471-501.
- Kagono, T., Nonaka, I., Sakakibara, K. & Okumura, A. 1985. *Strategic vs. evolutionary management: A U.S. - Japan comparison of strategy and organization*. Amsterdam: North Holland.
- Kanter, R. M. 1984. *The change masters: Innovation and entrepreneurship in the American corporation*. New York: Simon and Schuster.
- Kanter, R. M. 1988. When a thousand flowers bloom. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior*, vol. 10: 169-211. Greenwich, CT: JAI Press.
- Kim, D. H. 1993. The link between individual and organizational learning. *Sloan Management Review*, 35(1): 37-50.
- Kimberly, J. R. & Evanisko, M. J. 1981. Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal*, 24(4): 689-713.
- Kogut, B. & Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3 (3): 383-397.
- Lawrence, T. B., Mauws, M. K., Dyck, B. & Kleysen, R. 2005. The politics of organizational learning: Integrating power into the 4I framework. *Academy of Management Review*, 30(1): 180-191.
- Lee, H., Smith, K. G. & Grimm, C. M. 2003. The effect of new product radicality and scope on the extent and speed of innovation diffusion. *Journal of Management*, 29(5): 753-768.
- Lengnick-Hall, C. A. 1992. Innovation and competitive advantage: What we know and what we need to learn. *Journal of Management*, 18(2): 399-429.
- Leonard-Barton, D. 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, 13(Special Summer Issue): 111-125.
- Liebowitz, S. J. & Palmer, J. P. 1988. Assessing assessment of economics departments. *Quarterly Review of Economics and Business*, 28(2): 88-113.
- Machlup, F. 1962. *The production and distribution of knowledge in the United States*. Princeton, N.J.: Princeton University Press.
- Machlup, F. 1980. *Knowledge: its creation, distribution, and economic significance, Volume 1: Knowledge and knowledge production*. Princeton, N.J.: Princeton University Press.

- Marcus, A. A. 1988. Responses to externally induced innovation: Their effects on organizational performance. *Strategic Management Journal*, 9(4): 387-402.
- Mehra, A., Kilduff, M. & Brass, D. J. 1998. At the margins: A distinctiveness approach to the social identity and social networks of underrepresented groups. *Academy of Management Journal*, 41(4): 441-452.
- Menon, T. & Pfeffer, J. 2003. Valuing internal vs. external knowledge: Explaining the preference for outsiders. *Management Science*, 49(4): 497-513.
- Meyer, J. W. & Rowan, B. 1977. Institutionalized organizations: Formal structures as myth and ceremony. *American Journal of Sociology*, 83(2): 340-363.
- Myers, S. & Marquis, D.G. 1969. Successful industrial innovation: A study of factors underlying the innovation in selected firms. Paper No. NSF 69-17, National Science Foundation, Washington, DC.
- Nahapiet, J. & Ghoshal, S. 1998. Social capital, intellectual capital, and the organizational advantage. *The Academy of Management Review*, 23(2): 242-266.
- Narin, F. & Olivastro, D. 1988. Technology indicators based on patents and patent citations. In A. F. J. van Raan (Ed.), *Handbook of Quantitative Studies of Science and Technology*: 465-507. North-Holland: Elsevier Science.
- Nissen, M.E. 2002. An extended model of knowledge-flow dynamics. *Communications of the Association for Information Systems*, 8: 251-266.
- Nonaka, I. 1994. A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1): 14-37.
- Nonaka, I. 1995. *The knowledge creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.
- Oh, H., Chung, M.-H., & Labianca, G. 2004. Group social capital and group effectiveness: The role of informal socializing ties. *Academy of Management Journal*, 47(6): 860-875.
- Oh, H., Labianca, G., & Chung, M.-H. 2006. A Multilevel Model of Group Social Capital. *Academy of Management Review*, 31(3): 569-582.
- Pavitt, K. 1988. Uses and abuses of patent statistics. In A. F. J. van Raan (Ed.), *Handbook of quantitative studies of science and technology*: 509-536. North-Holland: Elsevier Science.
- Pennings, J. M. & Harianto, F. 1992. The diffusion of technological innovation in the commercial banking industry. *Strategic Management Journal*, 13(1): 29-46.
- Perry-Smith, J. E. 2006. Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal*, 49(1): 85-101.
- Perry-Smith, J. E. & Shalley, C.E. 2003. The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review*, 28(1): 89-106.
- Polanyi, M. 1967. *The tacit dimension*. London: Routledge & K. Paul.

- Ponzi, L. J. 2002. The intellectual structure and interdisciplinary breadth of knowledge management: A bibliometric study of its early stage of development. *Scientometrics*, 55(2): 259-272.
- Porter, M. E. 1990. *The competitive advantage of nations*. New York, NY: Free Press.
- Powell, W. W., Koput, K. & Smith-Doerr, L. 1996. Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly*, 41(1): 116-145.
- Prahalad, C. K. & Hamel, G. 1990. The core competence of the corporation. *Harvard Business Review*, 68(3): 79-91.
- Rodan, S. & Galunic, D. C. 2004. More than network structure: How knowledge heterogeneity influences managerial performance and innovativeness. *Strategic Management Journal*, 25(6): 541-562.
- Rogers, E. M. 2003. *Diffusion of innovations*. New York, NY: Free Press.
- Ruef, M. 2002. Strong ties, weak ties and islands: Structural and cultural predictors of organizational innovation. *Industrial and Corporate Change*, 11: 427-449.
- Schumpeter, J. A. 1934. *Theory of economic development*. Cambridge, MA: Harvard University Press.
- Schulze, A., & Hoegl, M. 2006. Knowledge Creation in New Product Development Projects. *Journal of Management*, 32(2): 210-236.
- Shane, S., Venkataraman, S. & MacMillan, I. 1995. Cultural differences in innovation championing strategies. *Journal of Management*, 21(5): 931-952.
- Stalk, G., Evans, P. & Shulman, L. E. 1992. Competing on capabilities: The new rules of corporate strategy. *Harvard Business Review*, 70(2): 57-69.
- Stigler, G. J. & Friedland, C. 1975. The citation practices of doctorates in economics. *The Journal of Political Economy*, 83(3): 477-508.
- Strebel, P. 1987. Organizing for innovation over an industry cycle. *Strategic Management Journal*, 8(2): 117-124.
- Szulanski, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal*, 17(winter special issue): 27-43.
- Teece, D. J., Pisano, G. & Shuen, A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7): 509-533.
- Tsai, W. & Ghoshal, S. 1998. Social capital and value creation: The role of intrafirm networks. *Academy of Management Journal*, 41(4): 464-476.
- Tsoukas, H. & Vladimirou, E. 2001. What is organizational knowledge? *The Journal of Management Studies*, 38(7): 973-993.
- Van De Ven, A. H. 1986. Central problems in the management of innovation. *Management Science*, 32(5): 590-607.
- Vera, D. & Crossan, M. 2003. Organizational learning and Knowledge Management: Toward an integrative framework. In M. Easterby-Smith & M. Lyles (Eds.), *The blackwell*

- handbook of organizational learning and knowledge management*: 122-141. Oxford: Blackwell.
- Walker, R. M., Jeanes, E. & Rowlands, R. 2002. Measuring innovation - Applying the literature-based innovation output indicator to public services. *Public Administration*, 80(1): 201-214.
- Walsh, J. P. 1995. Managerial and organizational cognition: Notes from a trip down memory lane. *Organization Science*, 6(3): 280-321.
- Weick, K. E. 1979. Cognitive processes in organizations. In B.M. Staw (ed.) *Research in Organizational Behavior*, vol. 1: 41-74. Greenwich, CT: JAI Press.
- Wernerfelt, B. 1984. A resource based view of the firm. *Strategic Management Journal*, 5(2): 171-180.
- West, M. A. & Farr, J. L. 1990. Innovation at work. In M. A. West & J. L. Farr (Eds.), *Innovation and creativity at work: psychological and organizational strategies*: 3-14. Chichester, England; New York: Wiley.
- Williamson, O. E. 1999. Strategy research: Governance and competence perspectives. *Strategic Management Journal*, 20(12): 1087-1108.
- Woodman, R. W., Sawyer, J. E. & Griffin, R. W. 1993. Toward a theory of organizational creativity. *Academy of Management Review*, 18(2): 293-321.
- Yli-Renko, H., Autio, E. & Sapienza, H. J. 2001. Social capital, knowledge acquisitions, and knowledge exploitation in young technology-based firms. *Strategic Management Journal*, 22(6/7): 587-613.
- Yueng, A. K., Ulrich, D. O., Nason, S. W. & Von Glinow, M. A. 1999. *Organizational learning capability: Generating and generalizing ideas with impact*. New York: Oxford University Press.

Table 1: The Duality of Innovation in Different Innovation Literatures



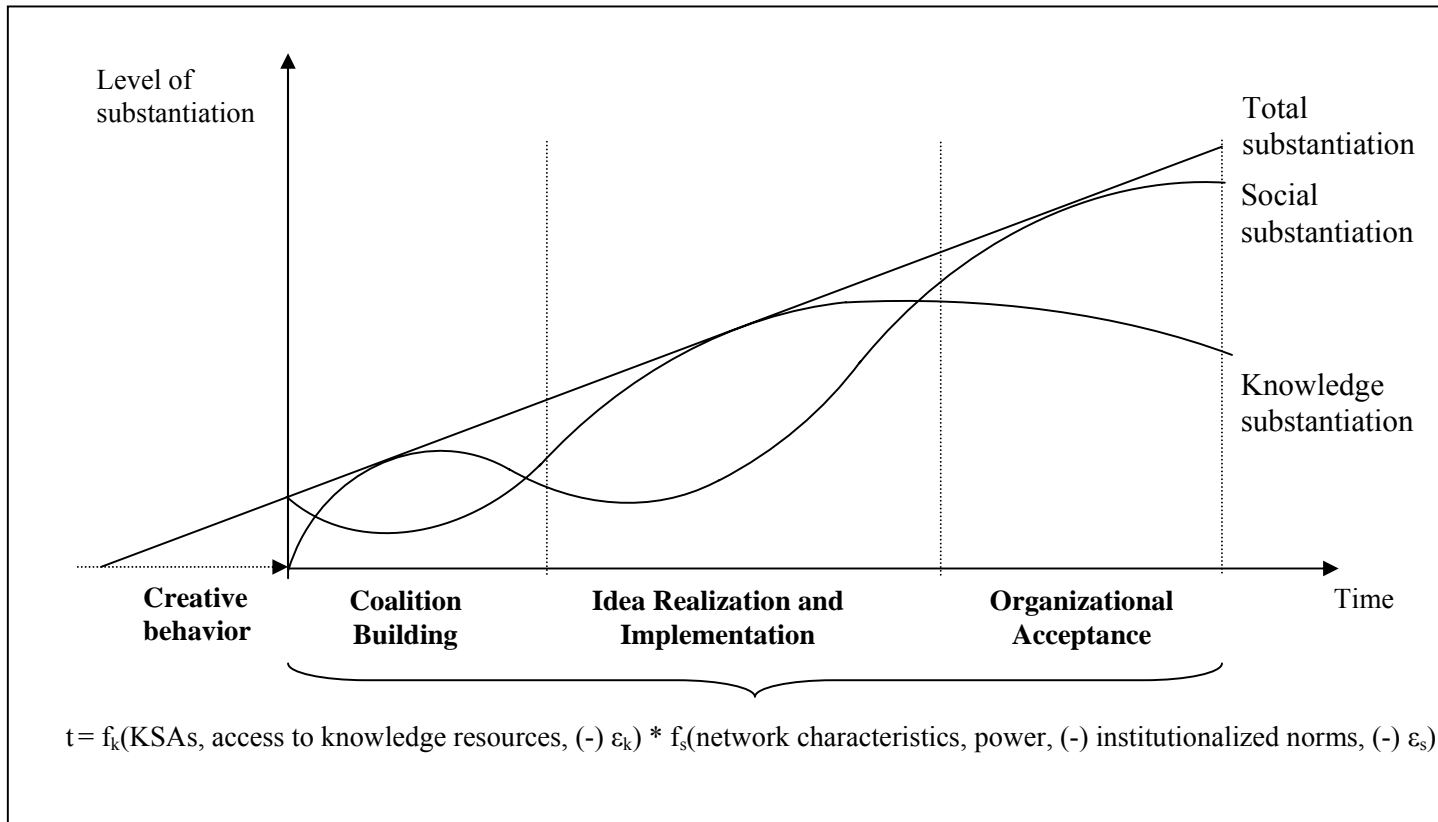
	Innovation as a process		Innovation as an outcome
Traditional innovation literature	<p>The introduction of an innovation.</p> <p>Two stages process, creation of an innovation and implementation</p>		<p>A product, process, software, idea, concept, etc., considered new in the environment into which it is introduced</p>
Knowledge-based conceptualization of innovation	<p>Knowledge exchange and recombination</p>		<p>Not clearly defined</p>

Figure 1: A Process-Model of Organizational Innovation



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