



Antecedent Factors Affecting Innovation, Radical Innovation and Incremental Innovation

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Abstract

This article presents a construct of the antecedent factors that enhance innovation in organizations. There are eight antecedent factors which are arranged in two main levels: individual and work environment levels. The eight antecedent factors for innovation are identified, such as employee knowledge and creativity skills, employee psychological state and attitudes, organizational structure, corporate strategy and shared vision, organizational creativity climate and culture, knowledge management and learning, management and leadership, and key individuals' roles facilitating innovation. Further, some antecedent factors are identified as having a significantly greater impact on radical innovation such as broad knowledge base; vision; slack resources; customer-related intelligence; innovation champion. And those that have more impact on incremental innovation are in-depth functional knowledge; centralization; competition-related intelligence; and orientation toward task excellence and quality.

Keywords: Innovativeness, Innovation, Antecedent Factors, Radical Innovation, Incremental Innovation

Introduction

Amidst the turbulent and severe competition in the present business world, companies are competing head-on for their market shares, growth or survival, even. They strive to gain a competitive advantage over their rivals, in terms of product quality, cost, process efficiency, innovation, and customer responsiveness (Daft, 2015). These elements enable them to come up with better or newer products and services to gain market shares or capture new markets. Nonetheless, products and services that are now new or disruptive will be duplicated by the competition and become commodities over time. Thus, continuously innovating and introducing disruptive new offerings to the market is imperative for company survival and growth (Christensen & Raynor, 2003).

Given the short life cycles of new products, innovativeness has become a central issue for the present-day competitive advantage and is regarded as an important organizational competency and a corporate strategy for firms to stay abreast and ahead of their competition (Amabile & Khaire, 2008; Drucker, 1985; McAdam & Keogh, 2004; Porter, 1990). Furthermore, trends such as globalization, the knowledge economy, and digital technologies have proved the very significance of innovation as such (Escriba-Esteve & Montoro-Sánchez, 2012). Failing to innovate has cost businesses heavily; examples abound in recent business annals where inability to pursue new innovations brought about downfalls of gigantic multinational corporations such as Kodak and Nokia, which were shoved out of their long-established businesses by disruptive innovations of digital cameras and smartphones respectively (Daft, 2015).

Meanwhile in the Thailand's scenario, the government has announced a policy to launch the country into Thailand 4.0 wherein industries are urged to move toward innovation-based businesses, not limited to just digital innovation but all forms of innovative products that utilize creativity and innovation (Office of the National Economic and Social Development Board, Office of the Prime Minister, 2017). Therefore, Thai organizations are awakened to look into their own innovativeness, to either enhance it or build it up in case of the absence of such.



These phenomena on both the global and the local fronts call for an exploration into what organizational factors could enhance innovation in organizations.

Over the past 40–50 years, businesses have been building up competencies aimed at enhancing efficiency, which are firmly established in organization management principles and practices (Sarri, Bakouros, & Petridou, 2010). However, an innovation-driven organization needs a skillset, a mindset, and antecedent factors different from those of an efficiency-driven organization (March, 1991; Raisch & Birkinshaw, 2008; Smith, Sutherland, & Gilbert, 2017). In becoming an innovative organization, there is a need for leaders and the management to establish a new and different skillset, mindset, and organizational factors that depart from what they are used to hitherto (March, 1991; Raisch & Birkinshaw, 2008; Smith et al., 2017).

Further, on the ground that radical and incremental innovations are the innovation types that commonly exist in companies that strive to become innovative and competitive in the marketplace, this article will identify and compare the antecedent factors that affect only one innovation type of either radical innovation or incremental innovation.

1. Overview of Innovation

1.1 Definition of Innovation

Innovation is “the intentional introduction and application” of ideas, processes, or procedures that are new and beneficial to an individual, a group, an organization, or a wider society that adopts the innovation (West & Farr, 1990, p. 9). It is “a process of turning opportunity into new ideas and of putting these into widely used practice” (Tidd & Bessant, 2009, p. 16). Innovation is considered the foundation of entrepreneurship in enterprises, large or small, and is rightly the means to create new organizational wealth or enable existing resources to create further wealth. (Drucker, 1985). It also contributes to organizational competitiveness and success (Amar, 2004; McAdam & Keogh, 2004). Prominent scholars in the realms of management, strategy and innovation studies such as Amabile and Khaire (2008); Christensen and Raynor (2003); McGrath (2001); Porter (1990), etc., all sing the same tune, confirming innovation as a competitive advantage for organizations to survive and prosper.

In various literature on innovation, one will often find the term *creativity* appear together with *innovation*, and in many occasions, it seems these two terms are even used interchangeably. This is apparently owing to the fact that researchers in creativity and innovation come from different fields of study. Research on creativity is often conducted in the field of behavioral science such as psychology and education; while research on innovation is conducted in the field of social science such as management and public administration (Sousa, Pellissier, & Monteiro, 2012). However, various scholars have managed to clearly distinguish the two terms (Anderson, De Dreu, & Nijstad, 2004). In essence, the distinction of the terms is made as follows: *creativity* is considered the initial stage of innovation that centers around generation of novel and useful ideas, while *innovation* involves both the generation of such ideas and their implementation (Amabile, 1997; West, 2002). Additionally, creativity is suggested to relate to the individual level; while innovation pertains to group and organizational levels (McLean, 2005).

1.2 Components of Innovation Process

Considered from the process perspective, *innovation* essentially consists of two sequential stages: *the creation of new and novel ideas* and *the realization of the ideas into final outputs* (Axtell et al., 2000; Tidd & Bessant, 2009). And again, if considered from its components, the innovation process is basically composed of two elements, namely, *creativity* in the first stage of idea generation and *implementation of the creative ideas* in the latter stage (Amabile, 1997; Anderson, Potočník, & Zhou, 2014; West & Farr, 1990).



1.3 Typologies of Innovation

Generally, innovation can be classified into administrative as opposed to technological innovation, and product as opposed to process innovation (Damanpour, 1991); administrative innovation refers to the innovation in administrative or management work, in contrast to the innovation in technology; and product innovation refers to new products and services, while process innovation refers to the innovation in production or work process.

In a more specific categorization, Schumpeter (1934) in his classical typology of innovation, classified it into five categories: *new products, new production methods, new markets, new sources of supply, and new forms of organization*. In a more recent study, innovation outputs are classified as *products or service, technologies, business models, work process, or management process* (Sengupta, 2014). In sum, this stream of definition looks at innovation from the perspectives of input, process, output and the administration in between.

Yet in a contemporary, comprehensive and relatively all-encompassing typology, innovation is classified into 10 categories, namely, *business model innovation* by which one finds new ways to deliver profits; *interorganizational network innovation* through which one can utilize innovation from other organizations; *structure innovation* in which an organization can find new unorthodox means of making fuller use of its resources; *process innovation* in which new activities and operations for production of products are employed; *product performance innovation* which enhances performance of a company's product by replacing it with an entirely new product or improved product features; *product system innovation* which bundles individual products and services to captivate, delight customers, and fend off competition; *service innovation* which enhances the value of a product offering; *channel innovation* through which customers can gain access to products and services with more ease and convenience; *brand innovation* which ensures customers' recognition and preference for an organization's product offerings; and *customer experience and engagement innovation* through which meaningful connections between customers and an organization are developed (Keely, Walters, Pikkell, & Quinn, 2013). This version of classification by Keely et al. (2013) addresses omni-dimensions of innovation, internally and externally, which involves input, process, output, organizational structure, marketing and brand management, networking, logistics, and strategic management. This orientation encompasses all critical dimensions of innovation and enable effective assessment and analysis of the state of innovation in an organization, leading to the systemized identification of the gaps that need remedying in order to shore up the innovation and, thus, competitiveness of the firm.

Apart from the above classification by types, there is yet another important approach of classification based on the novelty and impact of the innovation. This typology classifies innovation into two categories: radical and incremental innovation (Damanpour, 1991; Tidd & Bessant, 2009; O'Reilly III & Tushman, 2013; Tushman & Anderson, 1986).

Radical innovation requires new knowledge or departure from existing knowledge and technology; and involves searching for new organizational routines, experimentation, risk-taking and discovery of new approaches to technologies, products, businesses, and processes (Abernathy & Clark, 1985; Levinthal & March, 1993). Eventually, radical innovation results in new product, new designs, new work process; creates new markets, develops new channels of distribution (Abernathy & Clark, 1985; Atuahene-Gima, 2005; Benner & Tushman, 2003; Danneels, 2002; McGrath, 2001). Radical innovation comes in various forms and is called by various names. For example, it can be called: *disruptive innovation*, when the new innovation replaces the old one and drives incumbents out of the market (Christensen & Raynor, 2003); or *competency-destroying innovation*,

when new competency is needed to create the innovation (O'Reilly III & Tushman, 2013; Tushman & Anderson, 1986); or *discontinuous innovation*, when it replaces and puts an end to the existing product, process or technology (Tidd & Bessant, 2009). Essentially, radical innovation is the utilization of knowledge new to the actor to create new tangible and intangible outputs.

In contrast, incremental innovations utilize and refine their existing capabilities, knowledge, processes and operate in their current structures focusing on existing activities in their current domains (Benner & Tushman, 2003; Danneels, 2002). Incremental innovation involves small changes in technology and little deviation from the current products that the market is experiencing (Atuahene-Gima, 2005; Jansen, van den Bosch & Volberda, 2006), resulting in improvement in product features, production process, work efficiency and improvement in current distribution channels to meet the needs of existing customers (Abernathy & Clark, 1985; March, 1991).

The denotation of all the terms signifies the utilization of new knowledge in producing and using radical innovation; while points to the utilization of existing knowledge in incremental innovation (Damanpour, 1991; March, 1991; Tidd & Bessant, 2009; O'Reilly III & Tushman, 2013; Tushman & Anderson, 1986).

2. Antecedent Factors Enhancing Innovation

Innovation has been a topic of scholarly research for many decades, dating back to 1934 when the seminal literature *The Theory of Economic Development* by Schumpeter was published. Basically, study on innovation has been conducted in two approaches: process and antecedent factors approaches (King, 1990). Further, when considered from the areas of interest, it shows that literature streams have been centering around four dimensions of innovation: type, diffusion, antecedents of innovation, as well as the relation between innovation and firm performance (Lin & Chen, 2007).

However, in the field of organizational behavior, the *levels of analysis* seem to be the main-stream topic of study, with a plethora of research conducted on the individual, group and organizational levels. In the early days, research paid attention to study on the elements at the individual level conducive to creativity such as individual motivation (Amabile, 1988; Calder & Staw, 1975), personality and skills (MacKinnon, 1965; Williams & Yang, 1999). And in the later years, the focus shifted to the group level, exploring group diversity (Ancona & Caldwell, 1992; Williams & O'Reilly, 1998) and group creativity process (Agrell & Gustafson, 1994; Hunter, Bedell-Avers, & Mumford, 2007). Sequentially, by the early 1980s, leadership style influencing group innovativeness became one of the major focuses. A number of influential literature, including *In Search of Excellence* (Peters & Waterman, 1982) and *The Change Masters* (Kanter, 1983) explored the participative and democratic style of leadership influencing innovation. Further along, a number of scholars branched out to study the impact of transformational leadership on organizational innovation (Gumusluoglu & Ilsev, 2009; Howell & Avolio, 1993; Jaiswal & Dhar, 2015). In another research stream, starting from 1990s, scholars began to do research at the organizational level, investigating the role of organizational elements for innovation such as creative climate (Isaksen, 2007; 2017), corporate culture (Hogan & Coote, 2014; Kitchell, 1995) and organizational structure (Damanpour & Gopalakrishnan, 1998; Mumford, Hester, & Robledo, 2012).

Still, other researchers identified the antecedents simply in two categories of individual employee characteristics, and the work environment that the employee works in. This latter stream of research distinguishes between factors that are innate in the employees, which have little room for external influencing; and the work environment that can be strongly influenced by management at all levels (Amabile, 1997; Sternberg & Lubart, 1999). For the clear picture of what management can and cannot intervene to influence innovativeness as such,



this article will look at the antecedent factors through the latter perspective by arranging the factors into two categories of *individual innovative characteristics* and *work environment*.

Hence, *antecedent factors enhancing innovation* in this article will refer to the prerequisite elements, whether in the form of resources, capabilities or incidents which have the potential to induce future behaviour or results that are conducive to innovation in the organizations (Marín-Idárraga, Hurtado-González, & Cabello-Medina, 2016).

Antecedent Factors Pertaining to Radical and/or Incremental Innovation

Most of the research on innovation focus on innovation of new products and processes which belong in the category of radical innovation. Anyhow, some scholars found that, generally, antecedent factors of radical innovation also effectively impact incremental innovation (Marín-Idárraga et al., 2016). Nonetheless, since radical innovation and incremental innovation operate with different objectives in mind, they should, thus, require different resources and capabilities in several dimensions (Černe, Batistič, & Kenda, 2018; March, 1991; Marín-Idárraga et al., 2016). Furthermore, radical innovation involves more complex processes than those of incremental innovation and thus requires more resources, technology and staff than incremental innovation (Salomo, Weise, & Gemünden, 2007; Sivadas & Dwyer, 2000).

On the above-mentioned premise, in addition to reviewing the antecedent factors enhancing innovation in general, this article also attempts to identify and compare the elements that have either significantly more or less influence on one innovation type than on the other.

2.1 Individual Level

A substantial amount of research at the individual level has been conducted on the characteristics of an individual that lead to creativity. Many scholars (e.g., Amabile & Pillemer, 2012; Isaksen, 2017; McLean, 2005) have argued that individual creativity is fundamental to innovation. Variables such as individual traits, values and thinking style, self-concepts and identity, knowledge, and abilities and psychological states emerged from the researches (Anderson et al., 2014; Asif, 2017; Sternberg & Lubart, 1999). These elements are discussed separately as two distinct antecedent factors as in the following.

Antecedent Factors 1: Knowledge and Creativity Skills: *Knowledge* refers to the knowledge, expertise and skills in individuals, specifically the domain-related expertise and knowledge, which is the foundation of all creativity and innovation (Amabile & Pillemer, 2012; Mumford, Hemlin, & Mulhearn, 2017; Weisberg & Hass, 2007). *Creativity skills* refer to problem-solving techniques, cognitive style, and working style of an individual. These skills involve divergent thinking (which generates choices of ideas); ideation fluency (which refers to the ability to generate ideas); ability to connect ideas, seeing similarities and differences; being inquisitive, and questioning status quo (which leads to devising new ways of doing things) (Asif, 2017; Amabile & Pillemer, 2012; Mumford et al., 2017; Woodman, Sawyer, & Griffin, 1993). These elements are not only significant to the initiation of innovative ideas in the beginning stage, but also play important roles throughout the iteration process in the implementation phase (Hill, Brandeau, Truelove, & Lineback, 2014).

Antecedent Factors Effecting Particular Innovation Type

Katila and Ahuja (2002), and Marín-Idárraga et al. (2016) distinguished the influence of functional knowledge and broad knowledge on the two different innovation types. *In-depth functional knowledge* is derived from learning deeper into the current knowledge base, contrasting with *broad knowledge* which is derived from enlarging the knowledge perspective. In-depth functional knowledge is possessed by frontline people and is essential for incremental innovation where the knowledge enhances the ability to make improvements and refine

existing products and process. In contrast, broad knowledge perspective enables an individual to have systemic view of various functions and domains, internally and externally, and is often possessed by innovation management level; this broad knowledge is facilitative of radical innovation which requires knowledge beyond the existing knowledge base, resulting in new products and processes (Katila & Ahuja, 2002; Marín-Idárraga et al., 2016; Rothwell, 1992).

Antecedent Factors 2: Psychological States and Attitudes: This is about the personalities and affective elements of an innovative individual. Psychological elements are believed to significantly affect innovativeness at the individual level. Scholars have conducted research and identified a long list of the elements; nonetheless, many agreed that task motivation is of paramount significance, without which creativity does not occur effectively. (Amabile & Pillemer, 2012; Zhang & Bartol, 2010). Furthermore, some scholars explored the personality traits pertaining to innovativeness and found various traits of innovative people such as *openness to experience personality* (Baer, 2010); *proactive personality* (Gong, Cheung, Wang, & Huang, 2012); *self-efficacy* (Dunne, Aaron, McDowell, Urban, & Geho, 2016; Tierney & Farmer, 2011); *self-esteem* (Woodman et al., 1993); *tolerance of ambiguity* (Janssen, 2005; Unsworth & Clegg, 2010); and *social networking ability* (Baer, 2010). Obviously, as most of these elements are inborn and embedded in a person during early stages of life well before joining the organizations, they are beyond the intervention by the management. For that reason, organizations can but look for these individual characteristics during the processes of recruitment and selection (Loewenberger, 2013; Waples, Friedrich, & Shelton, 2011).

Antecedent Factors Effecting Particular Innovation Type

Though Amabile (1997) posited that intrinsic motivation is a foundation for innovativeness, the scholar also indicated that, on the contrary, extrinsic motivation such as rewards, do not contribute to innovation. This is concurred to a certain degree by some scholars such as Eisenberger and Shanock (2003) who suggested that properly-executed rewards for novelty are conducive to radical innovation; however, rewards designed for conventional performance decrease creativity. Drawing on this concept, organizations could best avoid dissipation of resources in radical innovation management by steering away from employing extrinsic motivation in the form of rewards for performance.

2.2 Work Environment Level

As for the antecedent factors in the work environment, extant studies have identified various elements at the team and organization levels that enhance workplace innovativeness. Contrary to individual's elements which are not subject to management intervention, the environmental elements are open for intervention by management in order to enhance innovation in the organizations. The following section displays the antecedent factors for innovation, together with the ones that affect either radical or incremental innovation.

Antecedent Factors 1: Organizational Structure: Organizational design concerns two organizational dimensions: structural dimension and contextual dimension (Daft, 2015). Prior studies have found that some conventional organizational elements are designed based on the strategic intent of maximizing efficiency, which somehow run counter to innovation; they proposed some different structural elements that enhance innovation in the organizations such as *flat structure with very few hierarchical layers* which shortens the chain of command, enhance information flow and exchange of ideas, (all of which are conducive to innovation) (Smith et al., 2017); *decentralization* and *low formalization* (Daft, 2015; Subramanian & Nilakanta, 1996).



Regarding the above-mentioned *decentralization*, the positive effect of *decentralization* on radical innovation can be explained via the negative effect of *centralization* on radical innovation. Research shows that *centralization*, which is on the other end of the spectrum, has negative influence on radical innovation (Jansen et al., 2006); it hampers communication (Cardinal, 2001) and reduces the quality and quantity of ideas and knowledge imperative to problem solving (Nord & Tucker 1987; Sheremata, 2000). Under *centralization*, team members do not perceive a sense of control over their work, and consequentially feel less inclined to autonomously seek innovative new solutions (Atuahene-Gima, 2003, Gopalakrishnan & Damanpour, 1994). And since radical innovation requires nonroutine problem solving and new knowledge, *centralization* is therefore posited to reduce radical innovation (Jansen et al., 2006). In this milieu, only by *decentralization* (i.e. getting rid of centralization) will all the concomitant negative influences on innovation be removed, the result of which is conducive to radical innovation.

By the same token, *low formalization* enhances innovation because *formalization*, on the other end of the scale, creates rules and procedures for organizations to control and monitor employees' work (Daft, 2015; Marín-Idárraga et al., 2016), the practice of which hampers experimentation and ad hoc problem solving (March, 1991), and discourages individuals from deviating from existing structured behavior (Jansen et al., 2006; Weick, 1979); consequentially constrains radical innovation. For this reason, *low formalization*, on the other end of the continuum, is posited to facilitate radical innovation.

Antecedent Factors Effecting Particular Innovation Type

Despite the above-mentioned notion that *centralization* has been found to hinder radical innovation, on the contrary, *centralization* has been found to positively affect incremental innovation. Sheremata (2000) indicated that *centralization* benefits the speed of incremental innovation. This is owing to the fact that incremental innovation is limited in scope and newness, generates less uncertainty of the end-result (Gopalakrishnan & Damanpour, 1994), and requires less input in terms of information or diverse ideas; in this regard, centralization is more effective in getting information across to the team members, resulting in speedy execution of the incremental innovation (Cardinal, 2001; Hoonsopon & Ruenrom, 2012). Acting on this proposition, vice versa, organizations should ensure *decentralization* in radical innovation projects to ward off detrimental effects on the projects.

Antecedent Factors 2: Corporate Strategy and Vision: *Corporate strategy* dictates the overall mission, direction and official goals for an organization to proceed (Daft, 2015); a strategy on innovation is thus an important antecedent factor of organizational innovation. Additionally, team vision is indicated as one of the four factors facilitative of innovation because it paints the picture of what the future holds for the innovation effort (West & Farr, 1990); and it helps ensure objectives and strategy for the on-going innovation efforts (Tessarolo, 2007). Various scholars have researched in this domain to reveal the related elements leading to innovation and have come up with some significant antecedent factors as follows: *a clearly articulated shared vision with an attainable and valued outcome*: this guides the collective efforts of the work team in the same direction (Brown & Eisenhardt, 1995); *stretched strategic intent*: this challenges the stretched abilities of the work team (Hamel, 2000); and *top management commitment*: this strengthen employees' perception of organizational support for innovation (Anderson & West, 1998; West & Farr, 1990).

Antecedent Factors Effecting Particular Innovation Type

While many scholars concur that strategy and vision are facilitative of innovation, some scholars found that vision does not have any impact on incremental innovation (Hoonsopon & Ruenrom, 2012). They argued

that incremental innovation concerns improvement of existing products or processes with no fundamental changes to be made, therefore the end results are readily predictable and foreseeable, so much so that no visioning is necessary. On this premise, organizations should articulate clear visions for radical innovation projects while spare themselves efforts and resources foregoing leading by vision in incremental innovation.

Antecedent Factors 3: Organizational Creativity Climate and Culture: *Climate* refers to the shared perceptions among workforce members regarding organizational policies, practices, and procedures as well as the behaviors that are rewarded, supported, and expected at work, whereas *culture* refers to shared values, norms, or beliefs underlying the customary ways things are done in organizations (Anderson & West, 1998; Ehrhart, Schneider, & Macey, 2013; Schein, 2010). Climate differs from culture in that it is more observable, easily managed, changed or improved (Tidd & Bessant, 2009).

A seminal framework of work environment factors conducive to creative and innovative work outcomes have been posited by Amabile (Amabile, 1997; Amabile & Pillermer, 2012). The framework indicated antecedents such as, *organizational encouragement for innovation* through various support, mechanism, rewards and recognition for innovation; *supervisory encouragement* through good work models, support and showing confidence in the team members; *supports from work group* via work group's diverse skills, communication, trust and help; *sufficient resources* in terms of funds, materials, facilities and information; *challenging work*; *freedom* in decision making and control of one's work.

Several of these factors concur with Isaksen (2007; 2017) who later posited Situational Outlook Questionnaire (SOQ) which specifies the elements that enhance innovative climate in the workplace such as *challenge/involvement*: high challenge/involvement implies better levels of engagement, commitment, and motivation in daily operations, long-term goals and visions; *freedom*: high levels of freedom imply more perceived independence and autonomy for individual discretion; *trust/openness*: high trust/openness enhances emotional safety in relationships where people feel comfortable sharing ideas and being frank and honest with each other; *idea-time*: this refers to the amount of time people can use to explore and develop new ideas that may not have been included in the routine task; *playfulness/humor*: this refers to the good-natured joking and laughter and a relaxed atmosphere displayed in the workplace; *lack of conflict*: this refers to the absence of personal and emotional tensions (conflicts can cause people to engage in interpersonal warfare, slander and gossip, and even plot against each other); *idea support*: in a high idea-support organization people listen generously to each other and receive ideas and suggestions in an attentive and professional manner; *encouragement for debate*: in a debating situation many different voices and points of view are exchanged and encouraged; *risk-taking*: this refers to the tolerance of uncertainty and ambiguity, and high risk-taking climate encourages people to make decisions even when they do not have certainty and all the information desired.

These two constructs overlap with each other in most areas, and could be seamlessly merged into a comprehensive single construct as follows: *organizational and supervisory encouragement*, *work group support*, *freedom*, *work autonomy and empowerment*, *challenging work*, *trust and openness*, *absence of over-workload*, *absence of organizational impediments*—i.e. internal politics, harsh criticism of new ideas, destructive internal competition, risk avoiding, and clinging to status quo; *orientation toward risk and risk-taking*, *slack resources*, *collaboration and communication* across an organization; *encouragement for debate*, and *playfulness and humor*. These elements have been concurred by several other scholars: participative safety, organizational and supervisory encouragement (Anderson & West, 1998); challenging work, performance feedback (Amar, 2004);



communication across an organization (Cummings & O'Connell, 1978); work autonomy (Daft, 2015; Damanpour, 1991), psychological safety (Gong, Cheung, Wang, & Huang, 2012), slack resources (Damanpour, 1991) involvement in innovation organization-wide (Rothwell, 1992; Tidd & Bessant, 2009), to name but a few.

Antecedent Factors Effecting Particular Innovation Type

Interestingly, despite the proposition that all the above elements enhance innovation, there is at least one exception as far as incremental innovation is concerned, that is, *slack resources*. Hoonsopon and Ruenrom (2012) found that though slack resources have a positive impact on radical innovation, they do not have any impact on incremental innovation. The argument for this finding is that since incremental innovation involves improvement of current products or processes, the resources required for the activities such as production processes, materials, or staff, are already acquired in the current job, rendering unnecessary the slack resources as in the case of radical innovation (Hoonsopon & Ruenrom, 2012). This proposition serves as a rule of thumb for organizations in assigning suitable quantity of resources to each innovation type.

Antecedent Factors 4: Knowledge Management and Learning: Knowledge management, which includes knowledge creation, knowledge storage, knowledge transfer, and knowledge application, has an impact on innovation and organisational performance through an increase in innovation capability (Donate & de Pablo, 2015; López-Nicolás & Meroño-Cerdán, 2011). This antecedent factor includes knowledge management and learning-related elements such as *networking with external sources of know-how and information*: organizations can utilize both internal and external knowledge to increase innovation capability (Amar, 2004; Dunlap, McDonough III, Mudambi, & Swift, 2016); *knowledge sharing*: explicit knowledge sharing positively affects innovation speed and financial performance, while tacit knowledge sharing affects innovation quality and operational performance (Wang & Wang, 2012); *sharing marketing intelligence*: this keeps the teams updated on the dynamics of the market (Atuahene-Gima, 2005); and *self-learning*: acquisition of knowledge could be through external uncontrollable learning opportunities, and self-learning which is within oneself and well within one's control (Banerjee & Kumar, 2018).

Antecedent Factors Effecting Particular Innovation Type

As for *marketing intelligence sharing*, research posits that different types of marketing-related intelligence impact radical and incremental innovation differently. Specifically, competition-related intelligence prompts companies to fight competition by offering better products and services to defend existing market (Jansen et al., 2006); meanwhile, customer and market related intelligence leads to radical innovation by prompting companies to develop new product and services and creating new markets (Zahra & Bogner, 2000). On this ground, feeding matching intelligence to the corresponding innovation type could ward off flood of irrelevant information, reduce contamination of ideas and enhance efficient use of time and resources.

Antecedent Factors 5: Management and Leadership: Management and leadership is considered one of the most significant antecedent factors for innovation. This is owing to the belief that leaders play a critical role in encouraging and facilitating collective learning and creating the climate for innovation through their remarks and behaviors, while the management have the authority to set up systems, structure, or relevant programs to indirectly influence innovation (Schein, 2010; Tidd & Bessant, 2009; Yukl, 2009). Moreover, once contextual factors are installed, skillful leadership is required to maximize the benefits from the new ways of working (Anderson et al., 2014).

Research has long focused on the dimension of leadership and management for innovation and has come up with various antecedent factors such as: *participative and empowering management style* (Smith et al., 2017; Zhang & Bartol, 2010): this enhances the participative or psychological safety for innovation; *orientation toward task excellence and quality*: which is signified by *Four-factor model of work group innovation* as one of the four elements enhancing innovation, i.e. participative safety, vision, support and task excellence orientation (Anderson & West, 1998); *open-mindedness* (King, McKee, & Broyles, 1996; Patterson, 2002): this is conducive to employee's participative safety; *enabling collaboration and combatting the lone inventor misbelief*: Hargadon (2003) stated that revolutionary innovations result from the combination of creative ideas, people and objects rather than strokes of genius from lone inventors; this antecedent factor involves tapping ideas from all ranks across organizations, and by managing diversity in teams to benefit innovation (Amabile & Khaire, 2008; Hill et al., 2014; Martin, 2014); *using metaphors, analogies, and stories*: this facilitates effective product visioning and enable teams to conceptualize together (Amabile & Khaire, 2008); *creating mechanisms to filter ideas and terminate unviable projects* (Klingebiel & Rammer, 2014; Kock & Georg Gemünden, 2016): this enhances effective use of resources in innovation project portfolio management.

Antecedent Factors Effecting Particular Innovation Type

Among the above-mentioned antecedent factors, *orientation toward task excellence and quality* could be viewed as impacting more on incremental innovation. Task excellence and quality is enabled through following rules and procedures which deters people from deviating from structured behaviour which, in turn, constrains radical innovation (Daft, 2015; March, 1991; Marín-Idárraga et al., 2016). On the contrary, Jansen et al. (2006) found positive relationship between rules and procedures and incremental innovation. This is supported by the notion that rules and procedures are established to incrementally improve processes and outputs (Benner & Tushman, 2003, Daft & Lengel, 1986), because rules and procedures make existing knowledge and skills explicit and facilitates swift diffusion of the new improvement in the work process (Zander & Kogut, 1995). Heeding this proposition, organizations can take steps not to emphasize task excellence and quality in radical innovation, to avoid hampering innovativeness in radical innovation efforts.

Antecedent Factors 6: Key Individuals Energizing or Facilitating Innovation: These key individuals are those who facilitate innovation in the roles of a) *innovation champions*: persons who fully support an idea, project, or product, and are willing to take risks by enthusiastically promoting the development and/or implementation of an innovation inside a corporation through a resource acquisition process and make an effort to force the idea through any resistance and evangelize it throughout the organization, also called idea champions, change advocates or change agents (Jenssen and Jørgensen, 2004; Rothwell, 1992); and b) *gatekeepers*: retrievers and disseminators of knowledge and information, performing a boundary spanning role by getting in touch and communicating with external players (Kim, Min, & Cha, 1999; Tidd & Bessant, 2009).

Antecedent Factors Effecting Particular Innovation Type

While an innovation champion is imperative for radical innovation, he/she is not necessary for incremental innovation. Innovation champions' roles are to promote an innovation ideas, evangelize them to gain acceptance and resources to carry them through to the materialization (Jenssen & Jørgensen, 2004; Sergeeva, 2016). After the launch of such radical innovation, there remains only incremental innovation to deal with the improvement of the products or processes; the resources required for such improvement activities (i.e. production processes, materials, or staff) have already been acquired in the implementation stage, rendering unnecessary the



slack resources as in the case of radical innovation (Hoonsopon & Ruenrom, 2012). Hence, the role of an innovation champion is no longer required in incremental innovation and is, thus, said to bear no impact on incremental innovation. Acting on this advice, organizations can avoid squandering manpower by not assigning an innovation champion role to incremental innovation activities.

Figure 1 summarizes the construct of antecedent factors of overall innovation in organizations and the variables effecting either radical or incremental innovation. The common list of antecedent factors conducive to both types of innovation includes elements such as *employee's knowledge and creativity skills, employee's psychological states and attitudes, corporate strategy and shared vision for innovation, innovation management and leadership practices, individual's roles as innovation champions and gatekeepers*. Among these are certain elements that have a positive impact specifically on either radical or incremental innovation. The items that have a positive impact on only radical innovation include the *management's broad knowledge perspective, vision for innovation, customer-related intelligence, decentralization of decision making, intrinsic motivation, slack resources and innovation champions*. Noteworthy are the items that have a negative impact on radical innovation such as *centralization of authority, extrinsic motivation in the form of performance rewards, the orientation toward task excellence and quality and formalization*. And those with positive effects on incremental innovation include *staff's in-depth functional knowledge, centralization, competition-related intelligence, and orientation toward task excellence and quality*.

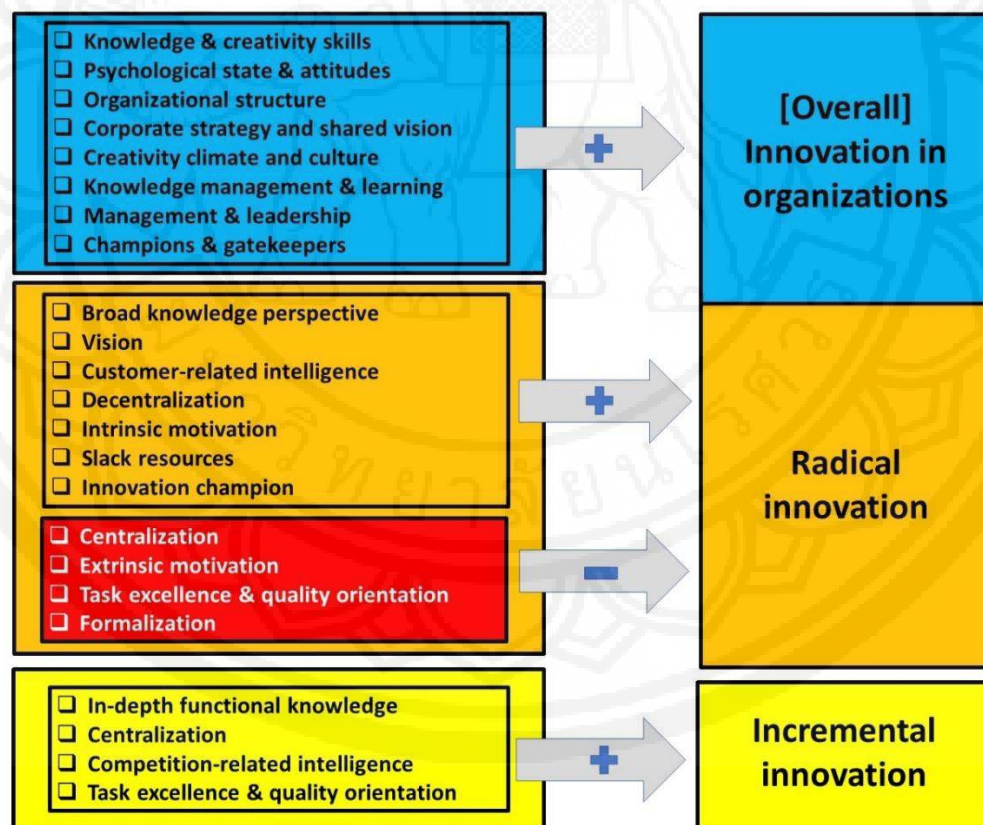


Figure 1 Organizational Antecedent Factors Affecting Innovation

Table 1 summarizes the antecedent factors that specifically show an impact on only one of the two innovation types. The table displays the antecedent elements that impact either one of the innovations, except for



centralization and *orientation toward task excellence and quality* which affect both types, having negative correlation with radical innovation and a positive impact on incremental innovation.

Table 1 Antecedent Factors Effecting Radical and Incremental Innovation

Antecedents of Innovation	Correlation with Radical Innovation	Correlation with Incremental Innovation
Broad knowledge perspective	[+]	
In-depth functional knowledge		[+]
Vision	[+]	
Customer-related intelligence	[+]	
Competition-related intelligence		[+]
Decentralization	[+]	
Centralization	[-]	[+]
Formalization	[-]	
Slack resources	[+]	
Innovation champion	[+]	
Extrinsic motivation	[-]	
Intrinsic motivation	[+]	
Orientation toward task excellence and quality	[-]	[+]

Conclusion

This article presents a construct of the antecedent factors that enhance innovation in organizations. There are eight antecedent factors which are arranged in two main levels: *individual and work environment levels*. Organization can do well to enhance creativity in the innovation process by coping with the elements at the individual level, whereas managing the elements at the work environment level would create the atmosphere, motivation and capabilities to implement innovation projects effectively.

The contribution of this article is the formulation of a construct of antecedent factors that not only speak to innovation in general but also address radical or incremental innovations in particular. This offers guidance for organizations to develop the right milieu for innovation activities and, specially, not to wrongly apply the particular antecedent factors to the wrong type of innovation, causing unnecessary impediments, detriment, or waste of organizational resources. The summary and applications for the construct are described below.

At the individual level, organizations have to develop individual *domain-specific knowledge* and *creativity skills* to enhance creativity in innovation processes. These elements include *divergent thinking* (i.e. creating a variety of ideas), *ideation fluency* (i.e. adroitness in forming an idea), *ability to connect ideas*, *seeing similarities and differences*, *inquisitiveness*, and *questioning the status quo* (all of which stimulate and trigger the motivation to search for new solutions). Other factors at the individual level involve *psychological states and attitudes* which feature *openness to experience personality*, *proactive personality*, *self-efficacy*, *self-esteem*, *tolerance of ambiguity*, and *social networking ability*. These individual characteristics are not subject to intervention because they are embedded in an individual since early life stage. For that reason, organizations can but look for these individual characteristics through effective human resource management processes during the recruitment and selection stages.



At the work environment level, organizations should focus on the organization design that emphasizes *flat structure, decentralization* and *low formalization*; these factors facilitate autonomy, swift communication, diversity in ideas, capabilities, and experiences. Additionally, organizations must stipulate *innovation as one of the corporate strategies and core values*, so as to enhance a mindset of innovation in all members of the organizations. *Organizational and supervisory support for innovation* should be clearly provided and demonstrated so all staff members could feel encouraged to participate in innovation at all levels. *Climate and culture for innovation* including policies, practices, and procedures should be enacted to facilitate innovation efforts. The company *management and leaders* are vital actors in pushing innovative organizations forward through their roles, practices, and behaviors. *Involving people at all levels in innovation, stressing the importance of team-based innovation, supporting risk-taking, maximizing learning from failures, creating psychological safety atmospheres, delegating decision making to team members* are some of the crucial practices that would enhance innovativeness in organizations.

Though most of the antecedent factors apply to innovation in general, there are a number of antecedents that are vital to only radical innovation and not incremental innovation, such as *the management's broad knowledge perspective, vision, customer-related intelligence, decentralization, intrinsic motivation, slack resources* and *innovation champions*. Care must be taken to enhance these antecedents in radical innovation function.

Meanwhile, there are also the factors that have a negative impact on radical innovation, such as *centralization, extrinsic motivation* in the form of performance rewards, the *orientation toward task excellence and quality*, and *formalization*. These are the factors that are detrimental to radical innovation and must be avoided at all cost.

Likewise, there are certain factors that are conducive to only incremental innovation; such factors are staff's *in-depth functional knowledge, centralization, competition-related intelligence*, and *orientation toward task excellence and quality*. Interestingly, despite *centralization*, and *orientation toward task excellence and quality* being conducive to incremental innovation, they hamper radical innovation. On this ground, care should be taken not to impose these elements on radical innovation, so as to avoid detrimental effects on this innovation type.

Recommendation for Future Research

To date there are many studies on antecedent factors of innovation, however there are not many researches comparing those of radical and incremental innovation. Future research can attempt to explore more antecedent factors of each innovation type by studying organizations that have clear separation of radical and incremental innovation functions. And of equal interest is the comparison of antecedent factors of incremental innovation in different functions, for example, between product improvement function and continuous process improvement function.

References

- Abernathy, W. J., & Clark, K. B. (1985). Innovation: Mapping the Winds of Creative Destruction. *Research Policy*, 14(1), 3–22. DOI: 10.1016/0048-7333(93)90040-O
- Agrell, A., & Gustafson, R. (1994). The Team Climate Inventory (TCI) and Group Innovation: A Psychometric Test on a Swedish Sample of Work Groups. *Journal of Occupational and Organizational Psychology*, 67, 143–151. DOI: 10.1111/j.2044-8325.1994.tb00557.x



Amabile, T. M. (1988). A Model of Creativity and Innovation in Organizations. In B. M. Staw, & L. L. Cummings (Eds.), *Research in Organizational Behaviour* (Vol. 10, pp. 123–167). Greenwich, CT: JAI Press.

Amabile, T. M. (1997). Motivating Creativity in Organizations: On Doing What You Love and Loving What You Do. *California Management Review*, 40(1), 39–58. DOI: 10.2307/41165921

Amabile, T. M., & Khaire, M. (2008). Creativity and the Role of the Leader. *Harvard Business Review*, 86(10), 100–112.

Amabile, T. M., & Pillemer, J. (2012). Perspectives on the Social Psychology of Creativity. *The Journal of Creative Behavior*, 46(1), 3–15. DOI: 10.1002/jocb.001

Amar, A. D. (2004). Motivating Knowledge Workers to Innovate: A Model Integrating Motivation Dynamics and Antecedents. *European Journal of Innovation Management*, 7(2), 89–101. DOI: 10.1108/14601060410534366

Ancona, D., & Caldwell, D. (1992). Demography and Design: Predictors of New Product Team Performance. *Organization Science*, 3, 321–341. DOI: 10.1287/orsc.3.3.321

Anderson, N., De Dreu, C. K., & Nijstad, B. A. (2004). The Routinization of Innovation Research: A Constructively Critical Review of the State of the Science. *Journal of Organizational Behavior*, 25(2), 147–173. DOI: 10.1002/job.236

Anderson, N., Potocnik, K., & Zhou, J. (2014). Innovation and Creativity in Organizations—A State-of-the-Science Review, Prospective Commentary, and Guiding Framework. *Journal of Management*, 40(5), 1297–1333. DOI: 10.1177/0149206314527128

Anderson, N., & West, M. A. (1998). Measuring Climate for Work Group Innovation: Development and Validation of the Team Climate Inventory. *Journal of Organizational Behavior*, 19(3), 235–258. DOI: 10.1002/(sici)1099-1379(199805)19:3<235::aid-job837>3.3.co;2-3

Asif, M. (2017). Exploring the Antecedents of Ambidexterity: A Taxonomic Approach. *Management Decision*, 55(7), 1489–1505. DOI: 10.1287/orsc.1080.0406

Atuahene-Gima, K. (2003). The Effects of Centrifugal and Centripetal Forces on Product Development Speed and Quality: How Does Problem Solving Matter? *Academy of Management Journal*, 46(3), 359–373. DOI: 10.5465/30040629

Atuahene-Gima, K. (2005). Resolving the Capability–Rigidity Paradox in New Product Innovation. *Journal of Marketing*, 69(4), 61–83. DOI: 10.1111/j.1540-5885.2006.00200.x

Axtell, C. M., Holman, D. J., Unsworth, K. L., Wall, T. D., Waterson, P. E., & Harrington, E. (2000). Shopfloor Innovation: Facilitating the Suggestion and Implementation of Ideas. *Journal of Occupational and Organizational Psychology*, 73(3), 265–285. DOI: 10.1348/096317900167029



Baer, M. (2010). The Strength-of-Weak-Ties Perspective on Creativity: A Comprehensive Examination and Extension. *Journal of Applied Psychology*, 95(3), 592–601. DOI: 10.1037/a0018761

Banerjee, D. C., & Kumar, Y. (2018). An Exploratory Study on Knowledge Acquisition through Self-Learning and Learning Opportunities. *ACADEMICIA: An International Multidisciplinary Research Journal*, 8(11), 16–30. DOI: 10.5958/2249-7137.2018.00057.5

Benner, M. J., & Tushman, M. L. (2003). Exploitation, Exploration, and Process Management: The Productivity Dilemma Revisited. *Academy of Management Review*, 28(2), 238–256. DOI: 10.5465/amr.2003.9416096

Brown, S. L., & Eisenhardt, K. M. (1995). Product Development: Past Research, Present Findings, and Future Directions. *Academy of Management Review*, 20(2), 343–378. DOI: 10.5465/amr.1995.9507312922

Calder, B. J., & Staw, B. M. (1975). The Innovative Organization: A Selective View of Current Theory and Research. *The Journal of Abnormal and Social Psychology*, 58, 67–80.

Cardinal, L. B. (2001). Technological Innovation in the Pharmaceutical Industry: The Use of Organizational Control in Managing Research and Development. *Organization Science*, 12(1), 19–36. DOI: 10.1287/orsc.12.1.19.10119

Černe, M., Batistič, S., & Kenda, R. (2018). HR Systems, Attachment Styles with Leaders, and the Creativity–Innovation Nexus. *Human Resource Management Review*, 28(3), 271–288. DOI: 10.1016/j.hrmr.2018.02.004

Christensen, C. M., & Raynor, M. (2003). *The Innovator's Solution: Creating and Sustaining Successful Growth*. Boston, MA: Harvard Business School Press.

Cummings, L. L., & O'Connell, M. J. (1978). Organizational Innovation: A Model and Needed Research. *Journal of Business Research*, 6(1), 33–50. DOI: 10.1016/0148-2963(78)90018-8

Daft, R. L. (2015). *Organizational Theory and Design* (12th ed.). OH: Cengage Learning.

Daft, R. L., & Lengel, R. H. (1986). Organizational Information Requirements, Media Richness and Structural Design. *Management Science*, 32(5), 554–571.

Damanpour, F. (1991). Organisational Innovation: A Meta-Analysis of Effects of Determinants and Moderators. *Academy of Management Journal*, 34(3), 555–590. DOI: 10.5465/256406

Damanpour, F., & Gopalakrishnan, S. (1998). Theories of Organizational Structure and Innovation Adoption: The Role of Environmental Change. *Journal of Engineering and Technology Management*, 15(1), 1–24. DOI: 10.1016/S0923-4748(97)00029-5

Danneels, E. (2002). The Dynamics of Product Innovation and Firm Competences. *Strategic Management Journal*, 23(12), 1095–1121. DOI: 10.1002/smj.275



Donate, M. J., & de Pablo, J. D. S. (2015). The Role of Knowledge-Oriented Leadership in Knowledge Management Practices and Innovation. *Journal of Business Research*, 68(2), 360–370. DOI: 10.1016/j.jbusres.2014.06.022

Drucker, P. (1985). *Innovation and Entrepreneurship*. New York, NY: Harper & Row.

Dunlap, D., McDonough III, E. F., Mudambi, R., & Swift, T. (2016). Making Up is Hard to Do: Knowledge Acquisition Strategies and the Nature of New Product Innovation. *Journal of Product Innovation Management*, 33(4), 472–491. DOI: 10.1111/jpim.12298

Dunne, T. C., Aaron, J. R., McDowell, W. C., Urban, D. J., & Geho, P. R. (2016). The Impact of Leadership on Small Business Innovativeness. *Journal of Business Research*, 69(11), 4876–4881. DOI: 10.1016/j.jbusres.2016.04.046

Ehrhart, M. G., Schneider, B., & Macey, W. H. (2013). *Organizational Climate and Culture: An Introduction to Theory, Research, and Practice*. London, England: Routledge.

Eisenberger, R., & Shanock, L. (2003). Rewards, Intrinsic Motivation, and Creativity: A Case Study of Conceptual and Methodological Isolation. *Creativity Research Journal*, 15(2–3), 121–130. DOI: 10.1080/10400419.2003.9651404

Escribá-Esteve, A., & Montoro-Sánchez, A. (2012). Creativity and Innovation in the Firm: Managerial Antecedents and Effects on Employees. *International Journal of Manpower*, 33(4), 344–348. DOI: 10.1108/01437721211243796

Gong, Y., Cheung, S. Y., Wang, M., & Huang, J. C. (2012). Unfolding the Proactive Process for Creativity: Integration of the Employee Proactivity, Information Exchange, and Psychological Safety Perspectives. *Journal of Management*, 38(5), 1611–1633. DOI: 10.1177/0149206310380250

Gopalakrishnan, S., & Damanpour, F. (1994). Patterns of Generation and Adoption of Innovation in Organizations: Contingency Models of Innovation Attributes. *Journal of Engineering and Technology Management*, 11(2), 95–116. DOI: 10.1016/0923-4748(94)90001-9

Gumusluoglu, L., & Ilsev, A. (2009). Transformational Leadership, Creativity, and Organizational Innovation. *Journal of Business Research*, 62(4), 461–473. DOI: 10.1016/j.jbusres.2007.07.032

Hamel, G. (2000). *Leading the Revolution*. Boston, MA: Harvard Business School Press.

Hargadon, A. (2003). *How Breakthroughs Happen*. Boston, MA: Harvard Business School Press.

Hill, L. A., Brandeau, G., Truelove, E., & Lineback, K. (2014). Collective Genius. *Harvard Business Review*, 92(6), 94–102. DOI: 10.1287/orsc.1040.0078



Hogan, S. J., & Coote, L. V. (2014). Organizational Culture, Innovation, and Performance: A Test of Schein's Model. *Journal of Business Research*, 67(8), 1609–1621. DOI: 10.1016/j.jbusres.2013.09.007

Hoonsoopon, D., & Ruenrom, G. (2012). The Impact of Organizational Capabilities on the Development of Radical and Incremental Product Innovation and Product Innovation Performance. *Journal of Managerial Issues*, 24(3), 250–276. DOI: 10.3850/978-981-07-8860-5_061

Howell, J. M., & Avolio, B. J. (1993). Transformational Leadership, Transactional Leadership, Locus of Control, and Support for Innovation: Key Predictors of Consolidated-Business-Unit Performance. *Journal of Applied Psychology*, 78(6), 891–902. DOI: 10.1037/0021-9010.78.6.891

Hunter, S. T., Bedell-Avers, K. E., & Mumford, M. D. (2007). Climate for Creativity: A Quantitative Review. *Creativity Research Journal*, 19(1), 69–90. DOI: 10.1080/10400410709336883

Isaksen, S. G. (2007). The Situational Outlook Questionnaire: Assessing the Context for Change. *Psychological Reports*, 100(2), 455–466. DOI: 10.2466/pr0.100.2.455-466

Isaksen, S. G. (2017). Leadership's Role in Creative Climate Creation. In M. D. Mumford, & S. Hemlin, (Eds.), *Handbook of Research on Leadership and Creativity* (pp. 131–158). MA: Edward Elgar. DOI: 10.4337/9781784715465

Jaiswal, N. K., & Dhar, R. L. (2015). Transformational Leadership, Innovation Climate, Creative Self-Efficacy and Employee Creativity: A Multilevel Study. *International Journal of Hospitality Management*, 51, 30–41. DOI: 10.1016/j.ijhm.2015.07.002

Jansen, J. J., Van Den Bosch, F. A., & Volberda, H. W. (2006). Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organizational Antecedents and Environmental Moderators. *Management Science*, 52(11), 1661–1674. DOI: 10.1287/mnsc.1060.0576

Janssen, O. (2005). The Joint Impact of Perceived Influence and Supervisor Supportiveness on Employee Innovative Behaviour. *Journal of Occupational and Organizational Psychology*, 78(4), 573–579. DOI: 10.1348/096317905x25823

Jenssen, J. I., & Jörgensen, G. (2004). How Do Corporate Champions Promote Innovations? *International Journal of Innovation Management*, 8(1), 63–86. DOI: 10.1142/s1363919604000964

Kanter, R. M. (1983). *The Change Masters: Innovation for Productivity in the American Corporation*. New York, NY: Simon & Schuster.

Katila, R., & Ahuja, G. (2002). Something Old, Something New: A Longitudinal Study of Search Behavior and New Product Introduction. *Academy of Management Journal*, 45(6), 1183–1194. DOI: 10.2307/3069433

Keely, L., Walters, H., Pikkell, R., & Quinn, B. (2013). *Ten Types of Innovation: The Discipline of Building Breakthroughs*. New Jersey, NJ: John Wiley & Sons.



- Kim, Y., Min, B., & Cha, J. (1999). The Roles of R&D Team Leaders in Korea: A Contingent Approach. *R&D Management*, 29(2), 153–166. DOI: 10.1111/1467-9310.00126
- King, L. A., McKee, W. L., & Broyles, S. J. (1996). Creativity and the Five-Factor Model. *Journal of Research in Personality*, 30, 189–203. DOI: 10.1006/jrpe.1996.0013
- King, N. (1990). Innovation at Work: The Research Literature. In M. A. West, & J. L. Farr (Eds.), *Innovation and Creativity at Work: Psychological and Organizational Strategies* (pp. 15–59). New York, Toronto: John Wiley & Sons.
- Kitchell, S. (1995). Corporate Culture, Environmental Adaptation, and Innovation Adoption: A Qualitative/Quantitative Approach. *Journal of the Academy of Marketing Science*, 23(3), 195–205. DOI: 10.1177/0092070395233004
- Klingebiel, R., & Rammer, C. (2014). Resource Allocation Strategy for Innovation Portfolio Management. *Strategic Management Journal*, 35(2), 246–268. DOI: 10.1002/smj.2107
- Kock, A., & Georg Gemünden, H. (2016). Antecedents to Decision-Making Quality and Agility in Innovation Portfolio Management. *Journal of Product Innovation Management*, 33(6), 670–686. DOI: 10.1111/jpim.12336
- Levinthal, D. A., & March, J. G. (1993). The Myopia of Learning. *Strategic Management Journal*, 14(S2), 95–112. DOI: 10.1002/smj.4250141009
- Lin, Y. C., & Chen, Y. M. (2007). Does Innovation Lead to Performance? An Empirical Study of SMEs in Taiwan. *Management Research News*, 30(2), 115–132. DOI: 10.1108/01409170710722955
- Loewenberger, P. (2013). The Role of HRD in Stimulating, Supporting, and Sustaining Creativity and Innovation. *Human Resource Development Review*, 12(4), 422–455. DOI: 10.1177/1534484313494088
- López-Nicolás, C., & Meroño-Cerdán, Á. L. (2011). Strategic Knowledge Management, Innovation and Performance. *International Journal of Information Management*, 31(6), 502–509. DOI: 10.1016/j.ijinfomgt.2011.02.003
- MacKinnon, D. W. (1965). Personality and the Realization of Creative Potential. *American Psychology*, 20, 273–281.
- March, J. G. (1991). Exploration and Exploitation in Organizational Learning. *Organization Science*, 2(1), 71–87. DOI: 10.1287/orsc.2.1.71
- Marín-Idárraga, D. A., Hurtado-González, J. M., & Cabello-Medina, C. (2016). The Antecedents of Exploitation-Exploration and Their Relationship with Innovation: A Study of Managers' Cognitive Maps. *Creativity and Innovation Management*, 25(1), 18–37. DOI: 10.1111/caim.12139



Martin, C. G. (2014). The Effects of Cultural Diversity in the Workplace. *Journal of Diversity Management*, 9(2), 89–91. DOI: 10.1007/s10551-014-2436-9

McAdam, R., & Keogh, W. (2004). Transitioning Towards Creativity and Innovation Measurement in SMEs. *Creativity and Innovation Management*, 13(2), 126–139. DOI: 10.1111/j.0963-1690.2004.00300.x

McGrath, R. G. (2001). Exploratory Learning, Innovative Capacity, and Managerial Oversight. *Academy of Management Journal*, 44(1), 118–131. DOI: 10.2307/3069340

McLean, L. (2005). Organizational Culture's Influence on Creativity and Innovation: A Review of the Literature and Implications for Human Resource Development. *Advances in Developing Human Resources*, 7(2), 226–246. DOI: 10.1177/1523422305274528

Mumford, D. M., Hester, S. K., & Robledo, C. I. (2012). Creativity in Organizations: Importance and Approaches. In M. Mumford (Ed.), *Handbook of Organizational Creativity* (pp. 3–16). San Diego, CA: Academic Press.

Mumford, M. D., Hemlin, S., & Mulhearn, T. J. (2017). Leading for Creativity: Functions, Models, and Domains. In M. D. Mumford, & S. Hemlin (Eds.), *Handbook of Research on Leadership and Creativity* (pp. 1–13). MA: Edward Elgar Publishing. DOI: 10.4337/9781784715465

Nord, W. R., & Tucker, S. (1987). *Implementing Routine and Radical Innovations*. Lexington, MA: Lexington Books.

Office of the National Economic and Social Development Board, Office of the Prime Minister. (2017). *The Twelfth National Economic and Social Development Plan (2017–2021)*. Retrieved from https://www.nesdb.go.th/nesdb_en/ewt_w3c/ewt_dl_link.php?nid=4345

O'Reilly III, C. A., & Tushman, M. L. (2013). Organizational Ambidexterity. Past, Present and Future. *Academy of Management Perspectives*, 27(4), 324–338. DOI: 10.5465/amp.2013.0025

Patterson, F. (2002). Great Minds Don't Think Alike? Person-Level Predictors of Innovation at Work. *International Review of Industrial and Organizational Psychology*, 17, 115–144. DOI: 10.1002/9780470696392.ch4

Peters, T. J., & Waterman, R. H. (1982). *In Search of Excellence: Lessons from America's Best Run Companies*. New York, NY: Harper & Row.

Porter, M. E. (1990). *The Competitive Advantages of Nation*. London, UK: MacMillan Press.

Raisch, S., & Birkinshaw, J. (2008). Organizational Ambidexterity: Antecedents, Outcomes, and Moderators. *Journal of Management*, 34(3), 375–409. DOI: 10.1177/0149206308316058



- Rothwell, R. (1992). Successful Industrial Innovation: Critical Factors for the 1990s. *R&D Management*, 22(3), 221–240. DOI: 10.1111/j.1467-9310.1992.tb00812.x
- Salomo, S., Weise, J., & Gemünden, H. G. (2007). NPD Planning Activities and Innovation Performance: The Mediating Role of Process Management and the Moderating Effect of Product Innovativeness. *Journal of Product Innovation Management*, 24(4), 285–302. DOI: 10.1111/j.1540-5885.2007.00252.x
- Sarri, K. K., Bakouros, I. L., & Petridou, E. (2010). Entrepreneur Training for Creativity and Innovation. *Journal of European Industrial Training*, 34(3), 270–288. DOI: 10.1108/03090591011031755
- Schein, E. H. (2010). *Organizational Culture and Leadership* (4th Ed.). San Francisco, CA: Jossey-Bass.
- Schumpeter, J. A. (1934). *The Theory of Economic Development*. Boston, MA: Harvard University Press.
- Sengupta, J. (2014). *Theory of Innovation: A New Paradigm of Growth*. Switzerland: Springer.
- Sergeeva, N. (2016). What Makes an “Innovation Champion”? *European Journal of Innovation Management*, 19(1), 72–89. DOI: 10.1108/ejim-06-2014-0065
- Sheremata, W. A. (2000). Centrifugal and Centripetal Forces in Radical New Product Development under Time Pressure. *Academy of Management Review* 25(2), 389–408. DOI: 10.5465/AMR.2000.3312925
- Sivadas, E., & Dwyer, F. R. (2000). An Examination of Organizational Factors Influencing New Product Success in Internal and Alliance-Based Processes. *Journal of Marketing*, 64(1), 31–49. DOI: 10.1509/jmkg.64.1.31.17985
- Smith, A. C., Sutherland, F., & Gilbert, D. H. (2017). *Reinventing Innovation: Designing the Dual Organization*. Switzerland: Springer.
- Sousa, F., Pellissier, R., & Monteiro, I. P. (2012). Creativity, Innovation and Collaborative Organizations. *The International Journal of Organizational Innovation*, 5(1), 26–64.
- Sternberg, R. J., & Lubart, T. I. (1999). The Concept of Creativity: Prospects and Paradigms. In R. J. Sternberg (Ed.), *Handbook of Creativity* (pp. 3–15). New York, NY: Cambridge University Press.
- Subramanian, A., & Nilakanta, S. (1996). Organizational Innovativeness: Exploring the Relationship between Organizational Determinants of Innovation, Types of Innovations, and Measures of Organizational Performance. *Omega*, 24(6), 631–647. DOI: 10.1016/s0305-0483(96)00031-x
- Tessarolo, P. (2007). Is Integration Enough for Fast Product Development? An Empirical Investigation of the Contextual Effects of Product Vision. *Journal of Product Innovation Management*, 24(1), 69–82. DOI: 10.1111/j.1540-5885.2006.00233.x



- Tidd, J., & Bessant, J. (2009). *Managing Innovation: Integrating Technological, Market and Organizational Change* (4th ed.). New Jersey, NJ: John Wiley & Sons.
- Tierney, P., & Farmer, S. M. (2011). Creative Self-Efficacy Development and Creative Performance over Time. *Journal of Applied Psychology*, 96(2), 277–293. DOI: 10.1037/a0020952
- Tushman, M. L., & Anderson, P. (1986). Technological Discontinuities and Organizational Environments. *Administrative Science Quarterly*, 31(3), 439–465. DOI: 10.2307/2392832
- Unsworth, K., & Clegg, S. R. (2010). Why Do Employees Undertake Creative Action? *Journal of Occupational and Organisational Psychology*, 83(1), 77–99. DOI: 10.1348/096317908x398377
- Wang, Z., & Wang, N. (2012). Knowledge Sharing, Innovation and Firm Performance. *Expert Systems with Applications*, 39(10), 8899–8908. DOI: 10.1016/j.eswa.2012.02.017
- Waples, E. P., Friedrich, T. L., & Shelton, P. M. (2011). Closing Comments on ‘Leading for Innovation’: We’ve Only Just Begun. *Advances in Developing Human Resources*, 13(3), 406–413. DOI: 10.1177/1523422311424719
- Weick, K. E. (1979). *The Social Psychology of Organizin*. Reading, MA: Addison-Wesley.
- Weisberg, R. W., & Hass, R. (2007). Commentaries: We Are All Partly Right: Comment on Simonton. *Creativity Research Journal*, 19(4), 345–360. DOI: 10.1080/10400410701753309
- West, M. A. (2002). Sparkling Fountains or Stagnant Ponds: An Integrative Model of Creativity and Innovation Implementation in Work Groups. *Applied Psychology: An International Review*, 51(3), 355–387. DOI: 10.1111/1464-0597.00951
- 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* (pp. 3–13). Chichester, England: John Wiley & Sons.
- Williams, K. Y., & O’Reilly, C. A. (1998). Demography and Diversity in Organizations: A Review of 40 Years of Research. *Research in Organizational Behavior*, 20, 77–140. DOI: 10.1080/19368623.2016.1181020
- Williams, W. M., & Yang, L. T. (1999). Organizational Creativity. In R. J. Sternberg (Ed.), *Handbook of Creativity* (pp. 373–391). Cambridge, UK: Cambridge University Press.
- Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Toward a Theory of Organizational Creativity. *The Academy of Management Review*, 18(2), 293–322. DOI: 10.2307/258761
- Yukl, G. (2009). *Leadership in Organizations* (7th ed.). Upper Saddle River, NJ: Pearson Higher Education.



Zahra, S. A., & Bogner, W. C. (2000). Technology Strategy and Software New Ventures' Performance: Exploring the Moderating Effect of the Competitive Environment. *Journal of business venturing*, 15(2), 135-173. DOI: 10.1016/s0883-9026(98)00009-3

Zander, U., & Kogut, B. (1995). Knowledge and the Speed of the Transfer and Imitation of Organizational Capabilities: An Empirical Test. *Organization Science*, 6(1), 76-92. DOI: 10.1287/orsc.6.1.76

Zhang, X., & Bartol, K. M. (2010). Linking Empowering Leadership and Employee Creativity: The Influence of Psychological Empowerment, Intrinsic Motivation, and Creative Process Engagement. *Academy of Management Journal*, 53(1), 107-128. DOI: 10.5465/amj.2010.48037118

