INNOVATION GENERATION PROCESS AND ITS DETERMINANTS

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Abstract

Background. The paper presents the conceptual and empirical examinations of the innovation generation process which is one of the most significant dynamic processes taking place within an organization. The generation of innovation is presented as a sequence of stages, progressing from idea generation through its development to the market introduction of the generated solution and it is considered at the organizational level.
Research aims. The purpose of the paper is to examine the broad sets of factors that influence the innovation generation process in the organizational, top managers' and environmental context.
Method. By using the Delphi survey conducted among 264 experts representing a diverse professional and academic experience, the study analyses the perceived significance of each factor for the various stages of the innovation generation process.
Key findings. The results of the analysis indicate that the considered factors do not affect the innovation generation process with the same strength but exert varying levels of influence on the subsequent stages. Implications of these findings as well as the suggestions for future research are also discussed.

Keywords: Innovation generation process, Determinants, Organizational design, Delphi Method

INTRODUCTION AND BACKGROUND

It has been widely recognized in the management literature that the survival and growth of many organizations depend on their ability either to intensely modify existing products (services) or to introduce new solutions that may stimulate the organization's competitive advantage (Bernstein & Singh, 2008; Damanpour & Wischnevsky, 2006). Contemporary organizations especially those that operate in high technology markets are mainly faced with this imperative.

Prior research has proposed many frameworks describing the innovation generation process (Bernstein & Singh, 2008; Rogers, 1995; Saren, 1984; Utterback, 1971). Some of them have been sequential and linear and the others have become more complex, more inter-disciplinary and more integrated. Although these valuable studies and the developed theoretical conceptualizations have contributed greatly to the remaining knowledge of the innovation generation process, they have not been testing this process in the multidimensional manner.

On the other hand, innovation scholars have considered the antecedents of the innovation generation process but the majority of that research

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have focused on the diffusion of innovation (Gambatese & Hallowell, 2011; Rogers, 1995) or has conceived innovation as a single event or outcome thus has renounced the distinction among phases of the innovation generation process (Lieberman & Montgomery, 1988; Roberts, 1988; Roy & Sivakumar, 2010). Finally, while some researchers have examined the predictors of the innovation generation, they had done so but only according to a few specific variables (Utterback, 1971; Zhou, 2006).

Drawing on a wide range of the innovation literature, the following study develops a synthesized framework of the technological innovation generation and empirically examines the conceptual model that integrates the two main agendas of the innovation research: the process approach and the factor approach. This study captures the innovation generation process as a sequence of three stages – invention, development and commercialization – which seems to be the most representative approach of the frameworks presented in the previous innovation literature. Then, based on a broad literature review, it widely describes the most important factors that may stimulate the innovation generation within organizational, top managers' and environmental dimensions.

The following paper advances the understanding of the innovation generation process by simultaneously examining the perceived significance of different factors on the subsequent stages of the innovation generation process. It is based mainly on the general assumption that in addition to being multiphase, the innovation generation process is also multidimensional and thus it may be influenced by the broad sets of variables that differ within the subsequent stages of the analysed process.

An innovation has been defined as the creation and the successful exploitation of new ideas (Adams, Bessant & Phelps, 2006; Damanpour & Wischnevsky, 2006). The concept of newness, which is a property of all definitions of an innovation, can be applied to distinguish the generation of innovation from its adoption. This distinction is similar to that made between the exploration and the exploitation in the organizational learning literature (March, 1991) or between the innovation and the imitation in previous innovation research (Schumpeter, 1961). The generation of innovation results in the introduction and the use of a product, service, process or practice that is at least new to an organizational population (Damanpour & Wischnevsky, 2006). The adoption of innovation results in the assimilation of a product, service, process or practice that is new by an adopting organization (Kimberly & Evanisko, 1981).

The innovation generation has been conceptually and empirically studied from multiple perspectives at different levels of analysis (Gopalakrishnan & Damanpour, 1997; Hameed, Counsell, & Swift, 2012; Slappendel, 1996). Early studies on innovation have focused on behaviour of the individuals and thus can be classified as individual level research

(Hameed, Counsell, & Swift, 2012). Since the late 1950s there has been growing interest in organizational innovation hence the innovation studies have been performed at the organizational level (Slappendel, 1996).

The innovation generation research at the organizational level has been categorized as a dichotomy of the process approach and the factor approach (Hameed, Counsell, & Swift, 2012). Studies taking the process approach have sought to describe an organization's behaviour connected with the development of new ideas by focusing on a broad class of events and sequences central to the innovation generation process (Bernstein & Singh, 2008; Damanpour & Wischnevsky, 2006; Gopalakrishnan & Damanpour, 1997; Eisenhardt & Tabrizi, 1995). A considerable amount of research has focused on the multitude of activities involved in the innovation generation process, thus the existing frameworks vary from the two-stage (Roberts, 1988) to the more detailed models that cover four (Bernstein & Singh, 2008) or more stages (Cooper & Kleinschmidt, 1986; Gopalakrishnan & Damanpour, 1997). Moreover, some innovation researchers have viewed this process in a linear and sequential way and thus they have applied the stage gate approach to describe how new ideas are improved from one stage to another (Gopalakrishnan & Damanpour, 1997). This approach has been labelled in the innovation literature as the 'unitary sequence model'. Other theorists have considered the innovation generation process as dynamic and recursive, thus characterized by feedback and feed-forward loops (Eisenhardt & Tabrizi, 1995). This approach has been labelled as the 'multiple sequence model' and in these conceptualizations the steps could be simplified, shortened or done in parallel (Bernstein & Singh, 2008; Gopalakrishnan & Damanpour, 1997). In most cases, however, researchers have argued that because of its simplicity the 'unitary sequence model' seems to be the most useful conceptual framework for examining the innovation generation process. Such a framework provides the general insights into how a new idea progresses from its inception to its commercialization. Moreover as it covers a predictable series of independent steps, it allows for generalization across different contexts. For these reasons the following study considers the innovation generation process as a unitary sequence model.

Studies taking the factor approach have focused on understanding the role of one or more hypothetical features in determining the innovation generation process. Past researchers have investigated various factors influencing the innovation generation within organizations including: organizational resources (Lieberman & Montgomery, 1998), organization's characteristics (proactivity and risk taking) (Pérez-Luńo, Wiklund, & Valle Cabrera, 2011), environmental or contextual factors (Zhou, 2006) as well as social and behavioural activities held by innovative organizations (Bernstein & Singh, 2008).

In addition to the above described models that have embodied different approaches (process vs. factor) and diverse patterns (linear vs. iterative) of the innovation generation at the organizational level, Saren (1984) has reviewed the innovation generation in the context of a number of activities carried out by the multidisciplinary teams, different departments and influenced by various decisions. Based on these conditions Saren (1984) has identified five types of innovation generation models. The model presented in the following study is consistent with the Saren's (1984) activity-stage model and incorporates either the factor approach or the process approach, by encompassing the innovation generation both as a multiphase and a multidimensional phenomenon.

Stages of the Innovation Generation Process

Previous innovation literature has offered many insights into activities and practices related to the conversion of the new ideas into commercially successful products and services. Damanpour and Wischnevsky (2006) have categorized these activities together and have described them as the 'innovation generation process'. Roberts (1988, p. 12) has stated that "innovation is composed of two parts: (1) the generation of an idea or invention, and (2) the conversion of that invention into a business or other useful application".

According to this definition an innovation consists of an invention and an exploitation and thus corresponds to the innovation generation process that begins with the creation of an idea and finishes with its commercialization. This simple approach is consistent with other models developed in the literature, no matter how many stages they are composed of. For example, Utterback (1971) has divided the innovation generation process into three stages: (a) idea generation, (b) problem solving, and (c) implementation. The first two stages culminate in an invention, while the implementation stage results in an innovation. Kulatunga, Amaratunga and Haigh (2010) have noted four phases of the innovation generation process: (a) initiation, (b) conceptualization, (c) development and (d) launch. Similarly, Nooteboom (1994) has divided the innovation generation process into: (a) invention, (b) development, (c) tooling/production and (d) introduction an innovation to practice/market. Gopalakrishnan and Damanpour (1997) have described the innovation generation process as a sequence of five stages: (a) idea generation, (b) project definition, (c) problem-solving, (d) design/ development and (e) marketing or commercialization, while Damanpour and Wischnevsky (2006) have labelled: (a) recognition of opportunity, (b) research, (c) design, (d) commercial development and (e) marketing and distribution. Cooper and Kleinschmidt (1986) have offered a more detailed description of this process and have developed a thirteen stage model that begins with the initial screening and finishes with the market launch.

A common element of all these models is the assumption that the subsequent stages reflect the increasing distinctiveness of an innovation and each successive stage removes the ambiguities about it (Bernstein & Singh, 2008; Gopalakrishnan & Damanpour, 1997).

As stated earlier, in the following study the innovation generation process is characterized by a set of three more general phases: (a) invention, (b) development and (c) commercialization. This simple conceptualization of the innovation generation process seems to be the most representative approach of the models presented in the literature.

The invention stage contains two sub-processes: idea generation and problem-solving, consistent with the Utterback's (1971) model of the technical innovation process. The idea generation reflects the activities related to recognizing of a problem or need (Rogers, 1995), acquiring knowledge and information about a problem or need that has been previously identified (Bernstein & Singh, 2008), recognizing of a feasible technical means to fulfil this need (Utterback, 1971) and creating of an idea or proposal through the combination of existing knowledge about a need and the technical means by which a need might be met (Gopalakrishnan & Damanpour, 1997). The problem-solving process results in an original solution and deals with the activities related to dividing the problem into the independent sub-problems, setting the specific objectives to be met for each sub-problem, assigning a priority to all the objectives, designing alternative solutions and evaluating the design alternatives toward previously identified objectives (Utterback, 1971). The development stage refers to the development and piloting of the new solution to test its validity (Kulatunga, Amaratunga, & Haigh, 2010). It encompasses performing a trial for its confirmation and carrying out an analysis to check its feasibility in order to bring the original solution or invention to its first use. Finally, the commercialization stage refers to the market introduction of the original solution possibly followed by the commercial dissemination of such innovation within the industry (Rogers, 1995).

Antecedents of the Innovation Generation

While analysing the organizational antecedents of the successful innovative activity, researchers have generally agreed that the description of the organizational structure seems to be the most important stimulus for organizational change and innovation. Drawing on the Burns and Stalker (1961) work and their distinction between 'mechanistic' and 'organic' organizational structures, innovation researches have tried to evaluate the effect of holistic descriptions of the organizational structure on an organization's ability to innovate (Aiken & Hage, 1971). On the other hand, more recent research has focused on the examining the separate organizational characteristics such as: specialization, horizontal and vertical differentiation, centralization, formalization and professionalism (Damanpour, 1991; Damanpour & Schneider,

2006; Kimberly & Evanisko, 1981). This paper relates the above mentioned structural variables to different phases of the innovation generation process in order to address how an organization's structural characteristics affect the innovation generation at the organizational level. Since professionalism, that represents the professional knowledge of the organizational members (Damanpour, 1991) is analogous to the notion of human resources described further, this study covers only five remaining structural variables.

Specialization (quite often named as: occupational complexity or role specialization) reflects the number of different specialties found in an organization (Damanpour, 1991; Kimberly & Evanisko, 1981). Horizontal differentiation (named as: functional differentiation or structural differentiation) represents the extent to which an organization is divided into a number of sub-units (Damanpour, 1991; Kimberly & Evanisko, 1981). Vertical differentiation refers to the number of levels in an organization's hierarchy below the chief executive level (Damanpour, 1991). Centralization represents the extent to which decision-making autonomy is distributed or concentrated within an organization (Damanpour, 1991). Finally, formalization reflects the emphasis on the rigid rules and the procedures within an organization in conducting organizational activities (Damanpour, 1991).

Irrespective of whether an organization is 'organic' or 'mechanistic', researchers have argued that the innovation activity requires considerable resources. The link between the resources and the innovation activity has been premised primarily on the resource-based view of the company (RBV) according to which organizations have incentives to invest the strategic, significant and idiosyncratic resources in maintaining and developing their ability for innovation (Barney, 1991). An organization's resources which mainly strengthen the innovation generation process fall generally into: financial resources and human resources as they constitute the most basic inputs to the effective innovation activity (Adams, Bessant, & Phelps, 2006; Ahuja, Lampert, & Tandon, 2008).

Human resources refer to the knowledge, skills and abilities, behaviour and attitudes towards work (Harris & Helfat, 1997) residing with and utilized by the organizational members (Subramaniam & Youndt, 2005). They are not only more likely to produce a short-term competitive advantage, but also to sustain it over longer periods of time. Financial resources allow an organization to conduct an effective innovation activity by making a use of chances and neutralizing a risk (Barney, 1991), absorbing the cost of failure (Damanpour, Chiu, & Wischnevsky, 2009) and investing in innovation in advance of the actual need (Nohira & Gulati, 1996). Innovation researchers have suggested that a higher level of financial investment enables the development of multiple innovation projects (Ireland, Hitt, & Sirmon, 2003), which gives an organization greater flexibility when facing high environmental uncertainty. Simultaneous development of many innovation projects

often leads to synergy and cross-fertilization effects (Xu, Sirmon, & Gao, 2010) and offers substantial advantages in terms of an organization's ability to maintain a diverse portfolio of innovative projects.

Another important element of the innovation literature is an assumption that leaders – or top managers – as powerful internal actors, have a significant role in promoting the innovation process by integrating, coordinating and reconfiguring of an organization's innovation-related resources portfolio (Xu, Sirmon, & Gao, 2010). Top managers may have different attitudes toward an innovation, e.g. they may be conservative and prefer to use typical methods and procedures no matter what the nature of the problem, (Dewar & Dutton, 1986) or they may encourage creativity and promote the overall capacity for change. Furthermore, they may be a potent force for or against the innovation (Premkumar & Roberts, 1999) since they stimulate the employee's creativity and their openness to the new internal as well as external knowledge, deal with the allocation of resources (Damanpour, Chiu, & Wischnevsky, 2009) and influence successful innovation commercialization in the market. Although Baldridge and Burnham (1975) have argued that demographic characteristics of top managers (age, gender, educational level) did not appear to influence the innovation in organization, more recent research has suggested that top manager's age, gender, tenure (Damanpour & Schneider, 2006) as well as the educational level (Chuang, Nakatani, & Zhou, 2009) may determine the innovation in organizations.

Other innovation researchers have been delving with increased focus into the contextual factors that influence the nature and the outcomes of the innovation generation process. The different conceptualizations that have been applied in previous innovation literature to describe the changing environmental conditions, fall generally into three dimensions: dynamism, hostility and complexity in the environment. Dynamism in the environment (usually called as uncertainty) is related to the rate of change and innovation within an industry as well as to the degree of unpredictability and variability of actions of competitors and customers (Miller & Friesen, 1983). Hostility in the environment generally refers to the level of resources available from the environment and to the competition for these resources that influence the extent to which the environment can hinder an organization's innovation activity (Covin & Slevin, 1989). Finally, complexity in the environment relates to the degree of heterogeneity in the environment and encompasses the level of a complex knowledge related to diversity in production and marketing orientations that is required to understand the environment (Miller & Friesen, 1983). This paper focuses on all these environmental dimensions.

The Conceptual Model

The ambiguous impact of the previously mentioned factors for the generation of innovations makes a good case for their investigation and validation

as the antecedents. The overall conceptual model that combines previous innovation literature is shown in Figure 1. The developed conceptual model covers the three stages of the innovation generation process (invention, development and commercialization of an innovation) as well as the three sets of attributes that affect the innovative activity within an organization.

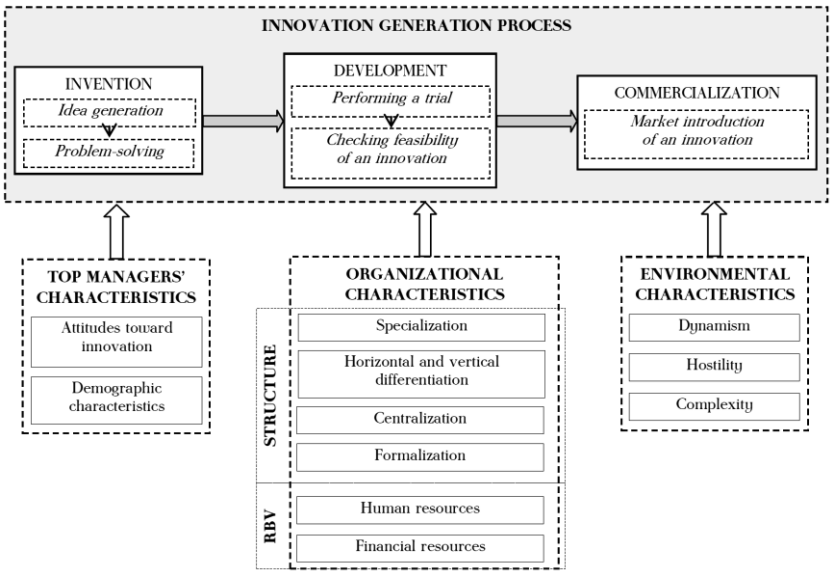

Figure 1. Conceptual Framework for the Determinants of the Innovation Generation Process

Source: own elaboration.

The following study aspires to regard innovation as either caused by individuals or organizational and environmental characteristics and provides the conceptual model sketched in Figure 1 in order to multi-dimensionally examine the innovation generation within organizations.

METHOD

The Delphi approach was used to assess the perceived significance of the analysed factors for the various stages of the innovation generation process. The Delphi Method is the widely adopted research procedure suitable for judgmental analyses of complex and ambiguous subjects among a group of experts (Rupprecht, Birner, Gruber, & Mulder, 2011). The Delphi Method allows for a systematic, interactive, iterative collection of the independent experts' opinions (Ononiwu, 2013) by a series of intensive questionnaires interspersed with controlled opinion feedback (Lindstone & Turoff, 1975; Nayan, Zaman, & Sembuk, 2010). The strength of this method is the fact that

viewpoints from a structured group of experts are more precise than those obtained from unstructured groups or individuals (Shang, 2012).

The Delphi study was conducted in four Polish Voivodeships, including Mazovian, Lodz, Podlasie and Silesian Regions. All data were collected from June 2013 till April 2014. The Delphi survey was conducted electronically consisting of two rounds of intensive questionnaire research among 264 experts representing a diverse professional and academic experience. The opinions of the theorists were expected to enhance and verify the opinions of the practitioners and the opinions of the practitioners to help the theorists build a sensible view of the innovation generation within an organization. Moreover, active participation of such a large number of panellists ensured a greater objectivity of the results obtained and provided a more precise identification of the determinants at the various stages of the innovation generation process. Among the participating theorists 31% specialized in electronics, 17% – in nanotechnologies, and 16% – in advanced material technology. The remaining group of experts specialized in other sciences including: information technology (14%), environmental engineering (7%) and other sciences (15%). Such distribution of experts involved indicates a high association of the panellists with the Key Enabling Technologies (KETs). In the group of entrepreneurs the largest percentage of participants was micro-entrepreneurs (83%) usually representing small innovative companies. The remaining parts of panellists (17%) were entrepreneurs working in large companies with well-developed R&D sub-units.

The first round of Delphi questionnaire was designed to identify the impact of the various determinants on the three stages of the innovation generation process in a five-point Likert scale from 1 – 'no impact' to 5 – 'a very strong influence'. After results were returned, they were summarized according to their associated assessment. The new questionnaire used in the second round of Delphi survey was formulated on the basis of the feedback from the first round. The authors computed the average ranking of the determinants and asked the experts to review and modify their responses according to the information presented. Since no changes were made to the average ranking of the determinants, a consensus has been reached and the Delphi process was terminated.

RESULTS

In the first round of Delphi survey 12 factors within three dimensions (organizational, top managers' and environmental) were converted to the first questionnaire. Table 1 shows the analysis for all 12 factors in division into the three stages of the innovation generation process.

Table 1. Analysis for the Delphi Study

FACTORS		INVENTION					DEVELOPMENT					COMMERCIALIZATION				
		Mean	Me	Q3	Q1	QD	Mean	Me	Q3	Q1	QD	Mean	Me	Q3	Q1	QD
Top managers characteristics	Top managers attitude towards innovation	3.89	4.0	4.0	3.25	0.375	3.94	4.0	4.0	3.5	0.25	4.03	4.0	4.5	3.5	0.5
	Top managers demographic characteristics	2.51	2.0	3.25	2.0	0.625	2.06	2.5	3.0	1.0	1.0	2.12	2.0	2.75	1.5	0.625
Organizational characteristics	Specialization	3.95	4.0	4.25	3.75	0.25	4.23	4.0	5.0	4.0	0.5	3.86	4.0	4.0	3.5	0.25
	Horizontal differentiation	2.25	2.0	3.0	1.5	0.75	2.23	2.0	3.0	1.0	1.0	2.28	2.0	3.0	1.75	0.625
	Vertical differentiation	2.17	2.0	3.0	1.0	1.0	2.25	2.0	3.0	1.0	1.0	2.19	2.0	3.0	1.5	0.75
	Centralization	3.29	3.0	4.25	3.0	0.625	3.3	3.0	4.25	3.0	0.625	3.22	3.0	4.0	2.75	0.625
	Formalization	2.83	3.0	3.5	2.0	0.75	2.12	2.0	2.0	1.0	0.5	2.12	2.0	2.5	1.5	0.5
	Human resources	4.73	5.0	5.0	4.0	0.5	4.01	4.0	4.5	3.5	0.5	4.05	4.0	4.25	3.5	0.375
	Financial resources	2.86	3.0	3.5	2.0	0.75	4.98	5.0	5.0	4.25	0.375	4.91	5.0	5.0	4.25	0.375
Environmental characteristics	Dynamism	4.27	4.0	4.5	4.0	0.25	4.65	5.0	5.0	4.25	0.375	4.39	4.0	4.5	3.75	0.375
	Hostility	3.17	3.0	4.0	2.75	0.625	3.01	3.0	4.0	2.5	0.75	3.23	3.0	4.0	3.0	0.5
	Complexity	3.21	3.0	4.25	3.0	0.625	3.18	3.0	4.0	2.5	0.75	3.28	3.0	4.0	3.0	0.5

Source: Own elaboration.

Based on the analysis conducted, quartile deviation value (QD) for 32 elements is less than 1. That means, all experts agreed with the influence of these factors on the various stages of the innovation generation process (Nayan, Zaman, & Sembuk, 2010; Ononiwu, 2013). Only for 4 elements (vertical differentiation for the first two stages, top managers' demographic characteristics and horizontal differentiation for the development stage) participating experts did not achieve a sufficient degree of unanimity. 14 elements (7 for the invention stage, 3 for the development stage and 4 for the commercialization stage) were valued as average, meaning that participating experts reached an agreement, but in the middle range with a quartile deviation value between 0.6 and 1.0 (Nayan, Zaman, & Sembuk, 2010). These factors have a median split value less than 3.5 for a 5-point Likert scale and thus were rejected in the second round of Delphi survey (Ononiwu, 2013). Finally, participating experts strongly agreed with 18 factors (4 for the invention stage, 6 for the development stage, and 8 for the commercialization stage) as they were valued $\leqslant 0.5$ (see table 1).

In the second round of Delphi survey only these 18 factors were given to the panellists to be evaluated. The Delphi panel of experts agreed on a list of determinants that need to be taken into account when dealing with the various stages of the innovation generation process as indicated in Table 1. Among the most important determinants of the invention stage participating experts indicated: top manager's attitude toward innovation, organization's specialization, human resources and dynamism in the environment. The development stage has been generally depended on: top manager's attitude toward innovation, organization's specialization and formalization, human and financial resources as well as dynamism in the environment. Finally, among the most important determinants of the commercialization stage panellists mentioned: top manager's attitude toward innovation, organization's specialization and formalization, human and financial resources and all three environmental factors.

DISCUSSION

An underlying conceptual model developed in the following study along with the presented empirical investigation would allow a deeper understanding of the innovation generation process. When considering the organizational characteristics participating experts strongly agreed that specialization significantly affects all the stages of the innovation generation process. It is in line with previous innovation researchers who have claimed that the cross-fertilization of ideas (Utterback, 1971) as well as depth and diversity of the knowledge base (Ahuja, Lampert, & Tandon, 2008) stimulate creativity and thus encourage the generation of innovation proposals. More specialized organizations have a better access to infor-

mation and knowledge and thus are more likely to develop and commercialize new ideas (Damanpour & Wischnevsky, 2006).

According to the experts opinions, formalization indicating emphasis on rigid rules and job descriptions within an organization strongly affects the development stage and the commercialization stage. This is because the norms, rules and authority relationships that offer employees more rigid work roles became particularly relevant in the development and commercialization of an innovation. Moreover, the findings obtained, partially confirmed the previous ones (e.g. Gambatese & Hallowell, 2011) by indicating that an innovation that is formally included in an organization's strategic plan motivates the organizational members to bring the original solution or invention to its first use.

The participating experts strongly agreed that human resources as well as top manager's attitude toward innovation are conducive to all the stages of the innovation generation process. It means that the number of qualified employees as well as the top management support proved crucial for the generation process over time. Top manager's attitude toward innovation brings the benefits in the form of creation of innovative solutions (Roberts, 1988) and additional benefits from the better use of resources (Xu, Sirmon, & Gao, 2010). Similarly, as the number of qualified employees increases, the quantity of these solutions also increases in response to perceived unique problems.

However, contrary to the prior expectation, financial resources influence only the development and commercialization stage. This suggests that financial resources are more essential when dealing with the post-invention activities rather than with the activities related to the creation of new ideas or proposals. Moreover, higher expenditures favour the development and the market introduction of the original solution (Pichlak & Bratnicki, 2011), since more resources are allocated to test its validity.

When considering the environmental characteristics Zhou (2006) has found that the benefits of the innovation strategy over the imitation strategy become stronger when organizations have to face higher levels of environmental uncertainty, technological turbulence and competitive intensity. As expected, according to the experts opinions, dynamism in the environment significantly affects all the stages of the innovation generation process. In the changing environmental conditions existing solutions will become obsolete more rapidly (Sorensen & Stuart, 2000). Such an environment provides the possibilities of creating new innovative solutions and thus meeting the needs of premium market segments and new niches (Lumpkin & Dess, 2001). Moreover, in changing environmental conditions an accurate development of the relevant solutions may encourage organizations to a large amount of experimentation, learning-by-doing, testing

new technological solutions and partial implementation of multiple innovative options (Pérez-Luńo, Wiklund, & Valle Cabrera, 2011).

However, contrary to the previous expectation, hostility and complexity in the environment strongly affect only the last stage of the innovation generation process. A possible explanation may be the fact that in such conditions the decision to introduce an innovation to practice is very risky, in particular for radically new products (implementing new technologies, performing new functions or existing functions in new ways) (Nooteboom, 1994). In the conditions of rising heterogeneity in the environment and growing competition for the scare resources, organizations are willing to adopt a more conservative attitude towards innovation, which leads to a resistance to searching for new solutions but rather focusing on increasing the competitiveness and efficiency of the operational activity conducted. Moreover, innovative companies can gain advantage through sustained technology leadership (Zhou, 2006) especially if there is the less scope for 'demand pull', and the emphasis often lies on 'technology push' (Nooteboom, 1994).

Limitations of the Study and Future Research

This effort towards revealing the variety of critical determinants of the various stages of the innovation generation process is constrained by several limitations, which also represent a broader perspective for further research in this area. First of all, the investigation on the influence of 12 factors from the three dimensions (top managers', organizational and environmental) on the innovation generation process was begun. Building on this, other factors could be included in further analysis. Secondly, in addition to the phases of the innovation generation process considered in the following study, the distinction among different types of innovation is necessary for a better understanding of the multi-dimensional nature of the propensity to generate innovations. Finally, although the results obtained in the following study contributed to identifying the variety of critical determinants of the innovation generation process, they are based on the recommendations of the experts constituting the Delphi panel. This process is known as daisy chaining and sometimes leads to new difficulties, e.g. in the form of the creation of various cliques or factions (Ononiwu, 2013). Moreover, the Delphi panel was composed only of Polish experts. Hence, future studies should explore these relationships in different contexts and cultures, especially in other emerging economies.

CONCLUSIONS

In conclusion, despite its limitations, this study has the implications for both practitioner and academic communities. In principle, the findings provide insights into how organizations deal with the generation of innova-

tions. Managers can assess the condition of the innovation generation process and focus on the possible factors that would enable them to successfully explore new possibilities, create new ideas and commercialize those in order to improve the organization's effectiveness and competitiveness. From the academic perspective, this study provides a holistic framework covering the vital antecedents of the various stages of the innovation generation process by indicating that the influences of the considered factors on the three phases of the innovation generation process are generally different. Finally, the following study advocates that the innovation generation in organizations should be viewed as both a multi-phase and a multi-dimensional phenomenon.

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PROCES GENEROWANIA INNOWACJI I JEGO UWARUNKOWANIA

Abstrakt

Tło badań. Artykuł prezentuje konceptualne oraz empiryczne badania procesu generowania innowacji, który jest jednym z najbardziej dynamicznych procesów zachodzących w organizacji. Generowanie innowacji jest przedstawione jako sekwencja etapów rozpoczynających się od pomysłu stworzenia innowacji poprzez jego rozwój oraz wprowadzenie na rynek gotowego rozwiązania, ponadto jest ono rozważane na poziomie organizacyjnym.
Cel badań. Celem niniejszego artykułu jest zbadanie szeregu czynników mających wpływ na proces generowania innowacji w kontekście organizacji, wyższej kadry zarządzającej oraz otoczenia.
Metodyka. Dzięki wykorzystaniu badania ankietowego metodą Delphi przeprowadzonego wśród 264 ekspertów reprezentujących różnorodne zawodowe oraz akademickie doświadczenia, badanie analizuje postrzegane znaczenie każdego czynnika dla poszczególnych etapów procesu generowania innowacji.
Kluczowe wnioski. Wyniki przeprowadzonych analiz wskazują, iż uwzględnione czynniki nie oddziałują na proces generowania innowacji z jednakową siłą, lecz wywierają wpływ w różnym stopniu w zależności od etapu. Omówione zostały także konsekwencje tych wyników oraz sugestie dotyczące przyszłych badań.

Słowa kluczowe: Proces generowania innowacji, uwarunkowania, organizacyjne projektowanie, Metoda Delphi