

Main types of SMEs innovations and their interdependence

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Abstract

Most innovation studies on SMEs are devoted to the determinants and barriers of the new products development, and to a lesser degree to the process innovations, or their combinations. Other types of innovations, and particularly organisational and marketing ones, remained relatively understudied. Additionally, the prevailing literature tends to examine individual innovation in isolation. There are no many studies that investigate the interdependence of different types of innovations.

The goal of this paper is to propose a conceptual model of the interdependence of main types of innovations and their effects on firm performance. It is based on a literature review related to the types of manufacturing SMEs innovations, their interdependence, and combined effects on performance. The key findings are the following.

The innovation typology usually includes product/service, process, organisational, and marketing innovations. Some researchers considered that process innovation include both non-technological (organisational) and technological changes. According to others, however, the distinction between two types of process innovations is difficult to sustain as many process innovations involve both types of changes. The results of several studies demonstrated that there is a strong interdependence and mutual support between product and process innovations. Other studies found that organisational, marketing and service/product innovations are also interrelated and influence each other.

The empirical researches on the relation “innovation - performance” revealed positive, negative, or even lack of such relations. In general product improvements influence positively firm growth, while the effects of process innovations are not so clear. The positive influence of organizational and marketing innovations on performance was also demonstrated in the literature. The challenge for the firms is to find a particular combination of a fixed number of innovation activities, which can bring the highest success.

If internal determinants for innovation refer to firm’s tangible and intangible resources, their combination, and entrepreneur/manager orientations, the external determinants include government regulations, access to finance, property and contract enforcement, labor market, institutional environment, etc. Barriers to innovations represent the back side of the innovation determinants (the same factors with negative sign), and because of that they are classified also as external and internal.

Based on a literature review a conceptual model of the interdependence of four types of innovations (organisational, product, process, and marketing) and their combined effects on firm performance is proposed. It is expected that the model will be tested further on data from a survey of 500 manufacturing SME in Bulgaria.

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1. Introduction

The successful SMEs development today depends on their capacity to align with technological progress and different types of innovations (organisational, process, product, and marketing). The necessity of SME innovations is determined by the growing economic globalization. Trade liberalisation, market deregulations, accelerating mobility of capital, technological changes, and competition (UN, 2009, p. 42) increased the *pressure* on SME to focus on innovation strategies (Chen and Huang, 2010).

Traditional management practices of many SMEs in transition and emerging economies, which are based on *cheap labour, local market and low specialisation of products* (Urbonavicius, 2005; Zhou and Li, 2007), seem already insufficient. Under the globalisation the national boundaries cannot keep domestic SMEs from the penetration of more advanced foreign companies (Singh *et al.*, 2010, p. 55). For instance Akhter and Barcellos (2011, p.17) suggested that given the cost advantage of other emerging economies, Brazilian executives need to make product and process innovations a key element of their strategies. According to UN (2009, p.40) price continues to be important, but the competition is increasingly driven by firms' capacity to meet global standards, innovation, networking, and reliability.

To sustain the new competition pressure SME have to develop innovation capacities in all areas of their activities (Damanpour, 1991, p. 561). The innovations could allow small firms to acquire competitive advantages (Armbruster *et al.*, 2008); adapt to the new market context (Denis and Bourgault, 2003); increase market share or create new markets (Tang and Murphy, 2012), and improve the overall firm's performance (Roberts, 1999). Jin *et al.* (2004) demonstrated that *innovative firms outperform non-innovative ones*, while Gunday *et al.* (2011) found that innovative firms have higher sales and exports. According to Kanter (1999) winning in the business today requires innovation.

Each innovation, however, is related to some costs, which may provoke initial declines in productivity (Pisano *et al.*, 2001). The studies have shown that the SME sector still suffer of innovation deficit (O'Regan *et al.*, 2005). Some Schumpeterian arguments on innovations pointed to the advantages of small firms, while other arguments favour large enterprises (Hong *et al.*, 2012, p. 424). The SMEs advantages refer to higher degree of flexibility, simple organizational structure, closer perception of consumers' needs, etc. For that reason the lower degree of SME innovation is viewed as a sign of their unrealized *innovation potential* (Chaminade and Vang, 2006). According to Acs and Audretsch (1998) the SMEs are a source of innovations based on new technologies, including the new IT. Particularly *entrepreneur-driven SMEs* are more willing to innovate as they navigate the frontiers of business activity (UN, 2009, pp. 2-3). At the same time many SMEs did not profit of the new global opportunities (Guzman *et al.*, 2012, p. 60), mainly because they are not entrepreneurial (UN, 2009, p. 13).

For many years the focus of innovation research has been on physical goods innovation, often supported by R&D activities (Gallego *et al.*, 2012, p. 565). The innovations encompass, however, new organisations of business processes, restructuring, creation and maintenance of external relations, and other changes, not related directly to the physical goods innovations (Baranãno, 2003). Yet other types of innovations (process, organisational, and marketing) remained relatively understudied (Crossan and Apaydin, 2010). Particularly in small firms the process innovation strategies and performance consequences are still *under-researched* (Hall *et al.*, 2009).

Some studies demonstrated that product, process, and organisational innovations should not be considered in isolation, but as mutually interdependent forces (Piening and Salge, 2014). Firms are more likely to accomplish non technological innovation when they are engaged with technological ones (Schmidt and Rammer, 2007). According to Gallego *et al.* (2012, p. 574) the combination of organizational and technical innovations is crucial for

the performance success, particularly for small firms. Other researchers also insisted on a broad concept of innovation, understood beyond its technological dimension (Edquist, 2005; Damanpour *et al.*, 2009).

The SME innovation capacity varies significantly in function of their size, sector, and environment. The Innovation Union Scoreboard measures the SME innovation with two indicators: the share of SMEs introducing product or process innovations, and the share of SMEs introducing marketing or organizational innovations. The Innovation Union Scoreboard 2014 places Member States into four groups: *Innovation Leaders*; *Followers*; *Moderate innovators*; and *Modest innovators* (EC, 2014). Bulgaria, Latvia and Romania belong steadily to the group of “*Modest innovators*” with an innovation rate well below the EU average. This situation calls for more attention on the SMEs innovative capacity in these countries.

The goal of this paper is to propose a conceptual model of the interdependence of main types of innovations and their effects on firm performance. It is based on a review the literature related to the types of SMEs innovations, their interdependence, and combined effects on performance. The research attempts to answer the following research questions:

1. What are the main types of SMEs innovations?
2. What is the interdependence of these types of innovations?
3. What are the main determinants and barriers to innovations?
3. What are the influences of types of innovations on firms' performance?

The paper is organized according to the above questions, followed by a conceptual model of the interdependence of four types of innovations (organisational, product, process, and marketing), their effects on firm performance, and conclusion.

2. Literature review

2.1. Definitions and types of innovations

In a *Survey of the Innovation Surveys* Hong *et al.* (2012, p. 421) noted that still difficulties remain as to what exactly we understand as innovation. According to Schumpeter (1934) entrepreneurs may introduce different types of innovation such as: new products; new methods of production; new sources of supply; new markets; and new ways to organize business. Based on that Edquist (1997, p. 9) defines innovation as a new combination of factors or simply *new combination*. The innovations refer not only to new products and technologies, but cover also changes in organisational processes and routines (Barañano, 2003). Because of that the understanding of innovation must be broaden to include organizational innovations rather than restricting it to the product-process ones (McAdam *et al.*, 2010). One of the broad definitions of innovation is the following: „Innovation is the adoption of an idea or behavior, whether a system, policy, program, device, process, product or service, that is new to the adopting organization” (Damanpour, 1991, p. 556). Linder *et al.* (2003) included under innovation the implementation only of these ideas, which create value. Other researchers also suggested that the innovation in economic sense is accomplished at a point, when the first transaction is done in respect to new product, process or means (Freeman and Soete, 1997, p. 6; Becheikh *et al.*, 2006, p. 645). Thus the innovation definitions reflect the adoption and commercialisation of a new idea or behavior (Jiménez-Jiménez and Sanz-Valle, 2011).

The Oslo Manual (OECD, 2005, p. 46) defines *four types* of innovations. *Product innovation* is the creation of a good and/or service that is new or significantly improved in respect to its characteristics. *Process innovation* is “the implementation of new or significantly improved production or delivery methods. This includes significant changes in techniques, equipment and/or software” (OECD, 2005, p. 49). *Marketing innovation* refers to the new marketing methods, which involve significant changes in product design or

packaging, product placement, product promotion or pricing. Finally, the *organizational innovation* is “the implementation of a new organizational method in the firm’s business practices, workplace organization or external relations” (OECD, 2005, p. 177). In comparison with Schumpeter types of innovations, the Oslo Manuel does not mention explicitly *market innovation*, while product innovation is expanded to cover both goods and services.

Thus the innovation typology includes product/service, process, organisational, and marketing innovations (Khazanchi *et al.*, 2007). The results of Mangiarotti and Riillo (2014, p. 440) showed that when organizational and marketing innovations were included in the definition of innovation, the percentage of small innovative firms increased from about 28 to 63 percent.

The researchers separate also *incremental* from *radical* innovations (OECD, 2005, p. 17), and *sustaining* innovations from *disruptive* ones (Forsman, 2011, p. 740). Some studies concluded that radical innovations are more apparent in young and small firms, while the incremental innovations prevail in large firms (Baumol, 2009; Damanpour and Wischnevsky, 2006). Other studies, however, have shown that the SME innovations are focused on small improvements instead of fundamental innovations (Albaladejo and Romijn, 2000; Forsman and Annala, 2011). According to de Jong and Marsili (2006) process innovations are more typical to small enterprises than product innovations. Most process innovations involve small-scale changes in the methods of production and are incremental in nature (Reichstein and Salter, 2006, p. 654; Piening and Salge, 2014, p.3).

2.2. *Understudies of process and organisational innovations*

Firms are pressed to introduce new products or to modify the existing ones by the shortening of the product life cycle (Duranton and Puga, 2001), and quick changes in customer preferences (Adner and Levinthal, 2001). Maybe because of that most of the innovation management literature dealt with product innovations (Yang, 2010), and to a lesser degree with process ones, or their combinations (Reichstein and Salter, 2006; Santamaría *et al.*, 2009). Keupp *et al.* (2012, p. 373) counted that from 342 articles analysed barely 11 were devoted particularly to the process innovations. Piening and Salge (2014, p. 13) found that the study on antecedents, contingencies, and performance effects of process innovation is still in its infancy. Most innovation studies were based on manufacturing firms where the new product offerings seem most important (Gallego *et al.*, 2012, p. 563). However, other types of innovations are no less significant for the firm productivity and performance (Vivero, 2002).

Researchers neglected also organizational and marketing innovations, in spite that these innovations are essential to the firm performance (Armbruster *et al.*, 2008). Although Hollanders and Kanerva (2009, p. 11) reported that the EU27 SMEs are more likely to introduce non-technological innovation, most studies on the SMEs innovations are technology oriented (Hervas-Oliver *et al.*, 2014, p. 874). Relatively few research on organizational and marketing innovations found that innovative firms were more committed to management changes (Baldwin and Johnson, 1996; Hult and Ketchen, 2001).

2.3. *Types of process and organisational innovations*

Process innovation concerns production or service operations - input materials, task specifications, work and information flows, and technical equipment (Reichstein and Salter, 2006, p. 661). Some researchers considered that process innovation involve both *non-technological (organizational)* and *technological changes* (Meeus and Edquist, 2006, p. 24). Technological process innovation refers to the adoption of new machines and technologies (including IT equipment and software) (OECD, 2005, p. 49). Organizational process innovations include new ways to organize business activities (Hervas-Oliver *et al.* 2014, p. 877. According to Reichstein and Salter (2006, p. 655), however, the distinction between the

two types of process innovations is difficult to sustain as many process innovations involve *both* organizational and technological changes.

Some researchers considered that product/service and process innovations may be united under the term *technical innovation* (Damanpour, 1991; Tang, 2006; Gallego *et al.*, 2012), while others viewed product, service, and production processes innovations as parts of firm *technological innovation* (Gunday *et al.*, 2011, p. 662; Tang and Murphy, 2012, p. 43). This ordering complicates additionally the distinction among different process innovations. Quite justifiably Reichstein and Salter (2006, p. 678) concluded that the tension between the “technological” and the “organizational” changes remains *unresolved* in the study of process innovation. The classification of different types of innovations according two main dimensions (process and non-process; and technological and non-technological) is given in the next figure (Fig. 1).

Figure 1. Types of innovations

Process innovations		Non-process innovations	
Non-technological innovations	Technological/technical innovations		
Non technological process innovations	Technological process innovations	Technological non-process innovations	
<p>Organisational:</p> <ul style="list-style-type: none"> - HRD and training; - Restructuring (R&D unit or employees); - Learning, information access; - Work task reload; -Networking, cooperation, etc. 	<ul style="list-style-type: none"> - New machines and technology; - New IT equipment and software; - New production methods, etc. 	<p>Product:</p> <ul style="list-style-type: none"> - New products; - Improved products (higher quality). 	<p>Service:</p> <ul style="list-style-type: none"> - New services; - Improved services (higher quality).
<p>Marketing:</p> <ul style="list-style-type: none"> - Marketing strategies and surveys; - Own brands, trademarks, patents; - New distribution channels; - Product promotions; -New market (local and foreign), etc. 			

As it is evident from the Figure 1, technological innovations cover product/service and technological process changes, while non-technological ones refer to organisational and marketing innovations. In difference to technological and non-technological process innovations, product and service innovations are non-process ones.

Armbruster *et al.* (2006, p. 646) considered that organisational innovations relate to the new intra- or inter-organizational structures and proceedings. *Structural* organizational innovation reflects the changes in the work responsibilities, information flows, hierarchical levels, or the divisional structure of functions. *Procedural* organizational innovations affect the firm routines and operations. Intra-organizational innovations occur within an organization, while inter-organizational innovations include cooperation with other institutions.

2.4. Interaction among different types of innovations

Piening and Salge (2014, p. 14) stated that the prevailing extant literature tends to examine individual innovation activities in isolation. There are no many studies that investigate the interdependence of different types of innovations and their combined impact on firm performance (Jin *et al.*, 2004; Gunday *et al.*, 2011; Hassan *et al.*, 2013). At the same time firms look beyond mere product and process innovations (Mezger, 2014, p. 437). According to Reichstein and Salter (2006, p. 658) existing research and theory suggest that there is a general degree of association or complementarity between different types of innovations. Walker (2004) revealed that in public organisations organizational, marketing and service/product innovations are interrelated and influence each other. Because of that the

innovative activities need to be focused on many aspects simultaneously such as new products, organizational and marketing practices, and process technologies (Drejer, 2002; Azadegan and Wagner, 2011; Gunday *et al.*, 2011). Other researchers also insisted that a holistic approach is required to capture more innovations activities together (Edquist, 2005, p. 201; Damanpour *et al.*, 2009, p. 656).

The results of several studies demonstrated that there is a strong interdependence, complementarities, and mutual support between *product and process innovations* (Milling and Stumpfe, 2000; Li *et al.*, 2007). Some researchers found that the process innovations may support the implementation of product innovations (Oke, 2007; Crossan and Apaydin, 2010). According to other studies the two types of innovations are mutually supportive, and their simultaneous introduction has positive performance effects (Damanpour and Gopalakrishnan's, 2001). Before introducing new products, the firms need to take into account the respective changes in process requirements (Pisano, 1997). Based on that Reichstein and Salter (2006, p. 676) concluded that theories of innovation need to account for the mutual interaction between the product and process innovations.

Previous studies found that that organizational (re)structuring can facilitate other types of innovations (Damanpour *et al.*, 1989). According to Gallego *et al.* (2012, p. 572) the enterprises which are more likely to introduce new or significantly improved products or processes are more likely to undertake organisational changes. Because of their flatter structure and direct communication small firms can relatively easier introduce organizational changes to increase their innovative potential (Hanna and Walsh, 2008; Wolf *et al.*, 2011).

2.5. Effects of types of innovations on firm performance

The empirical studies on the relation “innovation - performance” revealed positive (Rosenbusch *et al.*, 2011; Ngo and O’Cass, 2013), negative (Balkin *et al.*, 2000; Greve, 2003), or even lack of such relations (Subramanian and Nilakanta, 1996). The business performance does not coincide always with the innovativeness and vice versa (Coad and Rao, 2007, p. 30). According to Jiménez-Jiménez and Sanz-Valle (2011) there is no consensus in respect to the importance of innovation investment on performance, and the relationship between innovation and performance remain still an open question (Bowen *et al.*, 2010).

Small innovations, particularly in small firms, may contribute more significantly to the turnover growth compared to radical innovations (Oke *et al.*, 2007, pp. 739-749).

Many researches indicated that *product* improvements are positively associated with firm growth (Pett and Wolff, 2009). Fagerberg *et al.* (2004) considered that while the new products generally have a positive effect on firm’s growth, the effects of process innovations are not so clear. According to Cabagnols and Bas (2002) companies with product innovation perform better than those with process innovations. Other studies have shown, however, that *process* innovations may be an important source of firm performance (Reichstein and Salter, 2006; Keupp *et al.*, 2012; Piening and Salge, 2014). The benefits of process innovations include the improvement of the product/service quality, cost saving, increase in turnover, sales, and market shares (He and Wong, 2004). According to Simonetti *et al.* (1995) product innovations are related most often to the new markets creation, while process innovations are intended to decrease unit costs or to increase the flexibility.

The positive influence of *organizational* innovations on firms’ performance was also demonstrated in the academic literature (Gallego *et al.*, 2012, p. 574). Organizational innovation may contribute to the increasing productivity, reducing of unit costs, improvement of the quality, increasing of absorptive capacity, and overall firm competitiveness (Alegre and Chiva, 2008; McAdam *et al.*, 2010). Lin and Chen (2007, p. 124, 126) found that organizational innovations rather than technological innovations seemed to be the most

important factor for total sales. According to Johne and Davies (2000, p. 12) *marketing innovations* also lead to the increase in sales by increasing product consumption.

Other studies revealed that manufacturing firms, which undertake *simultaneous product-process* changes, are more successful (Pisano, 1997). Camisón and Villar-López (2012) found that the product innovation capabilities mediate the relationships between process innovation and firm performance. The results of Reichstein and Salter (2006, p. 668) showed that the industries with the highest levels of process innovation tend also to have the highest levels of product innovation.

Firms which develop *simultaneously* technical and organizational innovations achieve higher competitive advantage because of the acquired learning culture (Lee *et al.*, 2008; Damanpour *et al.*, 2009; Evangelista and Vezzani, 2010). The successful combination of the new technology with the organizational adjustments is a key for the successful innovation outcome (Ettlie and Reza, 1992). Hervas-Oliver *et al.* (2014, p. 877) showed that the synchronous co-adoption of organizational and technological innovations is positively related to innovative performance. According to Piening and Salge (2014, p. 4) *simultaneously* engaging in various innovation activities is more effective, because it increases the firm's absorptive capacity (Cohen and Levinthal, 1990). Cassiman and Veugelers (2006) demonstrated that the success of process innovation increased by simultaneously pursued innovation activities (internal R&D and external knowledge acquisition).

The simultaneous performance of multiple innovation activities, however, has certain *costs*, which can reduce a firm performance (Ebersberger and Herstad, 2011; De Marchi, 2012). Because of that Piening and Salge (2014, p.5) suggested that firms need to focus on a *limited number* of activities instead of engaging in many activities simultaneously. The challenge for the firms is to find a particular *combination* of innovation activities, which can bring the highest success.

2.6. Determinants and barriers to innovations

2.6.1. Determinants to innovations

According to the resource based view (RBV), the firm's competitive advantages stem from their unique internal resources, capabilities, and their combinations (Grant, 2002, p. 139). The industrial organisation (IO) theory focuses mainly on the industry external factors (Porter, 1991, p. 111). The internal and external to firm factors can facilitate or hamper innovations and growth (Mason and Brown, 2010). *Internal factors* for innovation refer to firm's tangible and intangible resources, their combination, and entrepreneur/manager orientations, while the *external factors* include government regulations, access to finance, property and contract enforcement, local labor market, institutional environment, etc.

Most innovation studies have been devoted to the determinants and barriers of the new products development, mainly from the manufacturing sector (De Jong and Vermeulen, 2006; Hervas-Oliver *et al.*, 2014). Among the innovation determinants researches used most often the following: access to information (Oksanen and Rilla, 2009); firm size (Bertschek and Entorf, 1996); age (Freel, 2003), structure (Leiponen, 2006); and strategies (differentiation or cost strategies) (Koc and Ceylan, 2007); intellectual property rights protection (trademarks, patents, etc.) (Oksanen and Rilla, 2009); managers and employees human capital (education, experience, knowledge) (Shane 2003; Tang and Murphy, 2012; Kato *et al.*, 2014); staff training (Kam *et al.*, 2003); firm's absorptive capacity (Cohen and Levinthal, 1990) in terms of internal and external R&D (Pisano *et al.*, 1988; Damanpour and Wischnevsky, 2006; Grimpe and Kaiser, 2010); marketing strategies and surveys (Baldwin and Johnson, 1996; Kahn, 2001); acquiring the advanced technology (Evangelista *et al.*, 1998; Uzun, 2001); access to finance (Greiger and Cashen, 2002); internationalisation (Huergo, 2006);

participation of foreign capital (Michie and Sheehan, 2003); industry characteristics (Todtling *et al.*, 2009); location and region (Falk, 2008); networking (Álvarez *et al.*, 2009); government policies (Souitaris, 2002); culture (Wu *et al.*, 2002; Rauch *et al.*, 2009), etc.

As the results of Becheikh *et al.* (2006, p. 659) showed the relationship linking several of these variables with innovation was often moderated by the interaction with other variables.

2.6.2. Barriers to innovations

Barriers to innovations represent the back side of the innovation determinants (the same factors with negative sign), and because of that they are classified also as external and internal (McAdam *et al.*, 2004, 218). For instance Hadjimanolis (1999, p. 566) identified five barriers in front of the SMEs innovativeness in Cyprus: easy coping of innovations; state bureaucracy; insufficiently qualified workforce; banks' policies toward financing innovations. The most important barriers were: „lack of time“ („one person responsible for many tasks“); „insufficient R&D activities, design and tests in firms“; „not enough financial means“. The results of Demirbas (2006, p. 87-88) on barriers to SMEs innovativeness in Turkey revealed the following formal and informal barriers: significant share of informal economy; high level of corruption; unstable tax policy; low degree of intellectual property protection; low rate of business investment in R&D; weak interaction with universities, etc. As the most important barriers were outlined lack of financing, high innovation costs, corruption, and informal economy. Bureš (2003) considered that the most general barriers to knowledge sharing in firms from the transition economies were: lack of trust, bureaucracy, cultural differences, strong hierarchy, etc.

Often the innovations are regarded as linear processes (“best practices”), which the SME are supposed to follow. Edwards *et al.* (2005) reformulated the innovation from a set of consecutive stages to interactive processes between agents and structure, which included an expression of power, domination, normative and professional pressure. Based on that Hotho and Champion (2011, p. 31) showed that the adoption of innovation unexpectedly transformed into necessity to manage the change, and finally, into the task to manage people under conditions of change. The innovative SME have to maintain two types of conflicting structures – one for exploitation of already commercialized products/services, and second one, related to new researches (“organizational ambidexterity”) (Raisch *et al.*, 2009; Vrande *et al.*, 2009). Supporting these structures is a continuous process of struggle, which explains difficulties to maintain innovative business for a longer period.

3. Conceptual model and hypotheses

Based on the literature review a conceptual model of the interdependence of four types of innovations (organisational, product, process, and marketing) and their combined effects on firm performance is proposed (Fig.2).

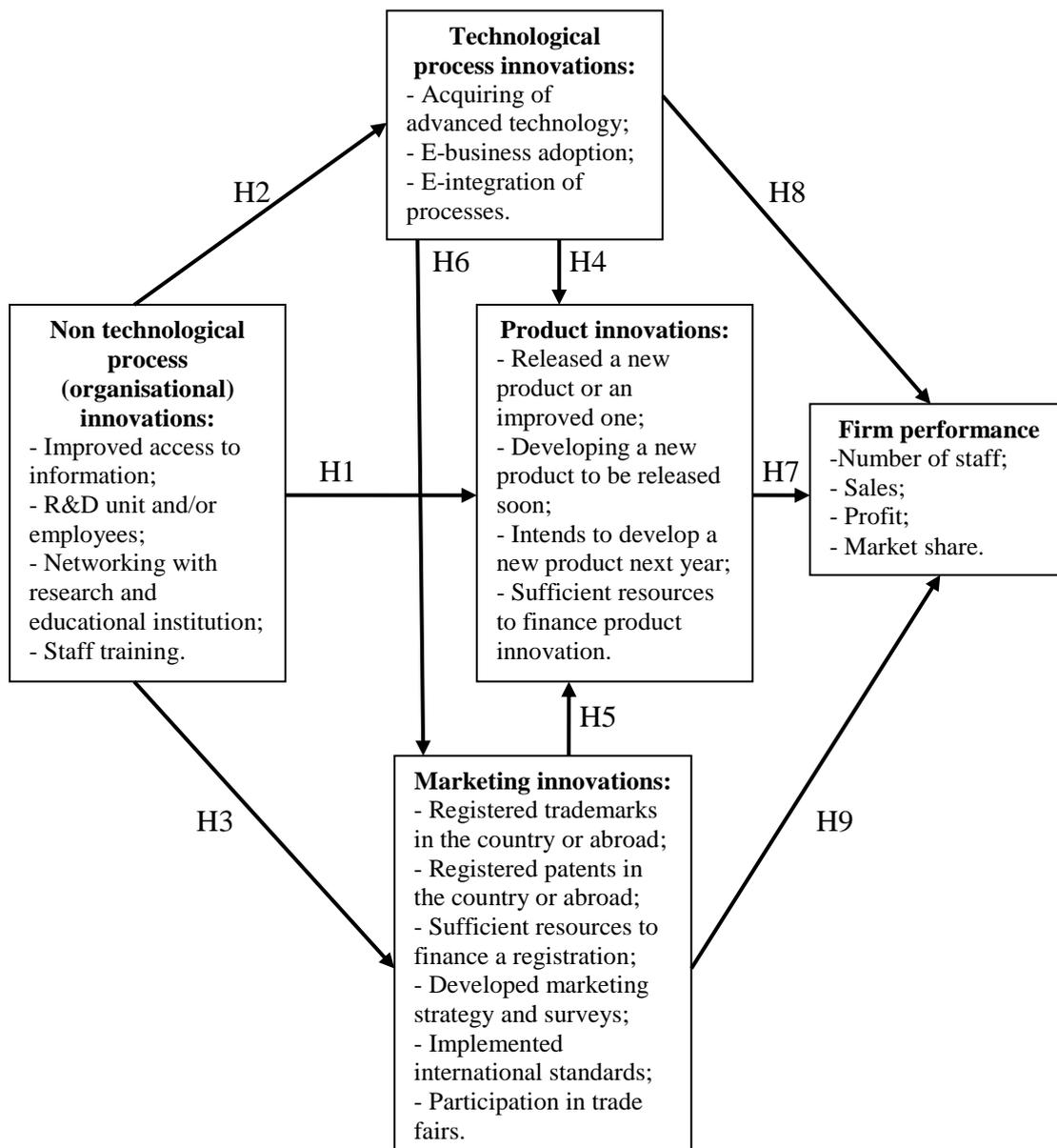
The model contains five blocks, of which four blocks for the four types of innovations (organisational, product, process, and marketing), and the fifth block for the overall firm's performance. It is expected that the model will be tested further on data from a survey of 500 manufacturing SME from 18 sub-sectors in Bulgaria. The field data were gathered by a professional vendor agency Noema in February and March 2013. For this purpose we will use a part of a larger questionnaire, which was developed to identify the factors for the manufacturing SME performance in Bulgaria. The questions in the survey refer to different innovations such as: product innovations; adoption of advanced technology, e-business, e-integration of processes (as a proxy of technology process innovations); registered trademarks and patents, and developed marketing strategy and surveys (as a proxy to marketing innovations); access to information, internal R&D, networking with research institutions, and

staff training (as a proxy of non-technological process or organisational innovations). Firm performance is reflected by the changes of four indicators – number of staff, sales, profit, and market share.

We will count on answers of 16 questions with a total number of 40 items. All of the individual variables are scored on two-point scale (0 - “none” and 1 - “yes”), except some demographic characteristics of firms and entrepreneurs. The ratio between cases and variables is 12.5:1, which is an acceptable level (Hair *et al.*, 2010, p. 102).

For each type of innovations a respective index will be created as an average of its constitutive items. The indexes will take values form 0 to 1, which will allow to compare the levels of manufacturing SMEs innovativeness in respect to each types of innovations. As a rule the values from 0 to 0.20 are regarded as reflecting the lowest level; from 0.20 to 0.40 – rather low level; from 0.40 to 0.60 – average level; from 0.60 to 0.80 – rather high level; and from 0.80 to 1.00 – the highest level. This comparison will give a clear picture about the weaknesses and strengths of the manufacturing SMEs in respect to different types of innovations.

Figure 2. Conceptual model of the interdependence of four types of innovations and their effects on firm performance



The conceptual model will be tested through a path model using Amos of SPSS 20. The model contains nine hypothesis, which are derived from the literature review, particularly from the sections on the interaction of innovations types and their impact on firm performance. Based on that we assume that organisational innovations will have a direct and positive effects on other types of innovations, and will indirectly contribute positively to the firm performance. Other three types of innovations are supposed to mediate fully the influence of organisational innovations on performance. We expect that technological process and marketing innovations will impact directly and positively product innovations, as well as directly and positively firm performance. Technological process innovations will have also a direct and positive influence on marketing innovations. Product innovations are supposed to mediate partially the effects of technology process and marketing innovations on performance, and to exercise a direct and positive influence on performance.

These hypotheses are in line with few studies, investigating the interdependence of four type of innovations. For instance Gunday *et al.* (2011, p. 671) found that the innovative performance is directly and positively affected by the organizational, product and marketing innovations. Process innovation influences innovative performance through product innovation, while organizational and marketing innovations have both direct and indirect (through product innovation) effects on innovative performance. The organizational innovation appeared to be the strongest driver of innovative performance. Hassan *et al.* (2013, p. 256) also found that organisational innovation impact positively other three types of innovations; process and marketing innovations influence positively product innovations; and four types of innovations have positive effects on firm innovative performance. Contrary to that Santos *et al.* (2014, p. 533) found little evidence for the sample Brazilian firms that innovation characteristics in one period have a positive impact on the firm performance in the next period. This can be explained by the time span between innovation data and innovation results. According to Bowen *et al.* (2010) neglecting the time may be a reason for the divergent results on the relationship between innovation and performance.

The model is heuristic as it allows to be enlarged on the left side – by adding determinants to different innovations, as well as on the right side – by adding different performance indicators. This capacity to the model enlargement, however, is restricted by the fact that different types of innovations may have different determinants and different effects on the firm outcomes.

4. Conclusion

The goal of this paper was to propose a conceptual model of the interdependence of main types of innovations (organisational, product, process, and marketing) and their combined effects on firm performance. The structure of the model was derived from the review the literature related to the types of SMEs innovations, their interdependence, and combined effects on performance. It was confirmed that most innovation studies on SMEs are devoted to the determinants and barriers of the new products development, while other types of innovations (process, organisational, and marketing ones) were of little interest to researchers. In general there were no many studies, which investigate the interdependence of more types of innovations.

In line with the Oslo Manuel (OECD, 2005), we revealed that the innovation typology includes product/service, process, organisational, and marketing innovations. It was shown that there are some tension in distinguishing between two types of process innovations - technological and non-technological (organisational) ones. The results of several studies demonstrated that organisational, marketing and product/service innovations are interrelated and influence each other. In general all types of innovations are assumed to influence positively the firm performance, although the effects of process innovations are not so clear.

According to the literature review, there are two types of determinants and barriers to the innovations – internal and external to the firm. Internal determinants and barriers refer to firm's tangible and intangible resources, their combination, and entrepreneur/manager orientations, while the external determinants include government regulations, access to finance, property and contract enforcement, local labor market, institutional environment, etc.

Based on that a conceptual model of the interdependence of four types of innovations (organisational, product, process, and marketing) and their combined effects on firm performance was proposed. We envisage to test the model further on data from a survey of 500 manufacturing SME in Bulgaria.

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