

How do a firm's age and size affect its organizational innovation?

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Abstract. This research explores the impact of the firm characteristics of size and age on organizational innovation (ORI). The study is based on data gathered from a sample of manufacturing companies from the central region of Russia. To make the research more specific, the ORI is broken down into three subtypes, namely, innovation in management practices, innovation in workplace organization, and innovation in external relations. The ORI subtypes demonstrate various levels of dependence on a firm's size and age. The study did not find evidence that the size of a firm has any significant impact on the ORI, while the age impacts each of the ORI subtypes. The study contributes to the ORI literature by advancing the concept of the ORI investigating the impact of a firm's characteristics on the ORI.

Keywords. Organizational Innovation; Innovation Management; Firm Characteristics; Size; Age.

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1 Introduction

A significant part of a firm's overall strategy is innovation management. The innovation activity in a firm aims to increase the productivity of each business function of the firm (Nandakumar et al., 2011; Forsman, 2009; Wang and Ahmed, 2004; Dukeov, 2008). A successful firm must always consider the business environment as a dynamic and continuously changing system (Bergman et al., 2006). To adapt the firm to a changing environment often requires introducing innovations. These could be new products, processes, management systems or elements of corporate culture (Damanpour, 1992). Different kinds of innovations within a firm are often closely interrelated. The introduction of technological innovation, which encompasses product and process innovation, is complementary to the adoption of non-technological innovation, which encompasses marketing and organizational innovation (ORI) (Koren and Palcic, 2015).

According to many studies, technological innovation acts as a driver for non-technological innovation within a firm (Henderson and Clark, 1990; Dougherty, 1993; Danneels, 2002). These studies usually suggest that non-technological innovation is the consequence of technological innovation which forces a firm to change its performance (Armbruster et al., 2008). However, to be successful in innovation management in general, firms must continuously develop appropriate non-technological innovation, and ORI in particular, to transform the overall effect of innovation activity into profit (Teece, 2010). Some researchers have stated that ORI underlies the efficient implementation of other types of innovation and is regarded as one of the most significant factors increasing competitive advantages for the firm (Geels and Schot, 2007; Lokshin et al., 2009).

Various research on ORI topic has been conducted for about four decades. Nevertheless, numerous related matters have not still found solid explanations, and a high level of inconsistency in the results seems to characterize the studies in this field (Damanpour and Daniel Wischnevsky, 2006). There are a few reasons why the ORI attracts the interest of scholars. First of all, a deeper understanding of the role that ORI plays in the context of the overall innovation activity of a firm is demanded. Secondly, from a managerial perspective, it would be good to know what the antecedents of ORI are, in order to raise the level of ORI activity in a firm. Nowadays technology often moves ahead of organizational trends and meets barriers created by these out-of-day trends (Apsalone et al., 2017).

A number of studies (e.g., Rosenbusch et al., 2011; Bradley et al. 2012; Laforet 2011) proved that ORI played a significant role in firm development. There have also been various discussions in the literature on how to identify and measure ORI in firms (Armbruster et al., 2008). In any case, regardless of the research focus, ORI is considered to have a crucial impact on the overall ability of a firm to innovate.

Among a number of factors that have an impact on the innovation of firm, are firm characteristics such as the firm's age and size (e.g., Heimonen, 2012; Gopalakrishnan and Damanpour, 2000).

The impact of a firm's age and size on the ORI is much less covered in the literature compared to this impact on technological innovation (e.g., Alabbas and Abdel-Razek 2016). At the same time, the ORI theory suffers from a lack of supporting studies in general, and in particular, ones exploring the impact of a firm's characteristics on ORI (Camisón and Villar-López, 2014).

In spite of the fact that there exist some studies that focus on the relation between a firm's characteristics and ORI (Damanpour, 1991; Wolfe, 1994; Van de Ven et al., 2000), a strong relationship between ORI and a firm's characteristics has not always been confirmed and needs to be further explored (Koren and Palcic, 2015). Drazin and Schoonhoven (1996) proposed that inconsistency in the results of innovation studies have appeared because many of them do not specify the context and types of innovation under consideration and have generalized the conclusions to a large extent (Gopalakrishnan and Damanpour, 1997). Thus, more research in the area of ORI and its determinants is needed (Armbruster et al., 2008).

This study examines the relationship between ORI and a firm's characteristics. Our study contributes to the theory of ORI by considering this relation in the context of ORI components to answer the question as to what impact the latter could have on ORI development in a firm. The study is based on a sample of 123 industrial firms from the central region of Russia. Our work is also in line with Eurostat (2012) studies and other studies (e.g., Heimonen, 2012; Yildiz et al., 2013; Le Bas et al., 2015; DeTienne and Koberg, 2002; Damanpour, 1987; Gopalakrishnan and Bierly, 2006) that have been carried out in the same area.

2 Conceptual framework and research hypotheses

2.1 Organizational innovation

At the beginning of the 20th century, Joseph Schumpeter (Schumpeter, 1934) introduced the term "new industrial organization". According Schumpeter's theory, there are five types of innovations: the introduction of new goods, the introduction of new methods of production, the implementation of a new supply source of raw materials or half-manufactured goods usage, the opening of new markets, and new forms of industrial organization. The latter is nowadays understood as organizational innovation (ORI). In the innovation management literature, ORI has gained a minor role in studies as it is a relatively new concept to be researched and implemented (Klette and Kortum, 2004). Therefore, it still represents a broad concept which deals with issues covered by strategic management, human resource management, knowledge management and other non-technological areas of firm control and evolution (Gera and Gu, 2004). All these areas can be considered indicators of the internal diffusion of various practices and elements of knowledge management. (Armbruster et al., 2008). In comparison with product or marketing innovations, ORI is not directly implemented in the market place. Nevertheless, the effect of ORI may be visible as the increasing level of competitiveness of a firm that introduces product, process, or marketing innovations supported by simultaneously introduced ORI. This simultaneous introduction of different types of innovations may lead to the synergy of various effects (Som et al., 2012).

Scholars have provided various classifications of organizational innovation in an attempt to explain and specify their characteristics in different contexts (Lam, 2004). Thus, quite a large number of definitions for ORI can be found, not to mention interpretations of the term (e.g., Mothe and Thi, 2010). One can also consider different levels of ORI. For example, these may take the form of appropriate solutions on the level of particular departments or functions of a company. They can also relate to the overall structure or the functional principles of the firm.

They may well be innovations that have an impact the firm's relationship with its environment (Wengel et al., 2002).

Despite many studies arguing that ORI should be considered as a firms' response to technological innovation forming a pre-condition environment for it, ORI can also play its own independent role in a firm's development and can be considered a distinct form of innovation (Tidd et al., 2005).

Firstly, ORI might aim at implementing new procedures in processes, operations, or behaviour in a firm (Som et al., 2012). These procedures could be the first introduction of a total quality management system or a PDCA cycle, or could involve just-in-time or teamwork practices that directly impact the organizational performance of the firm (Wheelwright and Clark, 1992; Reed et al., 2000; Ichniowski et al., 1997). The crucial criterion here is that the introduction should be for the first time (OECD-EUROSTAT 2005, p.51).

Often these are called procedural ORIs in comparison to structural ORIs which deal with increasing the efficiency of responsibilities, accountability, divisional structure of functions, and knowledge dissemination in a firm on its various levels (Som et al., 2012). Thirdly, ORI might reduce the organizational barriers of the external environment, thus facilitating enlarging the scale of the firms' external relations with customers, suppliers, research organizations, and governmental and non-governmental institutions (Heidenreich, 2009; Rammer et al., 2009).

In our paper, we will adhere to the OSLO Manual definition of ORI: "An organizational innovation is the implementation of a new organizational method in the firm business practices, workplace organization or external relations," (OECD-EUROSTAT 2005, p.51). According to this document, ORI may be intended to increase a firm's performance by reducing administrative or transaction costs, enhancing labour productivity by improving workplace satisfaction, gaining access to non-tradable assets (such as non-codified external knowledge), or reducing the costs of supplies. An organizational innovation should be based on strategic decisions taken by the management of the firm to implement organizational methods in business practices, workplace organization or external relations which are new for the firm.

2.2 Subtypes of ORI

As it was shown in the previous paragraph, ORI can be broken down into a few specific innovation subtypes that relate to business practices, workplace organization or external relations. Many studies on ORI (e.g., Murphy, 2002; Uhlaner et al., 2007; Eurostat, 2012), in accordance with the OSLO Manual, consider three subtypes of ORI. Often, the studies are dedicated to specific forms of ORI. For instance, Mothe and Thi (2010) focus on management practice and production approaches. Dukeov et al. (2017) consider an external relation subtype form of ORI.

2.2.1 Internally oriented subtypes of organizational innovation

The first subtype of ORI is related to innovations in management practices (IMP). These deal with the introduction of new management practices. IMP means the implementation of methods for organizing work routines that are new for the firm. These methods deal with the first introduction of, among other things, knowledge management related approaches, Total Quality

Management, Lean Production, Six Sigma, the Theory of Constraints, Kaizen or supply system elements, e.g. first implementation of practices for codifying knowledge, e.g. “establishing databases of best practices, lessons and other knowledge, so that they are more easily accessible to others” (OECD-EUROSTAT, 2005, p.51). According to many scholars (e.g., Prahalad and Hamel, 1990; Grant, 1996; Spicer and Sadler-Smith, 2006), knowledge management related practices in general enhance firms’ competitiveness and ability to innovate and in turn their ORI. Firms are more active in introducing innovations when a firm effectively absorbs knowledge from outside as well as when it makes it circulate intensively within the internal environment (Nonaka and Takeuchi, 1995).

The second subtype of ORI is linked with innovations in the workplace organization (IWO). These innovations focus on new methods of organizing the work of employees, e.g. centralization, decentralization or re-organizing the organizational structure, as well as integration or diversification of different business activities (OECD-EUROSTAT, 2005; Som et al., 2012). An example of an IWP “is the first

implementation of an organizational model that gives the firm’s employees greater autonomy in decision making and encourages them to contribute their ideas” (OECD-EUROSTAT, 2005, p.52). This subtype of ORI aims to improve the overall performance and results by increasing work efficiency (Mothe and Thi, 2010). However, there is variation between the results of studies that focus on IWO. For example, Ichniowski et al. (1997) propose that the overall impact of this subtype of ORI on the overall performance is positive, whereas, e.g., Bresnahan et al. (2002) argue that it is not that obvious, and IWO can be efficient only in combination with other types of innovation or technologies. Mothe and Thi, (2010), proved a strong positive relationship between IWO and the propensity of a firm to perform well.

2.2.2 Externally oriented subtypes of organizational innovation

The external relation subtype (IER) of ORI encompasses “new ways of building relations with a firm’s external environment including other firms, public institutions, research organizations, customers and suppliers in order enhance the efficiency of production, procuring, distribution, recruiting and ancillary services” (OECD-EUROSTAT, 2005, p.52). The IER demonstrates how a firm is able to make use of networking activities, which can be a crucial capability in the context of the knowledge-based global economy (Mothe and Thi, 2010; Sapprasert and Clausen, 2012). External relations provide a firm with potential access to partners’ complementary skills and that might create synergy in production and management areas (Kogut, 1988; Kogut and Zander, 1993; Cassiman and Veugelers, 2002), or exclude duplication in R&D activities, reduce risks involved in venture projects (Jacquemin, 1988; Sakakibara, 1997), promote benefits from economies of scale or scope (Kogut, 1988), and facilitate receiving new scientific and technological knowledge for the firm’s own R&D activities (Sakakibara, 1997, 2001). Despite the recognized effects of IER, studies have demonstrated controversial results on what impact this subtype of ORI has on the overall performance of the firm and its innovation activity. Some have shown positive relations between a firm’s cooperation with universities (Belderbos et al., 2004; Löf and Heshmati, 2002), whereas Mothe and Thi, (2010) observed a slightly negative interconnection between supplier related ORI and a firm’s overall performance. Klomp and van Leeuwen (2001)

presented evidence of a positive impact of client relation activities on the overall performance of a firm.

2.3 Organizational innovation and firm characteristics

By and large, the subtypes of ORI are different in their nature and depend on firm characteristics, for example, the age and size of the firm (Som et al., 2012). Due to this, it is important to see how firm-level characteristics are related to organizational innovation and, in turn, how they influence the firm's performance by means of ORI. The relationship between a firm's characteristics, in particular its age and size, and their effect on innovation activity has been debated for a long time (Damanpour, 2006). Some have used these variables to come up with conceptual conclusions regarding the relationship between a firm's level of innovation activity and its age and size (e.g., Reger et al., 1992). Nevertheless, there is no consensus as yet and several independent studies have found controversial insights (DeTienne and Koberg, 2002). Gopalakrishnan and Damanpour (1997) argue that inconsistency in the results may appear because ORI is considered in many studies as an indivisible concept, while age and size might have differentiated impacts on specific subtypes of ORI.

Appendix 1 demonstrates findings and the empirical characteristics of relevant prior studies

2.3.1 Firm age and organizational innovation types

The literature has demonstrated arguments both for the negative and the positive dependence of innovation intensity on the firm age. For example, Damanpour (1987), found that the older a firm is, the less flexible its organizational structure becomes, and the more such a firm becomes inertial in its management system implementation. The level of bureaucracy in a firm increases over the years, new and strong formal procedures appear, and authority becomes centralized (Kelly and Amburgey, 1991). According to Van de Ven (1986), as a firm ages, internal barriers that prevent innovation grow. Studies on the business life-cycle have proposed that the development of a young firm involves the innovative development of the organization (Churchill, 2000; Davidsson and Delmar, 1997; Scott and Bruce, 1987).

In contrast, there are many older companies that are highly innovative and demonstrate a very high level of performance (Huergo and Jaumandreu, 2004). Studies of those firms might provide new insights into how a firm can go through the process of economic and technological change within the firm over a long period (Hafkesbrink and Schroll, 2014).

As ORI comes to be essential for a firm that struggles for its competitiveness, IMP is a key factor in the creation and diffusion of new knowledge (Montoro-Sanchez, 2011). The development of knowledge management systems, organizational learning approaches, and the introduction of new management approaches, (e.g., Total Quality Management, Lean Production, Six Sigma, the Theory of Constraints, Kaizen) as it was mentioned above are more often characteristics of more mature firms as young firms often have neither resources nor the time to implement these systems and approaches (Temtime, 2003). Thus, we propose the following hypothesis.

H1a. Firm age has a positive effect on innovations in the management practices (IMP) in the firm.

In order to survive in the market place, older firms are forced to develop innovations in their workplace organisation (IWO), which is a subtype of overall organisational innovation (ORI). In the literature, employee satisfaction is considered a powerful mechanism for increasing the overall performance of a firm. The level of employee satisfaction in older firms is lower than in younger firms (Antoncic and Antoncic, 2011). Thus, older firms in comparison to young ones need to be more active in maintaining their level of employee satisfaction. This level can be maintained in numerous ways, such as by running training programmes, implementing knowledge sharing systems, increasing flexibility, reducing formalities in decision-making processes, eliminating some formal procedures (Tansel and Gazioglu, 2014; Hafkesbrink and Schroll, 2014). Taking into consideration these considerations, we propose the next hypothesis.

H1b. Firm age has a positive effect on innovations in the workplace organization (IWO) in a firm.

Nevertheless, firms can hardly innovate in isolation. This means that in order to receive new knowledge, old firms are forced to continuously elaborate their network (Montoro-Sanchez, 2011), which increases the probability of elaborating their ORI in the area of external relations (Dufour and Son, 2015).

Compared to younger firms, older ones more actively try to establish relations with partners in the area of research and development (Coad et al., 2016). Younger firms often have insufficient experience to process the weak signals that they receive from the business environment in order to adjust their external relations to the forthcoming situation. For this reason, they do not come with appropriate innovations external relations (IER) in time (Ismail, N. and Jenatabadi, H., 2014).

According to Gopalakrishnan and Bierly (2006), young firms that focus on developing their technological competences are active in enlarging their external connections to gain access to niche-based knowledge, although older firms are active in all kinds of external relations. This allows us to articulate the following hypothesis:

H1c. The firm age has a positive effect on innovations in external relations (IER) in a firm.

2.3.2 Firm size and organizational innovation types

Firm size is another characteristic of a firm that numerous scholars have approached in an attempt to prove Schumpeter's proposition that large firms are more active in technological innovation because they have more resources available, including financial, human, organizational, and intellectual resources (Acs and Audretsch, 1988; Bhattacharya and Bloch, 2004; Freeman and Soete, 1997; Santarelli and Piergiovanni, 1996; Tether, 1998). When compared to small firms, larger ones are more active in receiving patents for engineering solutions (Brouwer and Kleinknecht, 1999; Damanpour, 1987). As some studies argue, the firm size is among the most important determinants for innovation activity (Blau and McKinley, 1979; Camisón-Zornoza et al., 2004; Damanpour, 1996).

However, Wagner, E. and Hansen, E. (2005) studied the wood industry and found that firm size does not influence a firms' ORI activity.

Nelson (1993) found that small firms demonstrate a very high level of R&D activities. Tether (1998) argues that large firms introduce a considerable number of high-value innovations while small firms are active in the introduction of lower-value innovations.

Damanpour (1996) suggested that in large and more complex firms size stimulates knowledge flows within the firm, thus accelerating innovation. Large firms have more access to information regarding innovation which in turn allows them to select appropriate innovations to adapt from a broad selection (Fennel, 1984).

Many scholars have proved a positive relationship between the size of a firm and the rate of adoption of innovations in the broad sense of this term (Aiken et al., 1980; Kim, 1980). Large firms have more resources in terms of both scale and scope overall, which allows them to be more active in introducing all types of innovations (Damanpour, 1987).

In an intensive literature review we found that discussions on firm age in ORI were scarce. Nevertheless, Kimberly and Evanisko (1981); Zmud (1984); and Damanpour (1987) argue that size has a positive impact on both technological and organizational innovation. At the same time, there are some researchers who did not find any evident impact of firm size on innovation activity (Mohr, 1969; Utterback, 1974). The complexity of large firms might create barriers to implementing innovations, as well as extending the way from innovation identification to its adoption, thus reducing the positive effect of a firm's size on innovation (Kohn and Scott, 1982). To our best knowledge, the studies that investigate the relationship between a firm's size and organizational innovation do not investigate in detail the relationship between the firm size and different subtypes of organizational innovation.

As far as the IMP subtype of innovation is considered, Temtime (2003) found that large firms implement TQM practices more intensively compared to small firms, although the relation between firm size and TQM practice implementation is not very strong. This result goes along with Hajjem (2017) and Youssef et al. (2002). DeTienne, D. and Koberg, C. (2002) who found that the size of industrial firms has no any significant influence on management practices. The greater resources of larger firms sometimes cover the potential loss of profit due to their passiveness in innovation (Downs and Mohr, 1976). Besides the above-mentioned findings, Gopalakrishnan and Damanpour, 1997, argue that the complicated organizational structure of some large firms might reduce the dynamics of information flows. Thus, the impact of firm size on its IMP seems to be multidirectional and the following hypothesis is proposed:

H2a. Firm size has effect on the innovations in management practices (IMP) in a firm.

Damanpour (1992) found that large firms experience greater needs regarding innovations in the workplace organisation because small and medium sized firms in general have a more flexible structure. In large firms, the level of employee satisfaction is lower compared to smaller ones, which is evidence of the neglect of employee-care policies in large firms (Tansel and Gazioglu, 2014). Medium-size firms are less bureaucratic in making decisions on implementing IWO, as the risks negative effects resulting from changes are less costly (Damanpour, 1992; Kimberly et al., 1988). The organizational structure of a small firm is usually less sophisticated compared to a large one. Thus, it could dynamically relocate resources if needed to be innovative in some areas of IWO (Van de Ven et al., 2000). The controversial insights we found in the literature allow us to propose the following hypothesis:

H2b. Firm size has effect on innovations in the workplace organisation (IWO) in a firm.

The literature lacks evidence on the impact of firm size on the IER subtype of ORI. The evidence that has been released is highly contradictory. According to Anwar and Hasnu (2017) firms' external relations moderate more by the specific industry then by the firm size.

Kalkan et al. (2011) and Campos-Climent and Sanchis-Palacio (2015), carrying out their research in different contexts, found that there is no relation between size and firm performance including any innovation activity.

Coad et al., (2016) found that smaller firms have neither the need or the resources for placing orders with outsourced partners for research and development, thus they fall behind larger firms in their IER activities.

Youssef et al. (2002), stated that because the majority of small and medium size firms lack well developed TQM and Customer Relationship Management (CRM) systems they usually are more limited compared to large firms in establishing new forms of relationships with their customers. These findings are supported by Lun and Quaddus (2011) and Fort et al., (2013), who argued that IER in the context of customer relations are more sophisticated and better developed in many aspects in large firms compared to smaller ones because small firms have a lower capacity to establish relations with customers and consumers. Medium-sized and large firms are more likely to make use of e-business related IER in establishing new forms of customer relations (Bordonaba-Juste, 2012). In contrast, Kilenthong et al., (2016) has shown that smaller firms are slightly more active compared to large firms in IER related to customer relations.

As for other kinds of cooperation, the larger a firm is the more actively it cooperates technologically with its suppliers (Minguela-Rata et al., 2014) and with R&D partners (Badillo et al., 2017). Small firms cannot easily establish international cooperation because usually they suffer from a lack of resources (Zhou, 2018).

To be active in IER, a firm has to experience a need for network development (Gopalakrishnan and Bierly, 2006). On the other hand, it seems that no substantial evidence that a comprehensive network has a direct link with IER activity exists. Ono and Stango, (2005) found that outsourcing models differ for large and super-large firms, which points to differences in network patterns. They suggested that the decisions on which pattern to choose depend on a combination of factors rather than only the characteristic of firm size. Thus, the influence of firm size on innovations in external relations does exist to a certain extent but it is not obvious in its direction. We thus propose the following hypothesis:

H2c. Firm size has an effect on innovations in external relations (IER) in a firm.

3 Methodology

The data analyzed in this paper results from a survey conducted in Russia during the second half of 2016. The survey investigated the relationship between organisational innovations (ORI) on one side and firm characteristics on the other.

The population consisted of manufacturing firms based in the Central Region of Russia. The

questionnaire was administrated in electronic form to every tenth firm on the list which made a total of 550 firms. All the respondents at the moment of the survey held a top managerial position (CEO, CFO, or similar). After two weeks, a reminder was sent to those who had not replied by that time. As a result of the field work 145 completed surveys were collected. Twenty-two surveys were discarded because the answers to some questions were missing, which would not allow those questionnaires to be processed completely. The overall response rate was slightly above 25 per cent.

We employed a survey method for our study. We developed the dependent variables measuring ORI performance based on the definitions presented in the Oslo Manual (OECD-EUROSTAT, 2005). The scales for measuring ORI were taken from the previous studies with minimal adaptation. Similar scales for measuring ORI were used by Eurostat (2012), Kam Sing Wong (2013), Camisón and Villar-López (2014), Merono-Cerdan and Lopez-Nicolas (2013), Mothe and Thi, (2010). Respondents were asked to compare the innovation performance of their firm in comparison with the innovation performance of their competitors using a seven-point Likert scale, where 1 corresponds to “strongly disagree” and 7 corresponds to “strongly agree”, (Camison, 2014; Eurostat, 2012; Dadura and Lee, 2011). A firm size was measured by the number of employees on a 5-point scale: 1 = fewer than 50; 2 = 50–150; 3= 150–500; 4 = 500–1000; 5 = more than 1000 (e.g., Damanpour, 2006). The firm age was measured by the number of years since the foundation of the firm (Camison, 2014).

While designing the questionnaire, a few intensive interviews with both academicians and practitioners were conducted in order to check the presented concepts and the way in which respondents perceive the questions.

4 Results

An exploratory factor analysis was applied in the first stage of the data analysis to combine the observed variables used for measuring ORI into factors. We interpreted the obtained factors as ORI subtypes. To test the hypotheses on factorial validity of the identified factors a confirmatory factor analysis was carried out. The results of the confirmatory factor analysis proved the validity of the identified factors. At the last stage of the analysis, regression equations were calculated to determine the relations between firm size and age on the one side and the ORI subtypes on the other.

Before applying the exploratory factor analysis, the Kaiser-Meyer-Olkin (KMO) test was run for the sample. The KMO value obtained for the data set was 0.91, which demonstrates more than adequate quality for processing by factor analysis (Cerny and Kaiser, 1977). The exploratory factor analysis demonstrated that a 3-factor solution provided the best fit. The first factor (4 items) includes items which are related to innovation in management practices. These are: a system that enables the employees to gain access to non-codified external knowledge (NSEC); new practices of improving learning and knowledge sharing within the firm (PLKS); new management systems for general production or supply operations (MSPS); new methods that reduce costs of suppliers (MRCS). The second factor (3 items) includes items related to innovation in the workplace organization. The items associated with it are: a new workplace organizing method that reduces administrative and internal transaction costs (RATC); a new approach of improving

workplace satisfaction (IWC); new methods for distributing responsibilities and decision making among employees for the division of work within and between firm activities (and organizational units), as well as new concepts for the structuring of activities (MDR). The third factor includes only one item and it deals with innovation in external relations. This item was articulated as new methods in a firm external relations that involve the implementation of new ways of organizing relations with other firms or public institutions (MER).

The result of the exploratory factor analysis is illustrated in Fig.1 and Table.1. Three subtypes of ORI have been indicated initially. The exploratory factor analysis demonstrated that these three ORI subtypes are supported by different items. The cumulative explanation factor is 75.6.

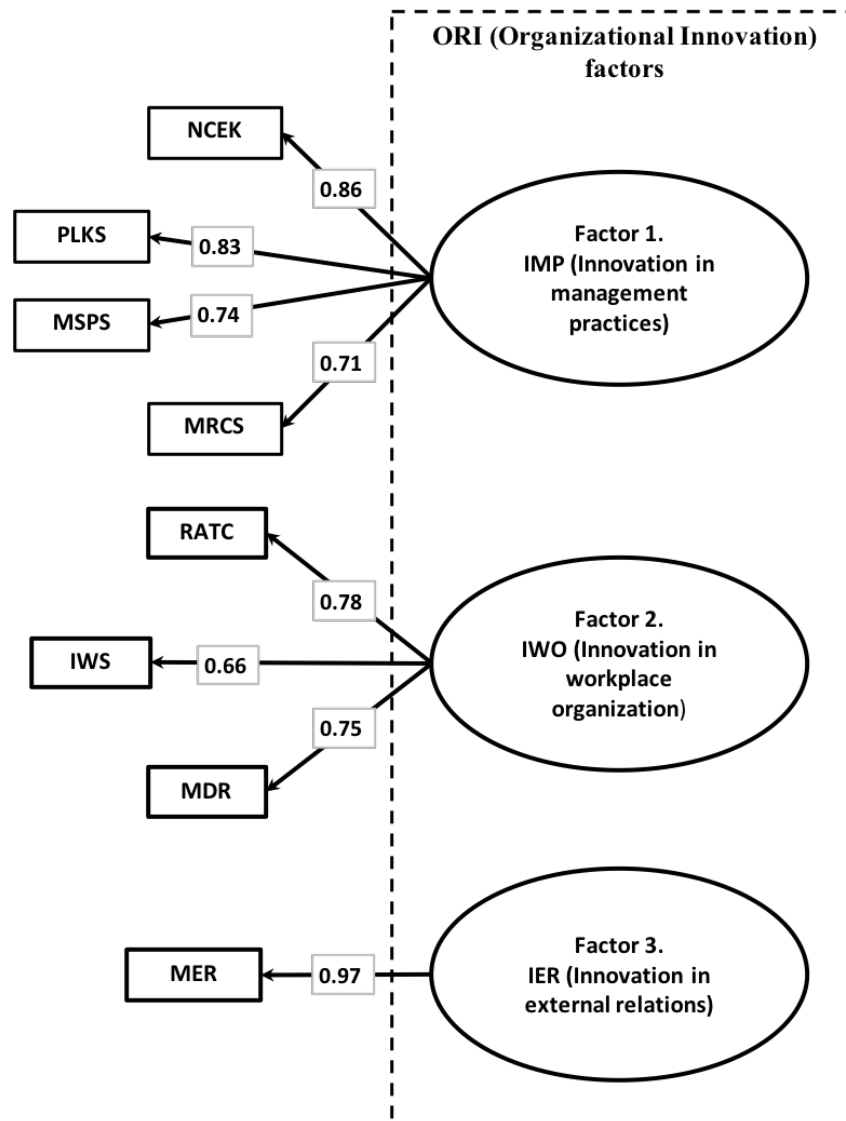


Fig. 1. The graphical model of the exploratory factor analysis

To test the hypotheses for the factorial validity of the identified factors, a confirmatory factor analysis was carried out. The results of an exploratory factor analysis (3 factors, 8 items) were

used as an a priori hypothetical structure of the scales. The values for the model fit measures are as follows: Chi-square/df = 1.77; CFI = 0.86; GFI = 0.936; AGFI = 0.87; SRMR = 0.98; RMSEA = 0.04; PCLOSE = 0.96. These measures indicate an acceptable model fit (Hair et al. 2010).

Further, the scale reliability was tested for internal consistency by using the Cronbach's alpha method. The Cronbach's alpha for the data set equals 0.87 which suggests high reliability of the scales in terms of their internal consistency (DeVellis, R.F., 2012). In addition to the calculation of the Cronbach's alpha for each scale, the Cronbach's alpha ratio was calculated for each of the scale provided one item masked. The results showed scale reliability as none of the items were superfluous.

Table 2 demonstrates the results of a correlation and regression analysis that was applied in order to determine the impact of firm age and size on ORI activities. A linear regression model was calculated for each pair of considered variables.

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Table 1. Organizational Innovation. Results of the factor analysis applied to OI variables.

ORI sub-type	Factors					
Innovation in management practices	IMP	Mean	Std. Dev.	1	2	3
A system that enables employees gain access to non-codified external knowledge	NCEK	4.07	1.86	0.86		
New practices improving learning and knowledge sharing within the firm	PLKS	4.10	1.68	0.83		
New management systems for general production or supply operations	MSPS	4.11	1.64	0.74		
New methods that reduce costs of suppliers	MRCS	3.95	1.64	0.71		
Innovation in workplace organization	IWO					
A new workplace organizing method that reduces administrative and internal transaction costs	RATC	3.97	1.65		0.78	
A new approach to improving workplace satisfaction	IWS	3.80	1.65		0.66	

New methods for distributing responsibilities and decision making among employees for the division of work within and between firm activities (and organizational units), as well as new concepts for the structuring of activities	MDR	3.43	1.63	0.75
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Innovation in external relations	IER			
New methods in a firm's external relations that involve the implementation of new ways of organizing relations with other firms or public institutions	MER	4.29	1.61	0.97
<hr/>				
% Total				54.41 11.38 9.84
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Cumulative				54.41 65.79 75.63
<hr/>				

Further, the scale reliability was tested for internal consistency by using the Cronbach's alpha method. The Cronbach's alpha for the data set equals 0.87 which suggests high reliability of the scales in terms of their internal consistency (DeVellis, R.F., 2012). In addition to the calculation of the Cronbach's alpha for each scale, the Cronbach's alpha ratio was calculated for each of the scale provided one item masked. The results showed scale reliability as none of the items were superfluous.

Table 2 demonstrates the results of a correlation and regression analysis that was applied in order to determine the impact of firm age and size on ORI activities. A linear regression model was calculated for each pair of considered variables.

The results prove that firm age impacts some ORI subtypes. Nevertheless, this impact is not very strong and for some relations the regression coefficients do not demonstrate significant values.

Among the ORI subtypes that encompass the "innovation in management practices" factor (IMP), the highest value of regression coefficient (0.67) received the item that deals with systems that enable employees to gain access to non-codified external knowledge. This could mean in general that the older firm is, the more information systems are put into use. Obviously, those systems being implemented have a positive impact on the ORI activities in the firm. The next ORI item, "new practices of improving learning and knowledge sharing within the firm" scored a regression coefficient of 0.56.

We did not find any significant relationship between firm age and the two other items of the IMP, namely "new management systems for general production or supply operations" and "new methods that reduce the costs of suppliers". This is evidence that firms do not develop systems and methods on a systematic basis by getting older.

As for the value of the IMP calculated as an average of the incorporated items (NCEK, PLKS, MSPS, and MRCS), the regression coefficient of the relationship between a firm's age and IMP received a value of 0.4 ($p < 0.1$).

As for the second ORI subtype "innovation in workplace organization" (IWO), the only item

of ORI that proved to have a statistically significant impact from the firm age variable with a regression coefficient of 0.44 was the item “new workplace organizing method that reduces administrative and internal transaction costs”. As for the value of the IWO calculated as an average of the three incorporated items (RATC, IWC, and MDR), no substantial relation was found between the firm’s age and IWO.

Finally, the third ORI factor “innovation in external relations” that encompasses only one variable “new methods in a firm’s external relations that involve the implementation of new ways of organizing relations with other firms or public institutions” received a regression coefficient of 0.43 ($p < 0.1$).

The ORI subtypes do not experience strong influence from firm size. Only two subtypes of ORI out of eight demonstrated statistically significant relation with a firm size. They are “New practices of improving learning and knowledge sharing within the firm” and “New management systems for general production or supply operations” with the regression coefficient 0.56. Thus, is the evident that a firm’s size has very limited impact on ORI as a whole. Graphically, the significant relations are presented in Fig.2.

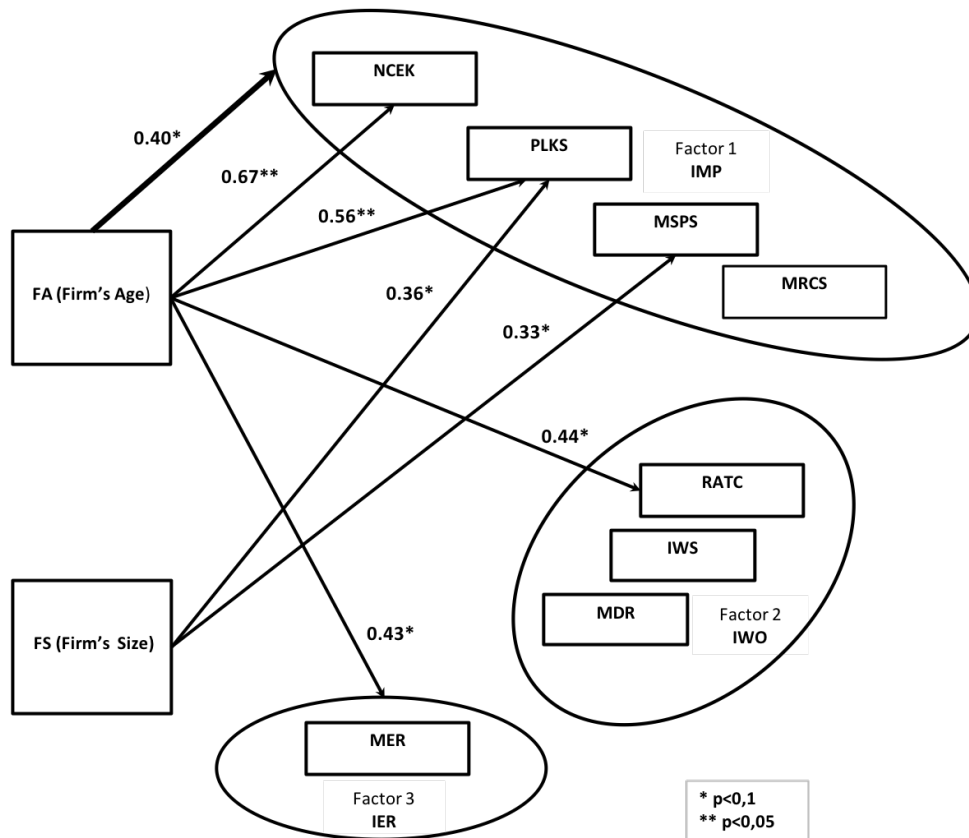


Fig. 2. Graphical model of the significant relations found.

Based on the results of the analysis, we can state that the proposed hypotheses:

H1a. Firm age has a positive effect on innovations in the management practices (IMP) in the firm - accepted.

H1b. Firm age has a positive effect on innovations in the workplace organization (IWO) in a firm – accepted.

H1c. The firm age has a positive effect on innovations in external relations (IER) in a firm – accepted.

H2a. Firm size has effect on the innovations in management practices (IMP) in a firm – rejected.

H2b. Firm size has effect on innovations in the workplace organisation (IWO) in a firm – rejected.

H2c. Firm size has an effect on innovations in external relations (IER) in a firm. - rejected.

Table 2. Results of the correlation and regression analysis.

		Structural path	Correlation coefficient	Regression coefficient	t-value	p-value
IMP (Factor 1)	FS (Firm's Size)	FA → IMP	0,209	0,402	1,925	0,058
		FA → NCEK	0,262	0,669	2,442	0,017
		FA → PLKS	0,246	0,559	2,286	0,025
		FA → MSPS	0,137	0,110	1,246	0,216 n.s.
		FA → MRCS	0,043	0,091	0,386	0,701 n.s.
	FA (Firm's age)	FS → IMP	0,124	0,213	1,127	0,263 n.s.
		FS → NCEK	0,086	0,196	0,777	0,439 n.s.
		FS → PLKS	0,179	0,362	1,639	0,095
		FS → MSPS	0,174	0,329	1,593	0,100
		FS → MRCS	-0,019	-0,036	-0,172	0,864 n.s
IWO (Factor 2)	FA (Firm's Age)	FA → IWO	0,182	0,319	1,664	0,100
		FA → RATC	0,198	0,436	1,817	0,073
		FA → IWS	0,141	0,295	1,278	0,205 n.s.
	FS (Firm's Size)	FA → MDR	0,107	0,226	0,964	0,338 n.s.
		FS → IWO	0,132	0,206	1,198	0,235 n.s.
		FS → RATC	0,138	0,270	1,250	0,215 n.s.
		FS → IWS	0,056	0,105	0,508	0,613 n.s.
	FS → MDR	0,129	0,243	1,169	0,246 n.s.	
IER (Factor 3)	FA (Firm's Age)	FA → MER	0,197	0,427	1,806	0,075
	FS (Firm's Size)	FS → MER	-0,031	-0,060	-0,281	0,780 n.s.

5 Discussion

The main contribution of the study is in investigating the relation between a firm's age and size and its ORI. It should be noticed that unlike the largest part of the literature on innovation, our study focuses on organizational innovation. For the purpose of our study, the ORI activity was considered at the level of the ORI subtypes.

Studies on how the probability of innovation depends on a firm's age and size play an important role in understanding ORI behavior (Huergo and Jaumandreu, 2004).

Some of the studies that have dealt with the problem of the impact of a firm's age on its ability to innovate (Van de Ven, 1986; Damanpour, 1987; Kelly and Amburgey, 1991; Huergo and Jaumandreu, 2004; Acemoglu et al., 2013; Cucculelli, 2014; Coad et al., 2016) have reported this relation as negative. On the other hand, Audretsch and Mahmood (1995) suggest that innovation provides heterogeneous mechanisms that ensure a firm's survival as they mature. The research has underlined the role of organizational change to implement new organizational forms and management practices to ensure a firm's survival and its further development (Freeman and Perez, 1988). For example, Sapprasert and Clausen (2012) reported a positive relation between a firm's age and its organisational innovation (ORI) supporting the proposition by Audretsch and Mahmood (1995). Our findings are coherent with these studies though they come from a different industrial and national context. We found that the intensity of the organisational innovation relates positively to the firm's age.

Firm size is usually considered an important factor in the innovation process (Vaona and Panta, 2008). Furthermore, contrarily to our findings, several studies have found a positive relation between ORI and firm size (e.g. Sapprasert and Clausen, 2012). However, it is technological innovation that the majority of studies in this field consider in the context of firm size (Blau and McKinley, 1979; Camison-Zornoza et al., 2004). Due to this, the evidence on the relationship between a firm's size and its ORI activity is not complete (Damanpour, 1992; Damanpour, 1996; Camison-Sullivan and Kang, 1999; Zornoza et al., 2004). Our findings show that a firm's size has no impact or has a very weak impact on the ORI subtypes. This supports those scholars who argue that firm size does not significantly influence the ORI (Mohr, 1969; Utterback, 1974; Kohn and Scott, 1982) and/or its subtypes (Downs and Mohr, 1976; Tansel and Gazioglu, 2014). Due to the ambiguity of the results for firm size and age these variables have sometimes applied as control variables in innovation research (Roxas et al., 2014).

Alternative explanation for a positive relationship between a firm's age and the ORI in contrast to a negative relationship between a firm's age and technological innovation can be derived from the finding by Bianchini et al. (2018). Surprisingly, they found a strong reverse effect of the quality of corporate governance on technological innovation. The former, like our results, refers to the organizational rather than the technological domain and corporate governance strengthens with the maturity of a firm. Hence these findings support the negative relationship between a firm's age and technological innovation. We could assume that our research outcome indicates organizational consolidation as a firm matures in the case that this consolidation involves ORI activity. Mature firms have often gained the capacity to develop more management systems, generate more knowledge, and are more active in developing external relations. Consequently, we may assume that that organisational innovation (ORI) can be described by three subtypes. These three ORI subtypes are known as ORI in management practices, ORI in workplace or-

ganization, and ORI in external relations. The three subtypes singled out are very much in line with the existing conventional understanding of the nature of ORI (e.g., Murphy, 2002; OECD-EUROSTAT, 2005; Uhlaner et al., 2007)

Our study also provides practical implications for innovation management. On the one hand, the importance of innovation for the progress of particular firms and specific industries, and, on the other hand, the inverse relationship between the age of the firm and the intensity of innovation that was revealed in some studies, can be considered as the starting point for developing practical recommendations aiming at stimulating innovation. Possibly the most radical proposal based on this assumption is the suggestion by Acemoglu et al. (2013) to tax the mature firms which are considered less innovation-intensive and then to relocate collected funds to more innovative recent entrants. In the light of our results, such a proposal might be counterproductive as our study indicates that the intensity of ORI increases along with organizational maturity. Moreover, it is a response to the challenge of offsetting the barriers to future growth that have been accumulated by aged firms. The existence of such barriers was postulated by Geroski (1995), who considered them to be stronger than those to market entry. Hence one can expect, a significant economic impact from ORI activity in mature enterprises because these entities, and not new entrants, account for the bulk of economic output and employment.

Some studies (e.g., Le Mens et al., 2014) argue that a firm's adaptive capacity decreases with age. Our findings in the context of the ORI subtype "innovation in external relations" suggest the opposite. The factor corresponding to the given subtype is represented by a single but a significant variable and is well associated with a firm age. Based on these findings, openness can be considered as an important strategy for survival of complex aged organizational systems with increased entropy. It provides another rationale for open innovation that has gained its share of attention in mature economies over the last 15 years. From this perspective, open innovation should be approached by older firms as a kind of external arrangement for survival as it should be facilitated primarily for the exploitation of external knowledge rather than more traditionally to acquire external knowledge (Torkkeli et al., 2009).

This study has some inherent limitations that are worth noting. Despite the relatively limited number of responses collected the results are indicative. On the other hand, to develop the results, comparative data from firms of specific industries should to be examined. The analysis of firm ORI performance covered a time period of three years. In order to strengthen the findings, the period of time for the analysis could be enlarged. The number of indicators for each of the scales should be increased. However, our study increases the understanding on the shared theory of ORI and firm performance.

One more limitation is that the results only provide knowledge about the direction of the innovation intensity change but not the shape of the function that underlies it. For example, this function might be U shaped. According re Audretsch and Mahmood (1995) the initial stage of a firm's development is by definition innovation-intensive. Juxtaposing the assumption that ORI is intensive in the initial stage with our results would produce a U-shaped function that is likely skewed to the one or another side.

This study provides several research avenues to understanding the mechanisms underlying the positive relationship between ORI and a firm's maturity, as well as its influence on a firm and industrial dynamics.

The first research avenue is to address the issue of complexity, which is generally missed in

the research into the relationship between innovation and a firm's age and size. This issue could be addressed by the incorporation into the research model of structural complexity, which Damanpour (1996) proposed as a candidate as a direct antecedent of organizational innovation. In this case, a firm's age, and probably also its size, have an impact on organizational innovation because structural complexity increases as the firm matures. If developing this approach, a set of dependent variables of structural complexity instead of age and size as proxies should be considered as independent variables of the ORI subtypes applied in our study.

The second research direction could be to clarify barriers to firm survival (Geroski, 1995) which organisational innovation is most probably intended to offset. The conclusions based on the results of our study could also be enriched with an account of idiosyncratic characteristics of an industry and a country. The inherent limitation of our study was set by the sample representing only Russian manufacturing firms. Following the evolutionary approach by Nelson and Winter (1982), conditions for survival depend on the technological and industrial context. Particularly, for a better understanding the role of the ORI and its subtypes in offsetting barriers to a firm's survival, we need to have a better understanding of organizational change occurring in day-to-day operations. In this respect, a firm's age in relation to the ORI could be considered just as a proxy for the dynamics of the routine regime.

An interesting extension of this research direction would be to simultaneously model the dynamics of organizational and technological innovation in consistency with the firm's life-cycle. We can assume that at different stages, the intensity of ORI activity would vary. The discrepancy between our findings related to the positive impact of a firm's age on its ORI activity and the negative character of this impact in the case of technological innovation (e.g. Kelly and Amburgey, 1991; Cucculelli, 2014; Coad et al., 2016) requires alternative explanations which should be tested. The first is that the intensity of ORI may be contrary to that of technological innovation, similar to the negative relation found by Bianchini et al. (2018) regarding corporate governance and technological innovation. To prove this means to challenge the existence of a close association or even symbiotic relationship between organizational and technological innovation. The alternative explanation that should be tested is that ORI simply fails to offset the negative influences on technological innovation accumulated as a firm ages.

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Appendix 1. Findings and the empirical characteristics of relevant prior studies.

Table 1. Companies and institutions interviewed

A Source	Research type	The main results pertained to the study	Research base
Acs and Audretsch, 1988	Empirical	Large firms compare to SMEs are more active in technological innivation	Analysis of 4476 innovations occurred in the U.S. manufacturing industries in 1982
Aiken et al., 1980	Empirical	The relation between the size of a firm and the rate of innovation adaption is positive	750 questionnaires administered to managers of various firms in Belgium
Antoncic and Antoncic, 2011	Empirical	The level of employee satisfaction in older firms is lower than in younger firms	149 firms in Slovenia
Anwar and Hasnu, 2017	Empirical	Firms’ external relations are moderating more by the specific industry then by the firm size	Empirical analysis of seven years financial data of 307 joint stock firms from 12 industries
Badillo et al., 2017	Empirical	Regarding research and development activities small firms cooperate less frequently than big ones	The data from the surveys done in 2010 and 2013 by the Technological Innovation Panel
Bhattacharya and Bloch, 2004	Empirical	Firm’s size, market structure, profitability and growth have strong impact on innovative activity in small to medium sized manufacturing businesses	The sample includes 1213 business units of Australian manufacturing firms
Blau and McKinley, 1979	Empirical	Firm’s size is among the most important determinants for innovation activity having the positive impact on it	The sample consists of 77 large firms of Manhattan

A Source	Research type	The main results pertained to the study	Research base
Bordonaba- Juste, 2012	Empirical	Medium-sized and large firms are more likely to use e-business in establishing new forms of customer relations	3272 e-business firms from 9 countries
Brouwer and Kleinknecht, 1999	Empirical	When compared to small firms, large ones are more active in formalizing TI, e.g. receiving patents for engineering solutions	The sample of 1728 manufacturing businesses in Europe
Camison-Zornoza et al., 2004	Meta-analysis	The firm's size is among the most important determinants for innovation activity having the positive impact on it	The sample was made up of 87 correlations drawn from 53 empirical studies published in the most important journals on business administration.
Campos-Climent and Sanchis-Palacio, 2015	Empirical	Results show the absence of a significant positive relationship between size and performance in agro-food firms.	Agro-food firms in Spain
Coad et al., 2016	Empirical	Compare to the younger firms, older ones more actively try to establish relations with partners related to research and development. Small firms have neither need no resources for placing orders with outsourced partners for research and development.	The data source is the Technological Innovation Panel between 2004 and 2012 of Spanish manufacturing and service firms
Damanpour, 1984	Empirical	Libraries adopt technical innovations at a faster rate than administrative innovations. The degree of organizational innovation is inversely related to organizational performance. Organizational and technical innovations have a higher correlation in high-performance organizations than in low-performance organizations. The adoption of administrative innovations tends to trigger the adoption of technical innovations more readily than the reverse.	The sample of 85 public libraries in the U.S.

A Source	Research type	The main results pertained to the study	Research base
Damanpour, 1996	Meta-analysis	In large and more complex firms size as such stimulates knowledge flow within the firm, thus accelerating innovation.	21 studies that include 36 correlations
Damanpour, 2006	Empirical	Each a firm organizational characteristics accounts for unique variance in the adoption of innovation. There is no difference in the direction of effects of any antecedent, but did find differences in the significance of effects of several antecedents, on the phases of innovation adoption	The sample of approximately 1200 public organizations in the U.S.
Damanpour, 2008	Empirical	The both innovation characteristics and manager characteristics influence the adoption of innovation; however, they do not reveal significant moderating effects of manager characteristics on the relationship between innovation characteristics and innovation adoption	The sample of 1276 managers/ chief administrative officers of municipalities with populations of 10000 or more in the U.S.
Damanpour, 2010	Meta-analysis	The firm's size has the impact on some of innovation types, but the influence is primarily due to the effect of size on process, not product, innovations	28 independent samples from the 20 primary studies
Davidsson and Delmar, 1997	Empirical	The development of a young firm involves the innovative development of the organization	8562 firms that in November 1996 were in the private sector of Sweden and had at least 20 employees
DeTienne and Koberg, 2002	Empirical	characteristics influence the adoption of innovation; however, they do not reveal significant	192 managers across the U.S.
Dufour and Son, 2015	Case study	In order to receive new knowledge, old firms are forced to elaborate continuously their network, which increases the probability of elaborating organizational innovation in the area of external relations	Case study

A Source	Research type	The main results pertained to the study	Research base
Fennel, 1984	Empirical	Large firms have more access to information regarding innovation that allows them to select appropriate ones to adapt from the broader selection	The sample of 173 firms of the State of Illinois, U.S.
Fort et al., 2013	Empirical	Small firms have lower capacity in establishing relations with the customers and consumers	The U.S. Census Bureau's dataset
Gopalakrishnan and Damanpour, 1997	Empirical	Age and size have differentiated impacts on specific subtypes of the organizational innovations. The complicated organizational structure of some large firms might decrease the dynamics of information flow	1075 reported innovations from commercial banking industry
Gopalakrishnan and Bierly, 2006	Empirical	Young firms that focus on developing their technological competences are active in enlarging their external connections to gain access to niche-based knowledge, though the old firms are active in all kinds of external relations. A firm's size and age influences the success of firm knowledge strategies	The population of 27 firms from the drug delivery sector of the pharmaceutical industry
Hafkesbrink and Schroll, 2014	Conceptual	Employee satisfaction is considered as a powerful mechanism for increasing the overall performance of a firm.	n/a
Hafkesbrink and Schroll, 2014	Conceptual	Studies of those firms might provide new insights on how a firm could go through the process of economic and technological changes within the firm over a long period	n/a
Hajjem, 2016	Empirical	The size of industrial firms has no any significant influence on management practices	47 Tunisian firms certified or undergoing certification according to ISO 9001: 2000

A Source	Research type	The main results pertained to the study	Research base
Huergo and Jaumandreu, 2004	Empirical	The probability of innovating widely varies according a firm's activity. Small size of a firm reduces the probability of innovation. Young firms demonstrate the highest probability of innovation while the aged firms tend to show lower innovative probabilities	The panel includes 582 firms in Spain surveyed during the years of 1991-1998
Ismail and Jenatabadi, 2014	Empirical	Younger firms often have no experience enough to process the weak signals that they receive from the business environment in order to adjust their external relations to forthcoming situation	30 airline companies that have being operated in the Asia Pacific region in 2006-2011.
Kalkan et al. 2011	Empirical	There is no relation between size and firm performance	125 firms which use information technologies in their operations in Isparta, Turkey
Kelly and Amburgey, 1991	Empirical	The level of bureaucracy in a firm increases over the years, new and strong formal procedures appear, as well as authority becoming centralized	136 air carriers in the U.S.
Kilenthong et al., 2016	Empirical	Smaller firms are slightly more active compare to large firms in establishing some activities related to customer relations. Age of a firm does not matter in a firm's activity with customers	752 business owner structured interviews
Kim, 1980	Empirical	The relation between the size of a firm and the rate of adoption of innovation is positive	The sample consists in 31 manufacturing organizations
Kimberly and Evanisko, 1981		A firm's size has a positive impact on both TI and NTI. Medium-size firms are less bureaucratic in taking decisions on implementing IWO, as the risks of having negative effect from changes are less costly	The sample of approximately 1000 U.S. hospitals

A Source	Research type	The main results pertained to the study	Research base
Kohn and Scott, 1982.	Conceptual	The complexity of large firms might create barriers to implementing innovation as well as extending the way from innovation identification to its adoption, thus reducing the positive effect of a firm's size upon innovativeness	n/a
Lun and Quaddus, 2011	Empirical	Customer relations in many aspects are more sophisticated and developed in large firms compare to small ones.	98 container transport operators in Hong Kong
Minguela-Rata et al., 2014	Empirical	The larger a firm is the more active it cooperates technologically with suppliers	1952 companies representing the Spanish manufacturing industries
Mohr, 1969	Empirical	There is no impact of firm size on innovation activity	94 agencies full-time local health departments in Illinois, Michigan, New York, Ohio, and Ontario (U.S.)
Montoro - Sanchez, 2011	Empirical	Organizational innovation related to management practices is the key factor in the creation and diffusion of new knowledge. In order to receive new knowledge, old firms are forced to elaborate continuously their network which increases the probability of elaborating organizational innovation in the area of external relations).	The sample is based on the CIS survey and includes 784 European companies
Ono and Stango, 2005	Empirical	Outsourcing models differ for large and super-large firms, which points to differences in network patterns. Large companies are much active in outsourcing in comparison to small ones.	The sample of approximately 10000 Credit Units operating in the U.S. in 1994–2003 according the National Credit Union Administration
Reger et al., 1992	Empirical	A firm's age and size has a strong effect on innovation activity.	The sample of 530 bank holding companies of the U.S.

A Source	Research type	The main results pertained to the study	Research base
Santarelli and Piergiovanni, 1996	Empirical	Firm size is another characteristic of a firm that numerous scholars approached in trying to prove Schumpeter's proposition that large firms are more active in TI as they have more resources available, including financial, human, organizational, and intellectual.	The database(PRODIN89) comprises all innovations reported in the complete 1989 volume of a sample composed by 25 Italian technical firms
Som at al., 2012	Empirical	Age and size of a firm have the strong impact on organizational innovation activity though the effect of the impact depends on the organizational innovation sub-type.	CIS Europe-wide study carried in the years of 2010-2012 with the sample of 127674 firms
Tansel and Gazioglu, 2014.	Empirical	Aged firms are forced to develop the Organizational innovation related to working place improvement. In large firms, the level of employee satisfaction is on a lower level compared to smaller ones, which is evidence of the underestimation of management-employee approaches and the neglect of employee-care policies in large firms	The study uses the data from the 1998 Workplace Employee Relations Survey (WERS), of the Department of Trade and Industry in Britain.
Temtime, 2003	Empirical	The large firms implement TQM practices more intensively compared to small firms, though the relation between firm size and TQM practice implementation is not very strong	54 SMEs in the Republic of Botswana

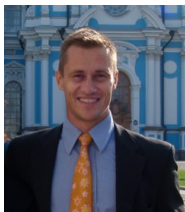
A Source	Research type	The main results pertained to the study	Research base
Tether, 1998	Empirical	argues that large firms introduce a considerable amount of high-value innovations while small firms are active in the introduction lower-value innovations. Firm size is another characteristic of a firm that numerous scholars approached in trying to prove Schumpeter's proposition that large firms are more active in TI as they have more resources available, including financial, human, organizational, and intellectual	The database of significant innovations introduced in the UK during the 1980s
Van de Ven, 1986,	Conceptual	The internal barriers that prevent innovation activity grow, as a firm ages	n/a
Vaona and Panta, 2008	Empirical	A firm's size has positive impact on innovation process	The sample is based on CIS 2 data at the industry level for 22 manufacturing sectors in 8 European countries.
Wagner and Hansen, 2005	Empirical	The firm size does not influence firms' ORI activity	35 U.S. firms based in different states
Walker, 2010	Empirical	Organizational innovation does not have a direct impact on organizational performance.	136 respondents from unitary and upper tier authorities in the UK
Zhou, 2018	Empirical	Small firms cannot easily establish international cooperation because usually they experience lack of the resources	535 manufacturing firms
Zmud, 1984	Empirical	The size has a positive impact on both TI and non-technological innovations	57 software development manager who were responsible for managing an internal software group

BiographyPage

Biographies



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