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## Innovation Capability Development in Regional Entrepreneurship: The Case of Economies in Transition

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**Abstract:**

**Purpose:** The first purpose of this study is to identify and explore IT professionals' innovation capability (IC) in terms of two dimensions: organizational and individual, in regional, micro-sized, and small organizations (RMSOs) in Poland, a transition economy. The second goal is to find demographic and organizational factors which may influence IC.

**Design/Methodology/Approach:** The authors unite an analysis comprised multiple-case studies based on mixed methods. The study employed qualitative and quantitative methods such as the method of competent judges, in-depth interviews and a structured survey as well as a combination of random and snowball sampling. On the basis of a survey among 60 IT professionals (supervisors and subordinates) the authors identified individual IC factors such as social competences, knowledge and skills, as well as organizational dimensions, such as the type of innovative change and ICT innovations. Factors influencing IC on an individual basis include position, education, age, and gender, while organizational determinants are related to organization size and location.

**Findings:** The proposed methodology let to find the benefits for management practices in transition economies, an underestimated problem within RMSOs.

**Practical Implications:** The current research expands the existing knowledge stream on ICT innovation capability in relation to individual socio-demographic factors and organizational factors, affecting its development in RMSOs in transition economies. This study adds potential to the implementation of the management practices in transition economies, an underestimated problem within RMSOs.

**Originality/Value:** The authors purpose, as the novelty, the new approach of ICT innovation capability at the organizational and individual levels of an enterprise tool. We developed our previous tool – the Questionnaire of Innovation Capability (QIC). The authors defined its two dimensions, as organizational innovation capability and individual innovation capability. The use of RMSOs in transition economies yielded rich data for further research.

**Keywords:** Innovation capability, human capital, knowledge economics, region, SMEs, transition economies, entrepreneurship, Poland.

**JEL codes:** J31, J44, M50, O47, O52.

**Paper type:** Research article.

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## **1. Introduction**

Organizations in transition economies are less likely to embrace emerging innovation and new competencies, which can impact the implementation of information and communications technologies (ICTs) (Bernroider, Sudzina, and Pucihar, 2011; Roztocki and Weistroffer, 2016). Brockmann and Roztocki (2017) stressed the importance of innovation capability (IC) and human capital as factors for improving organizational development.

In many transition economies, regional, micro and small organizations (RMSOs) are responsible for socioeconomic development. They are commercial base and ‘major engines’ to economic growth and socioeconomic development (Henderson and Weiler, 2010). Research on IC in RMSOs in transitional economies is limited. In the context of this study, a transition economy is defined as an economy that is in transition, or has recently transitioned, from a centrally planned economic system to a market-driven system (Roztocki and Weistroffer, 2016). In this article, the authors define the term ‘region’ as a distinct area, particularly as part of a country outside the capital or the main seat of the government, in accordance with the national laws of decentralization. A regional organization is defined as one with all its establishments located in the same region (INSEE, 2017; Oxford Dictionary, 2017). Regional small organizations are further classified into two categories by size: micro-organizations that employ less than 10 people, and small organizations, that employ at least ten but less than fifty people (European Commission, 2017; Huggins and Thompson, 2017).

From the perspective of human capital theory (Becker, 1993), humanistic management (Kostera, 2014), psychology of working (Duffy, Blustein, Diemer and Autin, 2016), and information and communications technology for human development, innovation can be understood as the possibility and/or capability for developing social competencies, knowledge, and new skills for businesses and governments to use (Qureshi, 2007). We define innovation capability (IC) as an organization’s ability to introduce innovative changes, new technologies, services or products, as well as to develop its employees social competencies, knowledge of ICT, and related skills on an individual level. RMSOs exist to produce goods and provide services mainly for local customers, and frequently they can only survive by promoting innovation and technological change. For poor SMEs open source software creates more opportunities to develop for free but requires more deep knowledge of computer science (Link, Kowal, and Qureshi, 2020).

To be competitive and survive in the long term, regional organizations must innovate often in order to satisfy their customers’ expectations (Chen and Tsou, 2007). RMSOs must also use information and communications technology and employ highly qualified employees such as IT professionals with ICT knowledge and skills (Kowal and Roztocki, 2015). ‘IT professionals’ are specialists, as IT managers, IT consultants, programmers, system analysts, telecommunication

specialists, network computer administrators, graphic designers, enterprise system, and so on. They can apply or create hardware and software and can actively take part in the development of the organization (Kowal, Mäkiö and Jasińska-Biliczak, 2016).

Being fast, flexible and innovative entails local organizations being able to fill gaps in the market and provide differentiated, innovative products and services specifically matched to the changing economy, while also responding to the needs of regional customers (Afuah, 2003). Weak socioeconomic development in transition economies such as Poland remains an unresolved problem (Roztocki and Weistroffer, 2016). Insufficient socioeconomic development is especially visible in underdeveloped regions where high unemployment is prevalent. In other words, these underdeveloped regions lack a robust commercial base. There are not many large corporations, and many of those that do exist exhibit weak technological development (Zadura-Lichota, 2015). They lack the competency, knowledge, and skills (Jasińska-Biliczak, Kowal, and Hafner, 2016) to be innovative, which means a weak IC. Therefore, it is important to determine the competency, knowledge, and skills needed for career development, as well as improve IC in RMSOs in Poland, a transition economy. This can help to resolve economic problems such as high unemployment.

Often, IC within transition economies, have lagged behind more developed economies (Kowal & Roztocki, 2015). Therefore, it is extremely important to understand the development of knowledge, skills, and special competencies considered innovative that would assist in the development of these types of economies. The development of IC, including competency, requires financial and social resources that can be differentiated in relation to sociodemographic and organizational factors (Kowal and Jasińska-Biliczak, 2016). There is not much research on innovations in RMSOs either in terms of organizations or individuals in transition economies (Roztocki and Weistroffer, 2016). There are a few reports from developed economies (Kourtit and Nijkamp, 2013) but one question still remains: are there some specific factors that foster innovations in RMSOs in transition economies?

It is possible that the level of innovation may depend on specific organizational and individual factors. For instance, there is a gender gap in innovative behaviour within the sector of RMSOs. Only a few studies focusing on gender suggest that the propensity to innovate is higher among companies with a female owner (Akulava 2015; Belghiti-Mahut, Lafont, and Yousfi, 2016). The lack of research in RMSOs in transition economies was the main motivation for our study.

The authors decided to explore the sector of RMSOs because Poland has 1.75 million businesses of this type, representing 95.6% of all organizations. More specifically, 93.7% are sole proprietors owning 1.64 million organizations. Micro and small organizations in Poland employ 3.4 million people, representing 37.9% of

the employee pool. These types of organizations generate 29.7% of gross added value, and 27.6% of production (PARP, 2017; Zadura-Lichota *et al.*, 2015). Improvements in IC relating to these organizations, especially in underdeveloped regions, could improve the aforementioned indicators and support socioeconomic development (Jasińska-Biliczak, 2016). Thus, the aim of this paper is to examine the effect of the individual and organizational factors on IC pertaining to RMSOs in Poland, a transition economy. Our findings seek to bridge the gap in research, relating associations between socio-demographic, individual factors (IF), organizational factors (OF) and IC of RMSOs in transition economies. The research questions guiding this study, in relation to the considerations mentioned above, are as follows:

**Question 1.** How to measure whether IT professionals in RMSOs in Poland manifest a high level of IC in general within its two dimensions:

- on an organizational level: perception of innovative changes and technological innovations, and
- on an individual level: social competencies, knowledge, and skills?

**Question 2.** What are the specific individual demographic factors, manifested by these IT professionals, such as the organizational position, education, age, and gender, that affect organizational IC?

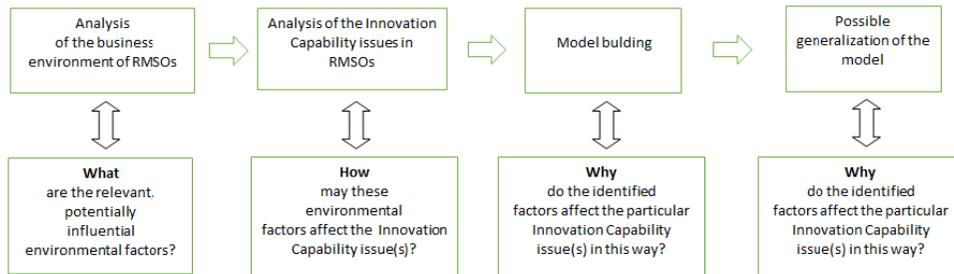
**Question 3.** Do specific organizational factors, such as the size or location, affect IC and how?

The environmental hypotheses were the theoretical foundation of our research methodology based on multiple-case studies, and mixed methods (Yin, 2003; Campbell and Ahrens, 1998, Jasińska-Biliczak, 2017). Therefore, our research begins with a careful analysis of environmental factors that may affect the innovation capability of IT professionals working at RMSOs in Poland, representing the Central and Eastern European economy. Secondly, we explored how these environmental factors such as individual socio-demographic and organizational characteristics of the regional business environment in Poland can affect innovation capability. Third, we tried to find explanations why environmental factors at the individual and organizational level could affect the innovation capability in the way we observed. In the last step, we considered the possible generalization of our conclusions and we discussed who could benefit from our study. The four-stage approach of the method is shown in Figure 1.

According to our theoretical foundation the rest of the article provides a brief overview of the literature, in relation to the research questions, followed by a description of the research methodology, including questionnaire adaptation and survey analysis. A discussion of our results follows along with a comparison of

these findings with current research. In a further section, we present the significant contributions, implications, and recommendations for managers, policy makers, RMSOs owners, etc. Finally, we conclude with a comment on the limitations encountered and ideas for future research.

**Figure 1.** *Research Methodology Based on Environmental Hypotheses for Innovation Capability Study (Adapted from Roztocki and Weistroffer, 2011).*



**Source:** *Developed by the authors.*

The subject of the study is to identify individual IC factors such as social competences, knowledge and skills, as well as organizational dimensions, such as the type of innovative change and ICT innovations. Factors influencing IC on an individual basis include position, education, age, and gender, while organizational determinants are related to organization size and location.

Presented selected tools let to find the benefits for management practices in transition economies, an underestimated problem within RMSOs. The current research expands the existing knowledge stream on ICT innovation capability in relation to individual socio-demographic factors and organizational factors, affecting its development in RMSOs in transition economies. This study adds potential to the implementation of the management practices in transition economies, an underestimated problem within RMSOs. The purpose of this article was to identify and explore IT professionals' innovation capability (IC) in terms of two dimensions: organizational and individual, in regional, micro-sized, and small organizations (RMSOs) in Poland, a transition economy. The second goal is to find demographic and organizational factors which may influence IC.

The research - the analysis of comprised multiple-case studies- methodology is based on the use of the methods: qualitative and quantitative methods such as the method of competent judges, in-depth interviews and a structured survey as well as a combination of random and snowball sampling.

On the basis of a survey among 60 IT professionals (supervisors and subordinates) the authors identified individual IC factors such as social competences, knowledge and skills, as well as organizational dimensions, such as the type of innovative change and ICT innovations. Factors influencing IC on an individual basis include

position, education, age, and gender, while organizational determinants are related to organization size and location.

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## **2. Literature Review**

In the current paragraph, we present an overview of various theoretical approaches regarding IC from the humanistic and psychosocial perspectives, which were the basis of our interests and assumptions, as well as the inspiration to formulate our research questions and hypotheses.

### **2.1 Innovation Capability of the Organization as Perceived by Individual Employees**

The concept of ‘capabilities’ is demonstrated by the functions of strategic management, including adapting, integrating, and reconfiguring organizational skills, increasing resources and functional competencies that are able to match the requirements of a changing environment (Rahmani and Mousavi, 2011). Capability is the measure of an entity (i.e. a department, organization, person, or system) to achieve its objectives in relation to its overall mission. Pettigrew and Whipp (1991) suggest that organizations need to develop their IC to produce strategic change management. Competitiveness and profitable result from an organization’s ability to meet the customers’ needs more effectively than their competitors (Wallace, 1995).

#### **2.1.1 Organizational Innovation Capability**

The revolutionary development of the telecommunications industry as well as information and communication technologies has fostered many changes for all organizations. Organizational innovation capability is the performance of an organization during innovation change, in order to achieve an overall improvement (Rahmani and Mousavi, 2011; Jasińska-Biliczak, 2014). Organizations can support product, process, and structure in order to innovate (Liao, Fei, and Chen, 2007). Thus, the concept of innovation comprises of: (1) the ability to develop products to meet the needs of the market, (2) the ability to use existing technology to develop products, (3) the ability to develop new products or update existing products to meet the needs of the markets, and (4) the ability to acquire new technology to create new opportunities (Alder and Shenhar, 1990). Rahmani and Mousavi (2011) understand the ‘innovation’ phenomenon as novelty, success, and change. Investments in ICT and organizational change complement each other, leading to improved organizational performance (Gera and Gu, 2004; Havlicek *et al.*, 2013).

Thus, innovation from the organizational and technical point of view can be understood as any and all processes of research and development aiming at applying solutions to current techniques and new technology within an organization (Griffin, 2004). Organizational innovation, from an economical and technical perspective, denotes the ability of an enterprise to create and implement innovation along with the actual ability to introduce new or modernized products, recent or developed technology, or updated organizational and technical processes (OECD/Eurostat 2005; Nelson and Rosenberg, 1993). We believe that RMSOs develop if they have the organizational innovation capability (Breckova and Havlicek, 2013).

The definition of Organizational Innovation Capability purposed by the authors emphasizes the importance of perception of organizational innovation and technical innovation changes, as well as how they are used, perceived, and assessed in the company. These changes can include: introducing new or modernized products, services, recent or developed technology, updated organizational and technical processes. Examples of technical innovation changes are: introducing new computers, phones, industrial TV or radio, local area network (LAN), Intranet, Extranet or ERP systems, etc.

### **2.1.2 Individual Innovation Capability**

Changes in ICT required practical knowledge (Probst *et al.*, 2002). The longevity of the organization is possible due to employees renewing and developing their current competences, including knowledge, skills, social, personal and managerial skills, while taking into account business changes in the environment (Teece, Pisano, and Shuan, 1997). This enables the use of innovation, understanding of knowledge acquisition and its practical application. The authors of this paper believe that the most important factor in real ICT innovativeness is Individual Innovation Capability, including social competencies, knowledge, and skills.

Competencies are the intrapersonal features and qualifications of employees that facilitate task completion and employee development. The three types of competencies-social, personal, and managerial-which involve psychosocial soft skills, as well as hard skills regarding professional knowledge, are required to perform organizational functions. Personal competencies are standards that facilitate task completion. These competencies affect quality measures, such as the speed, accuracy, and reliability of an employee's work. Social competencies affect the social domain of interaction as an element of task completion. Competencies in the social domain include relationship-building cooperation and collaboration. Managerial competencies include so-called 'soft management', work organization, strategic managerial aspects and affect the efficiency of the area managed (Kowal and Wegłowska-Rzepa, 2011; Listwan and Witkowski, 1983).

Skills are an ability and capacity acquired through deliberate, systematic, and sustained effort to smoothly and adaptively carry out complex activities and jobs

involving ideas (cognitive skills), things (technical skills), and/or people (interpersonal skills) (Online Business Dictionary, 2018).

Individual innovation capability is correlated with innovative capacity, transactional capability, and absorptive capacity. However, researchers have not been able to agree on a definition of IC. Some researchers regard 'transactional capability' as an important factor for organizational development. Transactional capability can be defined as the set of skills, knowledge and routines that the firm develops in order to transact in the market (buy and sell) at the lowest possible cost. It also enables the firm to be linked to the external environment, both to buy inputs, and to sell its finished products capability (Tello-Gamarra and Zawiślak, 2013).

Transactional capability involves skills, knowledge, and routines performed by its employees. Brockmann and Roztockki (2017) stressed the six elements that generate these knowledge outputs: innovation capability, leadership, human capital, information technology resources, financial resources, and innovation climate. According to the theory of human capital, there are certain labour tasks that produce economic value (Becker, 1985; 1993). Modern knowledge-based organizations in transition economies require the continuous development of information systems, along with their 'driving force'-IT professionals (Kowal and Roztockki, 2013; Jasińska-Biliczak *et al.*, 2016). With investments in education, the socio-economic development of employees may lead to an increase in productivity and innovation (Becker, 1985; 1993; Simkovic, 2013).

Absorptive capacity is the ability of a firm to recognize the value of new external information, assimilate it, and apply it to commercial ends (Cohen and Levinthal, 1990; Roztockki and Weistroffer, 2015; Jasińska-Biliczak, 2017). Absorptive capacity involves using external knowledge, and is influenced by IC (Rahmani and Mousavi, 2011; Zawiślak *et al.*, 2012). According to Cohen and Levinthal (1990), organizational IC is necessary for absorptive capacity.

Understanding of the mentioned definitions is central to the research questions and presented to support innovation capacity and capability in transitional economies. Thus, which competencies are most important in these countries and how should they be measured? Are there any individual and organizational factors influencing IC?

## **2.2 Individual and Organizational Characteristics in RMSOs**

### **2.2.1 Individual Level Demographic Factors**

The authors of this study suspect that certain individual characteristics of employees such as occupational status (position), education, age, and gender may have an impact on innovation capability in transition economies. Our assumptions are based on scientific reports from highly developed countries. However, to the best of our knowledge, no similar study on transition countries exists in the scientific literature.

*Position:* We investigated the positions of supervisor and subordinate. Supervisors are individuals in the first-line of management who monitor and assist employees in the performance of entrusted or delegated tasks. Supervisors take responsibility for planning, organizing, motivating, and monitoring the activities and tasks performed by the subordinates employed in their organizations. Subordinates are ranked below another employee in terms of seniority or office hierarchy (Online Business Dictionary, 2018; Griffin, 2004).

Strategies designed to enhance supervisor leadership facilitate the adoption of innovation and promote positive attitudes towards it, also in Poland, albeit beyond RMSOs (Aarons and Sommerfeld, 2012). We were interested in bridging the gap regarding how the position of supervisor or subordinate could affect the approach to IC in RMSOs in transition economies.

*Education:* Many studies have shown that the level of education is conducive to the development of innovation (Kowal and Roztocki, 2013). However, due to the specifics of RMSOs, the authors wanted to examine the type and level of education that is most beneficial to the regional organizations in question.

*Age:* We were also interested in how the age of IT professionals could influence ICs. Some researchers concluded that more senior employees learn and adapt to innovation with more difficulty (Jasińska-Biliczak, 2019). However, other studies showed that more senior people better understand the aim of innovation in a company (Kowal and Jasińska-Biliczak, 2016). It is interesting to explore how to use the potential wisdom of more senior employees for enhanced innovativeness.

*Gender:* Gender is the culturally and socially constructed difference between men/male and women/female, explored by terms such as ‘gender affairs’ and ‘gender politics’ (Online Business Dictionary, 2018). This concept varies according to the region of the world or epoch in question. In contrast, ‘sex’ relates to the biologically determined difference between men/male and women/ female (Holmes, 2007). Even in European Union programs, for example in Horizon 2020, gender is a divisive issue. However, there are gaps in different parts of EU programs such as HORIZON 2020 that are related to gender and innovation (HORIZON, 2020; Jasińska-Biliczak *et al.*, 2016; Kowal *et al.*, 2019).

### **2.2.2 Specific Organizational Factors**

The authors of this paper hypothesized that characteristics such as organizational size or location in RMSOs in transition economies may also affect IC. The performance of firms adapting novel software in more developed economies may be related to their geographical location within the country (Kourtit and Nijkamp, 2013). Reports from developed economies indicate that the rate of innovation in small firms is related to their size, organizational structure, ownership type, industrial branch, and location (Shefer and Frenkel, 2005). Large firms tend to invest more in innovation than smaller ones. As reported in developed economies,

innovation through research and development usually focuses on large urban areas and plays a more important role in central areas than on the periphery (Shefer and Frenkel, 2005).

Relationships between organizational characteristics such as the specific individual factors of position, education, age, gender, organizational size and location, and IC in RMSOs in transition economies are, as yet, to be understood. Comprehending the perceptions of IT professionals, an important employee group within emerging economies, may hold the key to strategies that facilitate innovation within a transition economy. A survey of IT professionals' perceptions of how these specific factors may impact innovation in knowledge-based RMSOs in transition economies like Poland is of interest.

### 3. Research Methodology

For current multiple-case studies, five components of a research design were especially important (Yin, 2003; Campbell and Ahrens, 1998). We formulated study's questions, based on the analysis of literature, regional data reviews, judgement sampling, focus groups interviews, discussions, deep reviews with IT professionals, as well as on the author's questionnaire. Thus, our units of analysis comprised qualitative and quantitative methods. The method of competent judges and mixed methods helped us to maintain the logic linking the data to the propositions the criteria for interpreting the findings (Baxter and Jack, 2008).

The authors of this paper explore the relationships between IC perceptions of supervisory level IT managers, IT professionals, and skilled IT professionals in regional and innovation contexts to determine whether individual demographic factors (i.e. professional position, education, age, and gender) and organizational factors (i.e. size or location) affect IC. In earlier studies, the authors found that IT professionals in RMSOs in Poland had sufficiently high levels of ICT capability, including perceptions of ICT innovation, social competencies, knowledge, and skills (Jasińska-Biliczak *et al.*, 2016; Kowal and Jasińska-Biliczak, 2016). Our research questions concern the relationship between individual and organizational factors and the IC of IT professionals.

To answer the research questions formulated in the Introduction and examine the possible relationships between IC and individual and organizational characteristics, the following hypotheses were formulated on the basis of the research questions:

**H1.** *IT professionals in RMSOs in Poland manifest IC in general within its two dimensions:*

- *on an organizational level: perception of innovative changes and technological innovations and*
- *on an individual level: social competencies, knowledge, and skills.*

**H2.** *Specific individual level demographic factors affect organizational IC.*

*H2.1. The organizational position held affects IC in the organization.*

*H2.2. The employee's educational level affects IC within the organization.*

*H2.3. The employee's age affects IC within the organization.*

*H2.4. The employee's gender affects IC within the organization.*

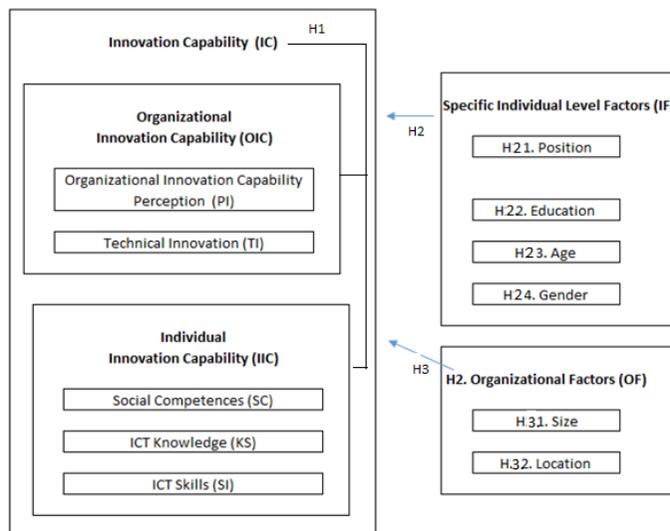
**H3.** *Specific organizational factors affect the IC of organizations:*

*H3.1. The size of the company affects its IC.*

*H3.2. The location of the company affects its IC.*

With reference to the hypotheses formulated above, a conceptual model of our research was developed and depicted in Figure 2.

**Figure 2:** *Research framework.*



*Source:* Developed by the authors.

### 3.1 Participants and Data Collection

The regional area selected for the research was the voivodship of Opole, Poland, at the request of the authorities of the region, to support the development of RMSOs in terms of innovation. This region is characterized by great economic and investment potential as well as a fast pace of ownership transformation. The characteristic feature of industries is their uniform distribution across the entire voivodship and its varied industrial structure.

The advantage of the region is its location on important lines of communication-roads, railways and the Odra river. In the Opole region, various cultures are intertwined: Polish, Silesian, German, and Czech. In addition, the population

structure is similar to the structure of the population of the whole country and is often used in pre-election polls-e.g. the town of Nysa.

To elaborate the research hypotheses, the authors conducted two separate studies in 2016 and 2017/ 2018 to check the QIC time stability as required by the procedure necessary for establishing the validation and reliability of the tool (Kaplan and Duchon, 1988; Kowal *et al.*, 2019).

Firstly, a qualitative study (focus groups interviews) and individual survey (quantitative study) were conducted with subject matter experts (consisting of 2 scientists, 30 supervisors and 30 subordinates) within an organization to develop the Questionnaire of Innovation Capability (Kowal and Jasińska-Biliczak, 2016). Secondly, the same groups of IT professionals took part in a main study - structured survey which quantitative results are presented in the current paper.

Two samples of 60 IT professionals (30 supervisors and 30 subordinates) were assembled via a combination of random and snowball sampling (Kowal *et al.*, 2019). Study participants were representatives of cases - companies characterized by levels of independent variables (Figure 2). The authors collected research data by drawing businesses randomly from the database of the Regional Statistical Office in the voivodship of Opole. The structure (Table 1) of the research samples of supervisors and subordinates would seem to be representative for IT professionals who work in RMSOs, in terms of the occurrence of all the desired ranges of variable values, and methodology of passive experiments (Kowal *et al.*, 2019; Paluchowski, 2012; Wu, 1978).

### 3.2 Statistical Methods

The authors applied statistical methods including descriptive analysis, statistical inference methods such as point estimation and verification of statistical hypotheses, as well as multivariate methods. There were used the multi-variable methods to analyze variance (ANOVA, AVE), correlations and multiple regression models. The authors employed the methods of confirmatory factor analysis (CFA) and structural equations modelling (SEM) to verify structural relations between variables and to confirm assumed directions of dependencies (Bagozzi and Yi, 2012).

The conceptual research model depicted in Figure 2 was developed on the basis of the SEM and can be seen in Figure 3. The aforementioned methods were applied due to the measurement scales of the variables or after the required data transformation. For instance the binary and ordinary data (i.e. educational level or location) was transformed into frequencies and ranks, with values ranging from '0' to '1' and then into the z-score. Only the salient results are presented. The significance levels in most analyses were equal to  $\alpha=0.05$ . Sometimes, we chose a larger  $\alpha$ , such as 0.10, to be more likely to detect a difference or an association that might exist (Noymer 2008; Kowal *et al.*, 2019).

### **3.3 Research Questionnaire**

Data was collected using the developed version of the Questionnaire of QIC (Jasińska-Biliczak *et al.*, 2016; Kowal and Jasińska-Biliczak, 2016) which made it possible to identify perceptions of innovative changes within the RMSOs and self-assessments of the IC of IT professionals.

The first part of the adapting process was conducted on the basis of qualitative methodology involving focus groups, in-depth interviews, and discussions (September 2016). The competent judges (expert panel of IT professionals and the authors of the current paper) analysed the first version of the QIC and formulated additional items, and dimensions prompts (Kowal *et al.*, 2019). The competent judges voted on these proposals for consensus and selected the items that best represented IC. The final version of the QIC was elaborated by the authors. The same group of IT professionals took part in a structured survey using the novel version of QIC in 2016. Next, professionals in December 2017/ January 2018, a subsequent individual survey was conducted on the basis of the developed questionnaire, involving the same two groups of 60 IT users to check the QIC timestability (Table 1)<sup>3</sup>. As can be seen from the Figure 2, the first part of the questionnaire covered metric data that were independent variables in the study and included:

1. Specific Individual Level Factors (IF), such as position (subordinate, supervisor), level of education, age and gender;
2. Organizational Factors (OF), such as firm size (micro, small) and location (village, small city, medium city).

The dependent variable of the research was the main dimension of the questionnaire: Innovation Capability (IC). It consisted of two scales:

1. The Organizational Innovation Capability (OIC), including Organizational Innovation Capability (PI) and Technical Innovation (TI), and
2. Individual Innovation Capability (IIC), which included
  - 2a. self-assessment of social competencies (SC: questions Q4-Q6),
  - 2b. ICT knowledge (KS: questions Q7-Q9) and
  - 2c. skills (SI: questions Q10-Q12).

These individual demographic factors and organizational factors enabled us to verify the proposed conceptual model more clearly.

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<sup>3</sup>*At the same time, in order to verify the discriminatory power, accuracy and reliability of the questionnaire, the authors conducted a random study on a group of more than three hundred IT users. Analysis of the results of this survey showed very good psychometric parameters comparable to those presented in the final table.*

The new version of the QIC contains examples of innovation related to organizational changes, as well as additional items which developed a list of social competencies. The total sum of points of the the QIC describes the level of innovation capability.

All items were binary coded. A '1' represented the existence of the phenomenon, while a '0' denoted its absence. The IT professionals in the ICT social competency dimension could receive a maximum of 21 points (three categories each for a total of 7 points per category). In the dimension of ICT knowledge, an employee could receive up to 21 points (a total equal to 7 points in each of the three categories). In the ICT skill dimension, an IT professional participant could receive a total of 42 points (a total of up to 14 points per three categories). The total value of all responses is 88 points.

### **3.3.1 Research Questionnaire Adaptation, Validation and Testing**

The QIC is a survey tool which assesses an individual's various abilities in an unbiased manner. According to our assumption, based on the theory of psychological tools (Kowal *et al.*, 2019; 1996; Rynkiewicz, 2009), the QIC relies on the mathematical score instead of a person's intuition (Molek-Winiarska, 2010). The QIC was adapted according to steps described by Harkness, Villar, and Edwards (2010), Peneva, Yordzhev and Ali (2013), as well as by Kowal *et al.* (2019). The authors verified the psychometric characteristics of the instruments applied to the samples of IT professionals. Thus, analyses were carried out to verify whether the implemented QIC met the criteria for psychometric validity and reliability (Kowal *et al.*, 2019).

To examine the discriminant validity of the construct, the authors applied the Average Variance Extracted method (AVE). This validity measure determines whether the amount of variance, explained by the construct in relation to the amount of variance due to the measurement error, is significant (Fornell and Larcker, 1981). The AVE results for all dimensions of the QIC were significant and greater than 0.5 (Table 6 in Result section). Thus, these results are satisfactory for the discriminant validity of the constructed tool.

The internal validity of QIC means its ability to measure what it is intended to measure (Cronbach and Meehl, 1955). The authors verified the validity by applying the methods of the confirmatory factor analysis (CFA) and structural equations modelling (SEM) (Bagozzi and Yi, 2012). The results were positive: the tracking error data indicated by the RMSEA statistics was less than 0.1 for all scales at each step of the analysis (Table 6).

The external validity of the questionnaire was assessed by competent judges (experts, raters), who rated to what extent each dimension and each item reflected the IC on a scale from 1 to 5. The authors computed the average rates, which, in the case of all the dimensions and items, were high and greater than 4. There has also

been calculated the Kendall's coefficient of concordance (W) to show assessment agreement among raters. The Kendall's W ranges from 0 (no agreement) to 1 (complete agreement) (Kowal *et al.*, 2019). The Kendall's coefficient of concordance was equal to  $W=0.8$ , meaning that there was a high level of agreement among the raters.

The reliability of the QIC was estimated by Cronbach's alpha, which indicated the strong capability of the tool to measure its internal consistency (Kowal and Roztocki, 2015; Kowal, Mäkiö, and Jasińska-Biliczak, 2016). The Cronbach's alpha coefficients for all scales ranged from 0.5 to 0.95. For the main construct of IC, the values were greater than 0.95. The average correlations between items ranged from 0.3 to 0.5. Thus, the analysis of the study indicated satisfactory results for further analysis. As a result of this study, the adaptation of QIC was elaborated as an appropriate and verified research instrument.

**Figure 3.** Some more important items from the QIC questionnaire.

Questions and answers – coded variables	Questions and answers – coded variables (cd 1)
<b>1. The company is an enterprise</b>	<b>4/5/6. What social competences related to ICT you: held three years ago (Q4) / currently holds (Q5) / would be developed in the near future (Q6)? (Any number of responses)</b>
Q1_micro	Q4/Q5/Q6_Communication
Q1_small	Q4/Q5/Q6_Cooperation
Q1_middle	Q4/Q5/Q6_Listening to others
<b>2. Do you undertake the innovative changes?</b>	Q4/Q5/Q6_The attitude towards others
Q2_Yes, in the past 3 years	Q4/Q5/Q6_Sharing knowledge
Q2_Yes, in the past 2 years	Q4/Q5/Q6_Solving the conflict
Q2_Yes, in the last year	Q4/Q5/Q6_negotiating
Q2_They are currently being planned	<b>7/8/9. What knowledge on ICT you: had three years ago (Q7) you currently holds (Q8) or would be developed in the near future (Q9) ? (Any number of responses)</b>
Q2_No, but there are plans to implement in the near term	Q7/Q8/Q9_Knowledge of computer software
Q2_No	Q7/Q8/Q9_Knowledge of the legal use of ICT
Q2_I do not know	Q7/Q8/Q9_Familiarity with the Intranet and / or Extranet
<b>3. Which ICT tools are used in your company?</b>	Q7/Q8/Q9_Familiarity with the ERP
Q3_computer	Q7/Q8/Q9_Knowledge of the topics of new technologies ICT, e.g. Data in the cloud
Q3_phone	Q7/Q8/Q9_Other - what?
Q3_TV	<b>10. What ICT-related skills you: had three years ago (Q10) / have now (Q11) / would like to develop in the near future (Q12)? (Any number of responses)</b>
Q3_radio	Q10/Q11/Q12_Computer skills
Q3_LAN (local area network, min. 2 computers)	Q10/Q11/Q12_MS Office
Q3_Intranet	Q10/Q11/Q12_Creating and posting on the Internet the results of their work
Q3_Extranet	Q10/Q11/Q12_Reading information about science, technology, business news, magazines online
Q3_ERP system	Q10/Q11/Q12_Develop interests through the use of thematic websites and discussion forums
Q3_Other – what ?	Q10/Q11/Q12_The use of a computer and the internet for creative activities, including blog writing, poems, graphics creation

*Source:* Developed by the authors

## 4. Results

The current section contains the results of statistical analyses regarding all hypotheses verification. We're discussing below the levels of IC and its dimensions

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in RMSOs, and especially the effects of individual-level factors and organizational-level factors on IC. The structural equation model is a global approach to the above-mentioned dependencies.

#### **4.1 Innovation Capability Factors**

The authors discovered the best predictors of IC in RMSOs (Table 1) on the basis of their analysis of multiple regression models. The best predictors of IC comprised of a perceived innovation for the past three years and a plan for the next innovations in the coming year (Table 1). The most important technical innovations were: industrial radio, ERP systems, LAN (local area network, with a minimum of two computers), industrial TV, and Intranet (Table 1).

Important factors in IC related to ICT knowledge were: individual online courses on reading information about science, technology, business news, and online magazines; current knowledge related to computer software; familiarity with the Intranet and/or Extranet; current knowledge related to the rules of behavior on the Internet. The most important social competence as a factor of IC was communication. The most important ICT skills were current negotiation skills. The IC was worse in companies where the IT professionals did not plan to undertake courses on a new ICT, for example, cloud computing coursework (Table 1).

The IT professionals also indicated other social competencies important for IC, such as listening to others, cooperation, and developing negotiation skills (Table 3). In regional organizations, 97% of supervisors and 83% of subordinates thought they had social competencies; 93% of supervisors and 80% of subordinates perceived their own social competencies, and 20% supervisors and 7% subordinates (H2.1) believed in their development in this sphere.

The IC innovation indexes were computed on the basis of the sums of questionnaire points, ranging from a mean rank of 0.34 for micro-organizations, to 0.40 for small organizations (Table 1); therefore, the results did not indicate a high level of IC, as the possible range was from 0 to 1 (H1).

As can be seen from Table 1, the highest results were observed in the perception of ICT technical innovation, followed by ICT social competencies, innovation skills, and knowledge scale. The employees observed new technical equipment and services, but very often they did not identify these items as an innovation. The hypothesis H3.1 was confirmed; however, positive results were present in 50% of the cases.

#### **4.2 Innovation Perceptions**

The age of the IT employee was a significant factor in the perception of innovation, as can be seen from Table 1. The analysis showed that employees aged 36-45

perceived innovation most often (H2). Those employees who completed college education with a Bachelor's, engineering, or Master's degree were more often employed in larger companies.

There were no significance differences between micro-organizations and small organizations in perceiving an innovation in the past three years. The IT professionals emphasized that innovation is planned in the future. The differences concerning IC in relation to independent variables are depicted in Table 1.

**Table 1.** Sample structure, mean ranks for IC and its sub-dimensions and U Mann Whitney Test results of differences significance between groups.

	Structure, variables	Answers in proportions																	
		Position			Education			Age			Gender			Size			Location		
		Sub.	Sup.	p<	Higher	Less	p<	≤35	>35	p<	Female	Male	p<	Small	Micro	p<	smaller	big	p<
<b>Structure</b>	Sample structure ( $N_{total}=39, N_{micro}=21, N_{sm}=30, N_{big}=30$ )	.5	.5	n.s.	.24	.76	.01	.22	.78	.01	.43	.57	.13	.43	.57	.13	.87	.13	.01
<b>Total Dimensions of IC</b>	<b>OIC - Organizational IC</b>	.31	.34	.16	.36	.27	.00	.38	.31	.00	.31	.33	.23	.34	.31	.13	.33	.33	.48
	TI - technical innovation	.48	.51	.24	.52	.46	.06	.54	.48	.08	.48	.51	.18	.51	.49	.24	.50	.47	.30
	PI - perceiving innovation	.14	.17	.25	.20	.09	.00	.22	.13	.01	.15	.15	.49	.17	.14	.18	.15	.19	.21
	<b>IIC - Individual IC</b>	.39	.46	.00	.44	.40	.06	.42	.43	.31	.41	.44	.17	.46	.40	.02	.42	.47	.07
	SC - ICT social competencies	.43	.51	.02	.48	.45	.29	.44	.48	.19	.45	.48	.27	.50	.44	.07	.46	.50	.20
	KS - ICT knowledge	.34	.39	.04	.38	.34	.08	.36	.36	.42	.36	.37	.39	.40	.33	.01	.35	.43	.02
	SI - ICT skills	.40	.49	.01	.47	.40	.03	.45	.45	.50	.42	.47	.11	.47	.43	.16	.44	.49	.16
	IC innovation capability	.35	.40	.01	.40	.33	.00	.40	.37	.07	.36	.39	.14	.40	.36	.02	.37	.40	.17
<b>Competencies</b>	Q5 Communication	.80	.93	.07	.86	.87	.48	.86	.88	.41	.88	.85	.36	.88	.85	.36	.87	.88	.47
	Q5 Cooperation	.70	.93	.01	.84	.78	.30	.79	.88	.19	.85	.79	.30	.85	.79	.30	.81	.88	.32
	Q5 Listening to Others	.63	.73	.21	.65	.74	.23	.67	.71	.41	.73	.65	.25	.73	.65	.25	.71	.50	.16
	Q5 Sharing Knowledge	.60	.60	.50	.62	.57	.34	.56	.71	.15	.46	.71	.03	.77	.47	.01	.60	.63	.44
	Q5 Conflict resolution	.43	.37	.30	.43	.35	.26	.42	.35	.32	.35	.44	.23	.46	.35	.20	.37	.63	.11
	Q5 Negotiating	.43	.43	.50	.41	.48	.30	.35	.65	.02	.38	.47	.26	.54	.35	.08	.48	.13	.01
<b>Knowledge</b>	Q8 Knowledge of computer software	.77	.83	.26	.84	.74	.19	.79	.82	.39	.73	.85	.13	.96	.68	.00	.79	.88	.27
	Q8 Knowledge of the rules of behavior on the Internet	.83	1	.01	.95	.87	.18	.93	.88	.30	.88	.94	.23	.96	.88	.12	.92	.88	.36
	Q8 Familiarity with the LAN	.37	.57	.06	.49	.43	.35	.53	.29	.04	.54	.41	.17	.50	.44	.33	.46	.50	.43
	Q8 Familiarity with the Intranet and / or Extranet	.43	.53	.22	.46	.52	.32	.51	.41	.25	.54	.44	.23	.58	.41	.11	.48	.50	.46
<b>Skills</b>	Q11 MS Office	.83	1	.01	.97	.83	.05	.91	.94	.32	.85	.97	.06	.96	.88	.12	.90	1	.01
	Q11 phone Service	.87	1	.02	1	.83	.02	.91	1	.02	.88	.97	.11	.96	.91	.21	.92	1	.02
	Q11 Real-time communication (Messenger, Skype)	.80	.93	.07	.97	.70	.01	.86	.88	.41	.81	.91	.13	.96	.79	.02	.85	1	.00
	Q11 Visiting social networking sites	.83	.93	.12	.92	.83	.16	.86	.94	.16	.77	.97	.02	.85	.91	.23	.88	.88	.47
	Q11 Using e-mail	.90	1	.04	1	.87	.04	.93	1	.04	.92	.97	.22	.96	.94	.36	.94	1	.04
	Q11 Reading information about science, technology, business news, magazines online	.73	.83	.18	.89	.61	.01	.77	.82	.32	.81	.76	.35	.81	.76	.35	.79	.75	.41

Sub. - subordinate, Sup. - supervisor; p - probability; Education: Higher - BBA, Engineer, MA or Ph.D degree; Less - other less; Location : big - town of 25,000-50,000 residents ; smaller - City of 50,000-100,000 residents or village

**Source:** Developed by the authors.

Some respondents concluded that innovations were not currently perceived but were to be implemented in the future. 15% of supervisors in micro-organizations and 4% of subordinates reported that their organizations had no plans to introduce

innovation in the future (H3.1). IT professionals associated innovation with modern ICT such as: industrial TV, industrial radio, LAN, and an ERP system. Respondents also perceived and understood innovation as new ICT skills such as supporting and managing the Intranet or Extranet, MS Office, phone service, real-time communication (messenger, Skype), and familiarity with the Intranet and/or Extranet (Table 1).

### **4.3 The Effects of Individual Level Factors on the Innovation Capability**

The effects of individual level factors were verified with the use of Kruskal-Wallis' nonparametric analysis of variance, Mann-Whitney-Wilcoxon (U) rank-sum test, Pearson correlation coefficients, regressions models, confirmatory factor analysis, and structural equations modelling (Table 1, Figure 2). SEM analyses also tested the directions of influence.

#### **4.3.1 The effect of position**

As can be seen from Table 1, supervisors demonstrated higher levels of IC. The supervisors had a better perception of innovation, and manifested higher levels of ICT social competencies, ICT knowledge, and ICT skills.

##### *The levels of ICT social competencies among subordinates and supervisors:*

Respondents indicated their need for further training in ICT social competencies (Table 1). Specifically, employees included these items ranked in the following order: communication, cooperation, listening to others, sharing knowledge, solving conflict, and negotiating. Subordinates suggested that they had less need for training in communication and cooperation than supervisors. The supervisors better assessed their social competencies such as communication, cooperation, solving conflicts, attitudes towards others, and sharing knowledge than the subordinates (Table 1). Thus, the position of supervisor or subordinate revealed differences in the self-assessment of social competencies. These results confirm hypotheses H2.1.

##### *The levels of ICT knowledge among subordinates and supervisors:*

Supervisors gave a more accurate self-evaluation of their past knowledge of computer software, familiarity with the Intranet, the Extranet, the ERP, as well as cloud computing (Table 1). They also provided a significantly better assessment regarding their current knowledge of the rules of behavior on the Internet, followed by computer software, familiarity with the Intranet and/or Extranet, the legal use of ICT, and cloud computing (H2.1). Both supervisors and subordinates had similar plans to develop their knowledge of cloud computing, familiarity with the LAN, Intranet and/or Extranet, computer software, the legal use of ICT, and the rules of behaviour on the Internet. Thus, hypothesis H2.1 seems to be supported.

##### *The levels of ICT skills among subordinates and supervisors:*

In general, both supervisors and subordinates were convinced that they had computer skills. In their everyday work, they used software and the Internet, as can

be seen in Table 1. The differences in favor of the supervisors concerned computer skills such as using e-mail, phone services, MS Office, visiting social networking sites, real-time communication (Messenger, Skype), posting the results of their work on the Internet, using a computer and the Internet for creative activities, including blog writing, poems, graphics creation, and support for ERP (H2.1). Supervisors and subordinates alike planned to develop their skills and undertake courses on ICT skills in the nearest future. Supervisors were interested in courses on real-time communication (Messenger, Skype) and social networking sites.

#### ***4.3.2 The effect of education***

Education levels impacted the IC and its sub-scales (H2.2). In general, the higher the educational level of an IT professional, the higher the levels of IC and its sub-scales (Tables 1-3). Educational levels correlated positively and most strongly with perceiving innovation, followed by skills, perceiving technical innovation, knowledge, and IC in total. The highest levels of IC were noted among the group of IT professionals with engineering degrees and other postgraduate studies (Tables 1-2, Figure 2). Thus, hypothesis H2.2 seems to be supported.

#### ***4.3.3 The effect of age and gender***

As can be seen from Table 1-2, younger IT professionals better evaluated their ability to resolve conflicts in the past, their negotiating ability, and cooperation. They more often planned to train and develop negotiating ability. Older IT professionals better evaluated their present ability to negotiate. Older IT professionals noticed more innovative changes and valued their current social competences higher-especially cooperation, listening to others, sharing knowledge, and negotiating skills.

They also stressed their knowledge of computer software, knowledge of the legal use of ICT, and familiarity with the ERP. Older IT professionals better evaluated their computer skills, familiarity with phone services, and Internet services.

The authors perceived differences related to gender and social competencies. Male IT professionals better evaluated their negotiating skills in the past while currently sharing knowledge. They more often plan to develop their attitudes towards others, especially listening to others. Female IT professionals better evaluated their communication ability in relation to listening to others in the past. They more often planned to develop their conflict resolution ability than male IT professionals. Male IT professionals manifested higher self-assessment in terms of knowledge and skills. Female IT professionals better evaluated their knowledge about the topics of new ICT, such as cloud computing than male IT professionals.

The analysis of the meand ranks (Table 1) Pearson's linear coefficients (Table 2) results showed a weak but positive significant association for more senior IT professionals having better results in the spheres of IC and social competencies (H2.4). Correlations and SEM analyses (Tables 1-2, Figures 2-3) related to gender

showed a weak but significant correlation, indicating that females manifested slightly fewer ICT skills (H2.3). The interaction of gender and age affects IC and its sub-scales (H2.3, H2.4). Thus, hypotheses H2.3 and H2.4 seem to be supported.

**Table 2.** Model fit in SEM - indicators for model and scales. Significant Pearson's correlation matrix coefficients (N=60) were included in with significance  $p < 0,05$ .

Constructs	AVE	$\alpha$	r	$\chi^2/df$	RMSEA	P <	GFI	AGFI
The measurement model	.70	.92	.7	.87	<.01	.48	.95	.97
Dependent variables related to global construct IC								
OIC	.5	.7	.8	1.6	<.1	.02	.9	.95
TI	.5	.7	.7	1.83	<.1	.013	.9	.8
PI	.5	.7	.6	1.3	<.06	.28	.98	.9
IIC	.50	.70	0,8	.09	<.1	.013	.6	.5
SC	.57	.7	.6	1.67	<.078	.001	.7	.64
KS	.5	.7	.6	1.73	<.1	.01	.7	.6
SI	.74	.86	.6	2.49	<.1	.001	.7	.6
Dependent variable IC related to other variables included in the model								
IC	.70	.9	.8	.9	<.01	.49	.9	.96
Independent variables related to global construct IC								
IF	.5	.7	.3	2,1	<.1	.1	.9	.9
OF	.5	.7	.3	1.5	<.06	.3	.98	.9
AVE - average variance extracted, $\alpha$ – Cronbach's $\alpha$ , r – Pearson's linear correlation coefficient, p – observed probability, indicators of model fit: $\chi^2$ - chi-square test statistics, df – degrees of freedom, $\chi^2/df$ - chi-square test statistics and degrees of freedom ratio, RMSEA - the Root Mean Square Error Of Approximation, GFI - Goodness of Fit Index, AGFI - Adjusted Goodness of Fit Index.								

**Source:** Developed by the authors.

## 5. Discussion

The salient finding of this study was the identification of individual innovation capability including ICT social competencies, knowledge, and skills in RMSOs in a transitional country such as Poland. This result is comparable to the findings of Tello-Gamarra and Zawisłak (2013), who stated that, ‘to be innovative, in addition to having a technological capability, an organization needs to develop its transactional capability.’

Our analyses of data indicated that the innovation capability and its sub-dimensions (sub-scales) may depend on individual socio-demographic factors. Thus, supervisors with a Bachelor's degree or higher, especially those aged from 36 to 45, are the leading force in innovation capability. Discussions with IT professionals during focus groups interviews as well as results of other research (Kowal and Węglowska-Rzepa, 2011) suggest that more senior IT professionals, especially women, are particularly valuable because they identify themselves with the company and are

experienced in the perception of innovation. They also show a higher level of social competence, which is important in order to support younger, adapting employees. Thus, more senior IT professionals demonstrated a greater IC and manifested the required social competencies. Furthermore, more senior professionals, especially women presented a significant identification with organizational values and competencies in comparison with younger IT professionals. Female professionals might be more able to innovate and create sustainable development within the economy (Akulava, 2015). These findings show that more senior IT professionals are an important innovative ‘force’, even more so than the younger generation, in contrast to observations and convictions on their lack of ability to learn new technologies (Kowal, Makio, and Jasińska-Biliczak, 2017). Female IT professionals noted a decreased perception of their ICT skills. This phenomena might be related to the fact that males and females vary in their verbal signal transmission and reception (Kuzio, 2016).

The IC also depends on the size and location of an organization. We have observed that the level of IC is lower in smaller regional companies and in smaller towns or villages. Micro-organizations in villages and in smaller towns had been established by poorer or less educated owners, who did not want or could not find jobs in larger cities and corporations. These owners in turn would hire younger or less educated and cheaper staff. IT professionals and users with higher education were more often employed in larger cities and reported increased perceptions of the need for ICT knowledge. In smaller locations, IT professionals perceived the need for innovation but were limited in social competencies and ICT skills. The way to develop these companies as well as to improve the level of working conditions is through the constant education of the staff and the support of the local authorities, by co-financing small and micro businesses in particular. Another possibility is to reach a broader market through, for example, social media or by searching for contractors and customers via the Internet.

On the basis of the data analyses, we can conclude that ICT social competencies, knowledge, and skills are necessary factors in IC and have a substantial effect on innovation development and economic growth in transition economies. These results expand and develop the research stream from transition economies (Kowal and Węglowska-Rzepa, 2011; Kowal and Roztock, 2015).

IT professionals in RMSOs seem to possess high levels of social competencies, knowledge, and skills which can support the innovation process in transition economies (Jasińska-Biliczak *et al.*, 2016). Skills in communicative competencies and in daily interactions, such as ethics and culture, may support organizational processes (Kuzio, 2015). However, in 50% of the RMSOs the innovation capability index appears to fall below the midpoint. Within larger companies, usually located in larger cities, the indexes were within normal levels compared with other

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economies. This again is supported by our previous studies and other researchers (Kowal and Węglowska-Rzepa, 2011; Jasińska-Biliczak *et al.*, 2016).

The important predictor of IC was the individual's perception of opportunities for technical innovation. IT professionals stressed the importance of developing knowledge of software, familiarity with the Intranet and/or Extranet rules and behavior. The IC was dependent on a variety of factors which supported the development of ICT skills. Examples of this support included skills development in applied activities such as support for LAN, developing personal interests in the use of thematic websites and discussion forums, and other creative activities such as blogging, writing poems and developing graphics.

The key abilities that allow IT professionals to innovate focused on social competencies. IT professionals' IC was directly related to the use of specific social competencies such as communication, cooperation, and teamwork, and listening to each other. The respondents emphasized that IC includes social competencies, such as solving conflicts, negotiating, maintaining appropriate attitudes towards others, sharing knowledge, and listening to each other. Although IC was the goal of RMSOs, employees were not rewarded for their attempts to innovate. Small companies, in comparison to micro-organizations, manifested a higher level of IC in terms of social competencies and knowledge.

The results obtained were discussed with representatives of local companies and authorities. The supervisors outlined their perceptions of barriers to innovation. In their opinion, the most important factors were complex legal regulations and interpretations creating additional bureaucracy in organizational operation, and administrative and legal employee costs. Competition in the market place as well as supply and demand issues were additional barriers to IC, especially in the smaller organizations.

Barriers to development may arise from deficits on organizational and individual levels, and their reduction can improve the economic development process. These barriers can be overcome by the competency development of employees, by educational business support through science, and by social media and/or volunteer work.

However, high levels of innovation capability were observed in less than 50% of companies. This correlates to the business failure rate in the various regions of Poland. The reasons for organizational failure of this magnitude points to incompetent and poorly trained staff and management. In order to improve the business success rate, funding for education with a focus on IC, knowledge, social competencies and skills and business ethics are recommended. These findings indicate potential directions for future professional personnel development.

The novelty of this study was the new approach of ICT innovation capability at the organizational and individual levels of an enterprise. In our adaptation of the QIC we defined its two dimensions, as organizational innovation capability and individual innovation capability.

Secondly, the current research expands the existing knowledge stream on ICT innovation capability in relation to individual socio-demographic factors and organizational factors, affecting its development in RMSOs in transition economies. The use of RMSOs in transition economies yielded rich data for further research.

Finally, this study adds potential to the implementation of the management practices in transition economies, an underestimated problem within RMSOs. Therefore, the results of our research seem promising.

## **6. Conclusions**

The authors defined and explored IT professionals' IC within its two dimensions-organizational and individual-in RMSOs in Opole region, in Poland. We also discovered which socio-demographic and organizational factors can influence IC. Specific demographic factors such as position, education, age and gender affect IC. However, IC depends on specific organizational factors such as location or organizational size. As expected, large firms tend to invest more in innovations than small ones as they have more resources.

Human capital and absorptive capacity may produce positive innovation outcomes. IC develops due to perceptions of ICT innovation, required social competencies, knowledge, and skills yielding human capital. IC in RMSOs can increase the competitive advantage crucial for organizational growth and long-term success.

Improving innovation by stimulating the IC of human capital in RMSOs is a task for a diverse group of IT professionals, including management, educators, local government, and politicians. With the support of IT professionals' competencies, the development of key skills is an investment in an emerging economy such as Poland's.

The limitations of this research include sample size, control variables, type of participants, as well as the structure and type of the organizations examined. The use of comparison studies with other economies may be of value in future projects. The authors also plan to examine additional variables such as salary and organizational structure. A survey of differing economies may provide unique characteristics and will offer a validation of the current research. Other transition economies such as Hungary, Slovakia, or the Czech Republic may provide rich data and comparisons. Despite these limitations, we hope that other researchers will use our results as an inspiration for their future studies.

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**References:**

- Aarons, G.A., Sommerfeld, D.H. 2012. Leadership, Innovation Climate, and Attitudes toward Evidence-Based Practice during a Statewide Implementation. *Journal of the American Academy of Child and Adolescent Psychiatry*, 51(4), 10.1016/j.jaac.2012.01.018. <http://doi.org/10.1016/j.jaac.2012.01.018>.
- Afuah, A. 2003. *Innovation management: strategies, implementation and profits*. New York, NY: Oxford University Press.
- Akulava, M. 2015. Does gender matter for the innovativeness of SMEs? FREE Policy Brief Series, available online at: [freepolicybriefs.org/2015/10/05/does-gender-matter-for-the-innovativeness-of-smes](http://freepolicybriefs.org/2015/10/05/does-gender-matter-for-the-innovativeness-of-smes).
- Bagozzi, R.P., Yi, Y. 2012. Specification, evaluation, and interpretation of structural equation models. *Journal of the Academy of Marketing Science*, 40(1), 8-34.
- Baxter, P., Jack, S. 2008. Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, 13(4), 544-559.
- Becker, G.S. 1993. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, Chicago, University of Chicago Press. ISBN 978-0-226-04120-9.
- Belghiti-Mahut, S., Lafont, A.L., Yousfi, O. 2016. Gender gap in innovation: a confused link? *Journal of Innovation Economics and Management*, (1), 159-177.
- Bernroider, E.W.N., Sudzina, F., Pucihar, A. 2011. Contrasting ERP absorption between transition and developed economies from central and Eastern Europe (CEE). *Information Systems Management*, 28(3), 240-257.
- Břečková, P. and Havlíček, K. 2013. Leaders Management and Personnel Controlling in SMEs. *European Research Studies Journal*, 16 (4), Special Issue on SMEs.
- Brockmann, C., Roztocki, N. 2017. The Six Pillars of Knowledge Economics, Proceedings of the 50th Hawaii International Conference on System Sciences (HICSS 2017), 4444-4453, <http://hdl.handle.net/10125/41701>.
- Campbell and Ahrens. 1998. Innovative community services for rape victims: An application of multiple case study methodology. *American Journal of Community Psychology*, 26, 537-571.
- Chen, J.S., Tsou, H.T. 2007. Information technology adoption for service innovation practices and competitive advantage: the case of financial firms, *Information Research*, 12(3). Retrieved from <http://www.informationr.net/ir/12-3/paper314.html>.
- Cohen, W.M., Levinthal, D.A. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128-152.
- Cronbach, L.J., Meehl, P.E. 1955. Construct validity in psychological tests. *Psychological Bulletin*, 52(4), 281-302. <http://dx.doi.org/10.1037/h0040957>.
- Duffy, R., Blustein, D., Diemer, M., Autin, K. 2016. The Psychology of Working Theory. *Journal of Counseling Psychology*, 63, 127-148. 10.1037/cou0000140.
- Fornell, C., Larcker, D.F. 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <http://dx.doi.org/10.2307/3151312>.
- Gera, S., Gu, W. 2004. The effect of organizational innovation and information and communications technology on firm performance. *International Productivity Monitor*, 9 (Fall), 37-51.
- Griffin, R. 2004. *Podstawy zarządzania organizacjami*. Wydawnictwo Naukowe PWN, Warszawa.

- Harkness, J.A., Villar, A., Edwards, B. 2010. Translation, adaptation, and design, in J.A. Harkness, M. Braun, B. Edwards, T.P. Johnson, L. Lyberg, P.P. Mohler, B.E. Pennell, T.W. Smith (Eds.). *Survey methods in multinational, multiregional, and multicultural contexts*. Hoboken, NJ, Wiley, 117-140.  
<http://dx.doi.org/10.1002/9780470609927.ch7>.
- Havlíček, K., Thalassinou, I.E. and Berezkinova, L. 2013. Innovation Management and Controlling in SMEs. *European Research Studies Journal*, 16(4), 57-70, Special Issue on SMEs.
- Henderson, J., Weiler, S. 2010. Entrepreneurs and job growth: probing the boundaries of time and space. *Economic Development Quarterly*, 24(1), 23-32. ISSN 0891–2424. DOI:10.1177/0891242409350917.
- Holmes, M. 2007. What is Gender? *Sociological Approaches*. London, Sage, 2-3.
- Horizon. 2020. The EU Framework Programme for Research and Innovation. Promoting Gender Equality in Research and Innovation. Retrieved from <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/promoting-gender-equality-research-and-innovation>.
- Huggins, R., Thompson, P. 2017. Networks and regional economic growth: A spatial analysis of knowledge ties. *Environment and Planning A*, 49(6), 1247-1265.
- Jasińska-Biliczak, A. 2014. Knowledge transfer within a region-the challenge for science, the economy and entrepreneurship. *Barometr Regionalny. Analizy i Prognozy*, 1(2), 119-124.
- Jasińska-Biliczak, A. 2016. Interactions of Knowledge and Economy as Practical Example of the Implementation of the Innovation. *Gospodarka, Rynek, Edukacja*, 17(3), 23-27.
- Jasińska-Biliczak, A. 2017. Endogeniczne uwarunkowania innowacyjności sektora małych i średnich przedsiębiorstw w regionie–ujęcie teoretyczne i praktyczne. *Studia KPZK*, 1, 167.
- Jasińska-Biliczak, A. 2019. The third sector—the new path towards the entrepreneurship of the future?—Polish insights. *AD ALTA-Journal of Interdisciplinary Research*, 9(2).
- Jasińska-Biliczak, A., Kowal, J., Hafner, J. 2016. Innovative Capacity in Small Regional Enterprises in Transition Economies: An Exploratory Study in Poland, Twenty-second Americas Conference on Information Systems (AMCIS 2016), San Diego.
- Kaplan, B., Duchon, D. 1988. Combining qualitative and quantitative methods in information systems research: a case study. *MIS Quarterly*, 571-586.
- Kostera, M. 2016. *Occupy management! Inspirations and ideas for self-organization and self-management*, Routledge, Taylor Si Francis Group, London and New York.
- Kowal, J., Jasińska-Biliczak, A. 2016. Socio-demographic factors of the innovative capacity of IT professionals in small regional enterprises in transition economies. *Proceedings of the 13th European, Mediterranean & Middle Eastern Conference on Information Systems (EMCIS)*. June 23th-24th, Cracow University of Economics, Krakow, Poland. Publisher: University of Piraeus, Greece.
- Kowal, J., Makio, J., Jasińska-Biliczak, A. 2017. Business competencies and innovation capability in cross-border small regional enterprises. 2017 IEEE 15th International Conference on Industrial Informatics (INDIN). doi:[10.1109/indin.2017.8104892](https://doi.org/10.1109/indin.2017.8104892).
- Kowal, J., Mäkiö, J., Jasińska-Biliczak, A. 2016. Business competencies as an innovation capability of IT users in Poland and Germany. *Experimental study, ICTM 2016*, 30.

- Kowal, J., Keplinger, A., Mäkiö, J. 2019. Organizational citizenship behavior of IT professionals: Lessons from Poland and Germany. *Information Technology for Development*, 25(2), 227-249.
- Kowal, J., Roztock, N. 2013. Information and communication technology management for global competitiveness and economic growth in emerging economies, *The Electronic Journal of Information Systems in Developing Countries*, 57, 1-12.
- Kowal, J., Roztock, N. 2015. Job satisfaction of IT professionals in Poland: does business competence matter? *Journal of Business Economics and Management*, 16(5), 995-1012.
- Kowal, J., Węglowska-Rzepa, K. 2011. Women's situation and management competences on the example of Poland: a review and research survey. *A XXI Century Woman: an interdisciplinary image*. Poznań, MAIUSCULA, 365-388.
- Kourtit, K., Nijkamp, P. 2013. In Search of Creative Champions in High-Tech Spaces: A Spatial Application of Strategic Performance Management. *Journal of Regional Science*, 53(5), 749-777.
- Kuzio, A. 2016. Shaping Gender Identity in Virtual Communication: a Case Study of Poles, *ICTM 2016 Proceedings of the International Conference on ICT Management for Global Competitiveness and Economic Growth in Emerging Economies: Economic, Cultural and Social Innovations for Human Capital in Transition Economies*, Wrocław, University of Wrocław, 85-103.
- Kuzio, A. 2015. The theoretical and Practical Problems of Acquiring Competence in Intercultural Communication in Polish, English and Russian, in Hawrysz, M., Uzdzińska, M., Wojciechowska, A. (eds.), *Język w życiu wspólnoty*, Zielona Góra: Oficyna Wydawnicza Uniwersytetu Zielonogórskiego, 91-100.
- Liao, S.H., Fei, W.C., Chen, C.C. 2007. Knowledge Sharing, Absorptive Capacity, and Innovation Capability: an Empirical Study of Taiwan's Knowledge-intensive Industries, *Journal of Information Science*, 33(3), 340-359.
- Link, G.J.P., Kowal, J., Qureshi, S. 2020. Open Source in Development: Enabling Business and Services. *Information Systems Management*, 37(1), 52-74.
- Listwan, T., Witkowski, S.A. 1983. Contest Method of Personnel Selection. Basic Substantial-methodical and Organizational Problems. Wrocław, TNOiK.
- Mincer, J., Polachek, S. 1974. Family investments in human capital: earnings of women, *Journal of Political Economy*, special issue: Marriage, Family Human Capital, and Fertility (part 2), 82(2), 76-108.
- Molek-Winiarska, D. 2010. Psychological tests. In Polish: Testy psychologiczne. In T. Listwan (Ed.), *Zarządzanie kadrami*. CH Beck.
- Munro, M.C., Huff, S.L., Marcolin, B.L., Compeau, D. 1997. Understanding and measuring user competence. *Information, and Management*, 33(1), 45-57.
- Insee National Institute of Statistics and Economic Studies. 2017. Measuring, understanding, <https://www.insee.fr>.
- Nelson, R.R., Rosenberg, N. 1993. Technical Innovations and National Systems, in R.R. Nelson (ed.), *National Innovation Systems: A Comparative Analysis*. New York, Oxford University Press.
- Noymer, A. 2008. Alpha, significance level of test. In Lavrakas, P.J. (ed.), *Encyclopedia of Survey Research Methods*. Thousand Oaks, CA, SAGE Publications Ltd.
- OECD. 2005. *Manual: Guidelines for Collecting and Interpreting Innovation Data*. Eurostat, 49, Oslo.
- Oxford Dictionary. 2017. OED Online. June 2017. Oxford University Press. <http://www.oed.com/viewdictionaryentry/Entry/11125>.

- Paluchowski, W.J., 2012. Mixed Methods Research Design: The Causes and Effects of Some Methodological Revolution. *Przegląd Psychologiczny*, 55(2), 113–28.
- PARP. 2017. Condition of the SME sector in Poland In Polish: Stan sektora MSP w Polsce. Retrieved from the website: <https://badania.parp.gov>. *Badania i ewaluacje PARP*.
- Peneva, I., Yordzhev, K., Ali, A.S. 2013. The Adaptation of Translation Psychological Test as a Necessary Condition for Ensuring the Reliability of Scientific Research. *International Journal of Engineering Science and Innovative Technology (IJESIT)*, 2(4), 557-560.
- Probst, G., Raub S., Romhardt, K. 2002. Knowledge Management in Organization (*Zarządzanie wiedzą w organizacji*). *Oficyna Ekonomiczna*, Kraków, 14-15.
- Qureshi, S. 2007. Information Technology Innovations for Development. *Information Technology for Development*, 13(4), 311-313.
- Rahmani, Z., Ali Mousavi, S. 2011. Enhancing the Innovation Capability in the Organization: A Conceptual Framework, 2nd International Conference on Education and Management Technology, IPEDR, 13, 285-291, IACSIT Press, Singapore.
- Rogers, E.M. 1962. *Diffusion of Innovations*. New York, Free Press.
- Roztocki, N., Weistroffer, H.R. 2011. Information Technology Success Factors and Models in Developing and Emerging Economies. *Information Technology for Development*, 17, 3, 163-167.
- Roztocki, N., Weistroffer, H.R. 2016. Conceptualizing and Researching the Adoption of ICT and the Impact on Socioeconomic Development. *Information Technology for Development*, 22(4), 541-549.
- Rynkiewicz, A. 2009. Classical theory of test reliability/ In Polish: Klasyczna teoria rzetelności testów. In K. Fronczyk (Ed.), *Psychometria - podstawowe zagadnienia*. Vizja Press & IT.
- Shefer, D., Frenkel, A. 2005. R&D, firm size and innovation: an empirical analysis, *Technovation*, 25(1), 25-32.
- Simkovic, M. 2013. Risk-Based Student Loans. *Washington and Lee Law Review*, 70(1), 527.
- Soja, P., Cunha, P.R. 2015. ICT in Transition Economies: Narrowing the Research Gap to Developed Countries. *Information Technology for Development*, 21(3), 323-329.
- Teece, D.J., Pisano, G., Shuan, A. 1997. Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, 18(7), 509-533.
- Tello-Gamarra, J., Zawisłak, P.A. 2013. Transactional Capability: Innovation's Missing Link, *Journal of Economics. Finance and Administrative Science*, 18(34), 2-8.
- Yin, R.K. 2003. *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA, Sage.
- Wallace, G.W. 1995. Balancing Conflicting Stakeholder Requirements. *Journal for Quality and Participation*, 18(2), 84-89.
- Wu, C.F. 1978. Some Algorithmic Aspects of the Theory of Optimal Designs. *Ann. Statist.* 6, 1286-1301.
- Zadura-Lichota, P. (ed.). 2015. *Innowacyjna przedsiębiorczość w Polsce. Odkryty i ukryty potencjał polskiej innowacyjności*. Warszawa, PARP.
- Zawisłak, P., Alves, A., Tello-Gamarra, J., Barbieux, D., Reichert, F. 2012. Innovation Capability: From Technology Development to Transaction Capability. *Journal of Technology Management, and Innovation*, 7(2), 14-27.