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## **Measuring the ICT Influence on Innovativity Level**

Milena Boskoska Klisaroski<sup>a\*</sup>, Marija Midovska Petkoska<sup>b</sup>, Dejan Nikolovski<sup>c</sup>,  
Marija Boneva<sup>d</sup>, Spire Lazaroski<sup>e</sup>

<sup>a,c,d</sup>*Ministry of finance, Dame Gruev 12, 1000 Skopje, Republic of North Macedonia*

<sup>b,e</sup>*Faculty of economics Prilep, Marksova 133, 7500 Prilep, Republic of North Macedonia*

<sup>a</sup>*Email: milenaboskoska@yahoo.com, <sup>b</sup>Email: marija.midovska@gmail.com*

<sup>c</sup>*Email: dejannikolovski1991@yahoo.com, <sup>d</sup>Email: boneva.marija@yahoo.com*

<sup>e</sup>*Email: spire.lazaroski@gmail.com*

### **Abstract**

Economic theory and empirical studies have shown that innovation is the key driver of economic growth and development. Innovations may increase productivity and quality of services and products, making the companies more competitive. Today innovations are a basic business strategy for most businesses and various researchers and academics. Innovation is being paid more and more attention and the key understanding of the development of society and companies lies precisely in innovation through the application of ICT technology. This paper highlights the significance of ICT and innovation, they are of great importance for the prosperity and economical development in the Republic of North Macedonia. The survey was conducted in the period when the Republic of North Macedonia is increasingly encouraging and supporting the innovation activity in the companies for achieving accelerated technological development, based on knowledge transfer, ICT, innovations and R&D (research and development). Results from the empirical research implied to accepting certain hypothesis, which led to accepting the main hypothesis that ICT play important role in promoting innovations and innovation activities in the Republic of North Macedonia. The obtained results of this research can be a guide when creating the innovative strategy in the Republic of Macedonia.

**Keywords:** ICT; Innovation; innovative strategy; R&D.

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\* Corresponding author.

## **1. Introduction**

During the first decade of the new millennium, great effort has been made to help countries in the application of ICT in their approach to social and economic development. But in the second decade of the new millennium, things have changed dramatically. Technological advances, infrastructure development and price cuts have led to the unexpected growth of ICTs, where through its application have enabled the connection of billions of people around the world. Today, the goal of companies is not just the acquisition and deployment of technology, but the ability to use technology in an innovative way [1]. "Companies must be able to innovate globally. They must create and commercialize a stream of new products and processes that move the edge of technology, to develop so quickly that their competitors cannot reach them [2]." The main goal of the research is to accept and apply the benefits of innovation, as well as incentives and constraints that affect this process at the firm and society level. A number of factors influencing this process have an impact on the rate, type and direction of future innovations, and in particular explores the role that the development and application of ICTs play in that direction [3]. The survey was conducted in order to identify the link between ICT and innovation in the direction of enhancing innovation in the Republic of North Macedonia. This contributes to greater innovation, and hence the competitiveness of enterprises. This explains the need for proactive strategies, creating the necessary ambience and connection of ICT with innovation and information society in the Republic of North Macedonia and the main hypothesis of the research is: "ICTs play an important role in promoting innovation and innovation activities."

### **1.1. Literature review**

Many studies have shown that they have noticed the value of the relationship between innovation and ICT. In one survey in Australia is found that different ICT technologies are related to different types of innovations. For example, connecting to the Internet via a cable modem is related to product innovation, while the wireless Internet connection is more important for organizational / managerial operations and is related to organizational innovation [4]. Eurostat project shows that, ICT (on average) usage has a positive relationship with efficiency of the company. However, differences in individual country results and between ICT use types suggest that the impact of ICT use has had a varying impact according to activities of the company [5]. OECD findings support the hypothesis that ICTs act as an enabler of innovation, particularly for product and marketing innovation, in both manufacturing and services [6]. ICT's are major factor in carrying out business activities and a major catalyst for fundamental change in organizations today. Information technologies are closely related to communication technologies in terms of their development, application and utilization. ICT's are considered as major promoters of development in modern societies and economies, and their use is an important component of all development strategies in modern societies based on the digital economy and the broadband technology and e-business models.

## **2. Research aim, problem and sample**

The research aim is to discover what is the role of ICT in promoting innovations in the Republic of North Macedonia. The main research problem is ICT and its position in promoting innovation with particular accent

on the application of innovations and the need to adopt proactive strategies, creating the necessary ambience and connectivity with ICT and information society in the Republic of North Macedonia. The research subject is focused on the question of interconnection between innovation and ICT in the Republic of North Macedonia, and what the role of ICT in promoting innovations in the country is [7]. Data were collected by means of a self-administered questionnaire, prepared in Google Docs. Questionnaire contained questions in closed ended format and a 5-point Likert scale and the model of questions was based on the theory and methodology presented in the Oslo Manual. The questionnaire contained an introduction and five sections with logically connected questions. The introduction part was designed to gather basic information for the companies, including number of employees, sections, ownership and profit. The other five sections used questions for innovation activities of the company, innovation drivers and barriers, cooperation with others, measures to support innovation and ICT innovation in the company. In order to complete the objectives of the study, the questionnaire was sent randomly to 400 companies in the Republic of Macedonia, and response was received from 103 companies. The survey ran from January 1st to December 31st 2014. Most of the companies according to the number of employees belong to the category of micro and small enterprises, belong to the section processing and manufacturing industry and have private domestic property. The data analysis was accomplished using SPSS v20 statistical software. Three types of analyses were primarily conducted: the first one included descriptive data analysis; the second one was Pearson Chi-Square test for independence, whilst the third one was Correlation-Pearson Correlation Coefficients. Due to the scope of the research, in this paper we will show only the second and the third part of analyses.

### 3. Empirical research

The main research hypothesis: „*ICT play an important role in the promotion of innovation and innovation activities*“. Also, have been defined individual hypothesis and using the methodological instruments is measured.

- **Dependent variable:** ICT; Innovation
- **Independent variables:**
  - Types of innovation;
  - Number of accepted patent;
  - Profit increase;
  - Employees in the company only for R&D;
  - Investing in innovative activities in the company;
  - Technological and non-technological innovation;
  - Innovation drivers in the company;
  - Innovation barriers in the company;
  - Company export;
  - Company competition;
  - Company cooperation with other subjects;
  - Participation of the company in tenders for public procurement;

- Use of standards;
- Difficulties finding domestic services for certificates of standards;
- Government innovation policies;
- Company web page and profile on social networks;
- Funds invested for ICT in the company;
- Use of ICT tools in the company;
- Use of ICT tools in different departments in the company and
- Use of innovative software solutions in the company.

Pearson  $\chi^2$  (Chi-Square) test for independence has been carried out to analyze the hypothesis. Companies how participating in the survey are 103 ( $n = 103$ ), and given a margin of error of 5 %, ie  $\alpha = 0,05$ . The main research hypothesis will be tested by both, the ICT and the innovation. Because of the data volume the results are presented in the table. When the dependent variable is company innovation the results are presented in Table 1.

**Table 1:** Individually testing hypothesis

Individual hypothesis	Variables	Value	df	Asymp. Sig. (2-sided)	Individually testing hypothesis
Q <sub>1</sub> : Activities in the company have an impact on the company's innovation	q <sub>1</sub>	113,783	15	0,000	is accepted
	q <sub>2</sub>	46,572	6	0,000	is accepted
	q <sub>3</sub>	70,438	18	0,000	is accepted
	q <sub>4</sub>	70,438	3	0,001	is accepted
	q <sub>5</sub>	6,972	15	0,958	is rejected
	q <sub>6</sub>	109,982	33	0,000	is accepted
W <sub>1</sub> : Innovation drivers and barriers have an impact on the company's innovation	w <sub>1</sub>	28,778	15	0,017	is accepted
	w <sub>2</sub>	28,778	15	0,017	is accepted
P <sub>1</sub> : Company cooperation with other business entities and among the companies themselves have an impact on the company's innovation	p <sub>1</sub>	40,908	12	0,000	is accepted
	p <sub>2</sub>	290,513	9	0,000	is accepted
	p <sub>3</sub>	52,894	30	0,006	is accepted
	p <sub>4</sub>	4,237	3	0,237	is rejected
S <sub>1</sub> : Measures to support innovation in the company have an impact on the company's innovation	s <sub>1</sub>	20,154	3	0,000	is accepted
	s <sub>2</sub>	9,831	3	0,020	is accepted
	s <sub>3</sub>	6,742	15	0,964	is rejected
D <sub>1</sub> : ICT innovations in the company have an impact on the company's innovation	d <sub>1</sub>	209,272	9	0,000	is accepted
	d <sub>2</sub>	51,863	15	0,000	is accepted
	d <sub>3</sub>	14,015	3	0,003	is accepted
	d <sub>4</sub>	36,187	18	0,007	is accepted
	d <sub>5</sub>	35,971	30	0,209	is rejected

When the dependent variable is ICT use in the company the results are presented in Table 2.

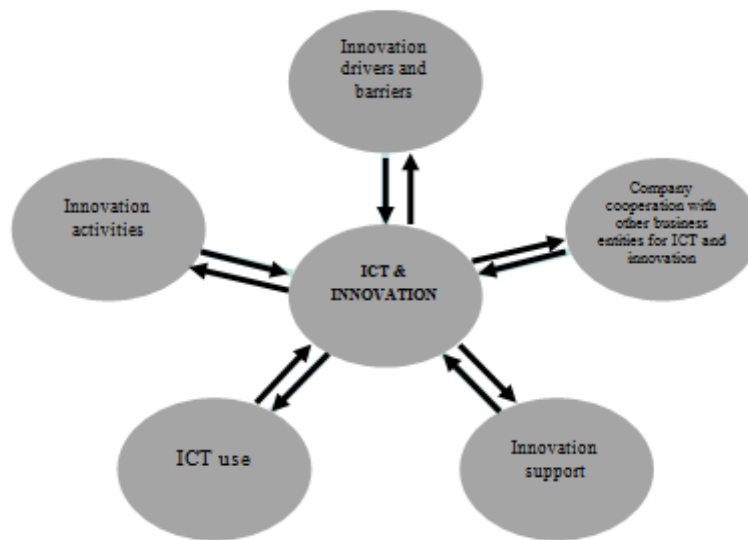
**Table 2:** Individually testing hypothesis

Individual hypothesis	Variables	Value	df	Asymp. Sig. (2-sided)	Individually testing hypothesis
Q <sub>1.1</sub> : Activities in the company have an impact on the ICT use in the company	q <sub>1.1</sub>	15,508	6	0,017	is accepted
	q <sub>2.2</sub>	17,960	4	0,001	is accepted
	q <sub>3.3</sub>	15,546	6	0,016	is accepted
	q <sub>4.4</sub>	52,359	1	0,000	is accepted
	q <sub>5.5</sub>	10,780	6	0,095	is rejected
	q <sub>6.6</sub>	60,657	12	0,000	is accepted
W <sub>1.1</sub> : Innovation drivers and barriers have an impact on the ICT use in the company	w <sub>1.1</sub>	1,920	5	0,860	is rejected
	w <sub>2.2</sub>	1,920	5	0,860	is rejected
P <sub>1.1</sub> : Company cooperation with other business entities and among the companies themselves have an impact on the ICT use in the company	p <sub>1.1</sub>	31,919	5	0,000	is accepted
	p <sub>2.2</sub>	16,749	3	0,001	is accepted
	p <sub>3.3</sub>	41,125	11	0,000	is accepted
	p <sub>4.4</sub>	0,684	1	0,408	is rejected
S <sub>1.1</sub> : Measures to support innovation in the company have an impact on the ICT use in the company	s <sub>1.1</sub>	68,073	1	0,000	is accepted
	s <sub>2.2</sub>	7,913	1	0,005	is accepted
	s <sub>3.3</sub>	6,863	5	0,231	is rejected
D <sub>1.1</sub> : ICT innovations in the company have an impact on the ICT use in the company	d <sub>1.1</sub>	11,276	3	0,010	is accepted
	d <sub>2.2</sub>	9,420	6	0,151	is rejected
	d <sub>3.3</sub>	14,015	3	0,003	is accepted
	d <sub>4.4</sub>	10,350	6	0,111	is rejected
	d <sub>5.5</sub>	20,127	10	0,028	is accepted

From the research analysis of the all individual responses and from the testing of the individual hypotheses, we can see that, in general, all individual hypotheses are accepted. Only W<sub>1.1</sub> individual hypothesis is rejected, that means that innovation drivers and barriers don't have an impact on the ICT use in the company. But that don't means that innovation drivers and barriers are isolated from the ICT and its application, but one should bear in mind that there are many other factors that have a major impact on innovation drivers and barriers (for example, lack of financial assistance for ICT advancement, initiative of company managers for ICT promotion, etc.). Acceptance of individual hypothesis lead to acceptance of Main research hypothesis: ***“ICT play an important role in the promotion of innovation and innovation activities “*** – is accepted.

#### 4. Model of ICT and innovation approach

Model of ICT and innovation approach is proposed in order to determine the most important factors of ICT and innovation (based on questions from the questionnaire and from the conducted analysis of the hypothetical framework), illustrated in Figure 1. The model will contribute to greater implementation of innovation and ICT in the North Macedonian companies.



**Figure 1:** Model of ICT and innovation approach

Five indexes were created for the five elements of the model and the five elements of this model are composed in a 21 subindexes obtained through responses to the questions that measure the variables. For that purpose is applied Pearson Correlation Coefficients (Pearson Correlation Coefficients), to discover which variables have the greatest influence in the index. The correlation is made for each variable (subindex) with the index and the subindex with the greatest value is selected. This means that the variable with the highest value has the highest relation to the index, i.e. it is the most important factor of the index.

##### **A. Innovation activities index**

This index consists seven variables. In Table 4 it can be seen that there is a different correlation between the index and the variables. The small correlation has variable  $q_3(-0.046)$ , the medium correlation have variables  $q_0(0.416)$ ,  $q_1(0.439)$ ,  $q_2(0.342)$  and  $q_4(-0.301)$ , and the strong correlation have variables  $q_5(0.584)$  and  $q_6(0.935)$ . The strongest correlation has the variable  $q_6$ , where  $r = 0.935$ ,  $n = 103$  and  $p < 0.05$ . This suggests that the major factors of innovation activities are the technological and non-technological innovations of the company. The second most important factor is the investments in innovative activities in the company. The medium correlation has variables: types of innovation, company innovation, employees in the company only for R&D and number of accepted patent application. However, in spite of this, they have statistically significant correlation because  $p < 0.05$ . The small correlation has a variable profit increase and is not statistically significant ( $p > 0.05$ ).

**Table 3:** Indexes and subindexes

Symbol	Index	Variables
I <sub>IA</sub>	Innovation activities	<p>q<sub>0</sub> Company innovations</p> <p>q<sub>1</sub> Types of innovation</p> <p>q<sub>2</sub> Number of accepted patent application</p> <p>q<sub>3</sub> Profit increase</p> <p>q<sub>4</sub> Employees in the company only for R&amp;D</p> <p>q<sub>5</sub> Investing in innovative activities in the company</p> <p>q<sub>6</sub> Technological and non-technological innovation</p>
I <sub>IUB</sub>	Innovation drivers and barriers	<p>w<sub>1</sub> Innovation drivers in the company</p> <p>w<sub>2</sub> Innovation barriers in the company</p>
I <sub>SDS</sub>	Company cooperation with other business entities for ICT and innovation	<p>p<sub>1</sub> Company export</p> <p>p<sub>2</sub> Company competition</p> <p>p<sub>3</sub> Company cooperation with other subjects</p> <p>p<sub>4</sub> Participation of the company in tenders for public procurement</p>
I <sub>PI</sub>	Innovation support	<p>s<sub>1</sub> Use of standards</p> <p>s<sub>2</sub> Difficulties finding domestic services for certificates of standards , s<sub>3</sub> Government innovation policies</p>
I <sub>II</sub>	ICT use	<p>d<sub>1</sub> Company web page and profile on social networks</p> <p>d<sub>2</sub> Funds invested for ICT in the company</p> <p>d<sub>3</sub> Use of ICT tools in the company</p> <p>d<sub>4</sub> Use of ICT tools in different departments in the company</p> <p>d<sub>5</sub> Use of innovative software solutions in the company</p>

**Table 4:** Correlation between variables

	q0	q1	q2	q3	q4	q5	q6	I <sub>IA</sub>
q0 Pearson Correlation	1	,172	,595**	(,457)**	(,382)**	,149	,430**	,416**
q0 Sig. (2-tailed)		,083	,000	,000	,000	,133	,000	,000
q0 N	103	103	103	103	103	103	103	103
q1 Pearson Correlation	,172	1	(,128)	(,079)	(,047)	,127	,300**	,439**
q1 Sig. (2-tailed)	,083		,197	,425	,637	,200	,002	,000
q1 N	103	103	103	103	103	103	103	103
q2 Pearson Correlation	,595**	(,128)	1	(,424)**	(,381)**	,181	,385**	,342**
q2 Sig. (2-tailed)	,000	,197		,000	,000	,068	,000	,000
q2 N	103	103	103	103	103	103	103	103
q3 Pearson Correlation	(,457)**	(,079)	(,424)**	1	,216*	(,134)	(,092)	(,046)
q3 Sig. (2-tailed)	,000	,425	,000		,029	,178	,354	,646
q3 N	103	103	103	103	103	103	103	103
q4 Pearson Correlation	(,382)**	(,047)	(,381)**	,216*	1	(,035)	(,395)**	(,301)**
q4 Sig. (2-tailed)	,000	,637	,000	,029		,723	,000	,002
q4 N	103	103	103	103	103	103	103	103
q5 Pearson Correlation	,149	,127	,181	(,134)	(,035)	1	,318**	,584**
q5 Sig. (2-tailed)	,133	,200	,068	,178	,723		,001	,000
q5 N	103	103	103	103	103	103	103	103
q6 Pearson Correlation	,430**	,300**	,385**	(,092)	(,395)**	,318**	1	,935**
q6 Sig. (2-tailed)	,000	,002	,000	,354	,000	,001		,000
q6 N	103	103	103	103	103	103	103	103
I <sub>IA</sub> Pearson Correlation	,416**	,439**	,342**	(,046)	(,301)**	,584**	,935**	1
I <sub>IA</sub> Sig. (2-tailed)	,000	,000	,000	,646	,002	,000	,000	
I <sub>IA</sub> N	103	103	103	103	103	103	103	103

**B. Innovation drivers and barriers index**

This index consists two variables and in Table 5 we can see that variables have values greater than 0.05 that indicates a strong correlation between variables and the index I<sub>IUB</sub>. The strongest correlation has variable w<sub>2</sub>, where r = 0.953, n = 103 and p<0.05. This suggests that the major factor of innovation drivers and barriers are the innovation barriers in the company. The second most important factor is the innovation drivers in the company, and they are statistically significant because p <0.05. Although they have the same statistical significance, however, there is the strongest correlation with barriers that does not allow companies to use ICTs and innovations. Most of the companies are focused on removing barriers that avoid them from innovating and



developing their work, after that they will focus on suppliers, consumer needs, competition and their own initiative to innovate in their operations.

**Table 5:** Correlation between variables

	w <sub>1</sub>	w <sub>2</sub>	I <sub>IUB</sub>
Pearson Correlation	1	,325**	,596**
w <sub>1</sub> Sig. (2-tailed)		,001	,000
N	103	103	103
Pearson Correlation	,325**	1	,953**
w <sub>2</sub> Sig. (2-tailed)	,001		,000
N	103	103	103
Pearson Correlation	,596**	,953**	1
I <sub>IUB</sub> Sig. (2-tailed)	,000	,000	
N	103	103	103

**C. Company cooperation with other business entities for ICT and innovation index**

This index consists four variables and in Table 6 we can see different correlations between variables in the index. The small correlation has the variable p4 (-0.100), the medium correlation has the variable p2(0.441), and the strong correlation has the variables p1(0.502) and p3(0.934).

The strongest correlation has the variable p3, where  $r = 0.934$ ,  $n = 103$  and  $p < 0.05$ . This implies that the main cooperation factor of companies with other business subjects for innovations and ICT is the cooperation of the company with other subjects.

The second most important factor is the company export, which has statistically significant correlation because  $p < 0.05$ . The medium correlation has a company competition variable and its statistically significant  $p < 0.05$ .

The small correlation has a participation of the company in tenders for public procurement variable, and is not statistically significant ( $p > 0.05$ ). It's beneficial to see with who the company cooperates with in the implementation of its innovative activities, whether with universities , research institutes, consultants, suppliers, etc. from the country or abroad, because according to that, the company chooses whether and where it will export its products and services.

The level of competition on the market is the determined based on where the companies export.

**Table 6:** Correlation between variables

	p1	p2	p3	p4	I <sub>sds</sub>
Pearson Correlation	1	,346**	,173	,062	,502**
p1 Sig. (2-tailed)		,000	,081	,533	,000
N	103	103	103	103	103
Pearson Correlation	,346**	1	,297**	(,092)	,441**
p2 Sig. (2-tailed)	,000		,002	,357	,000
N	103	103	103	103	103
Pearson Correlation	,173	,297**	1	(,196)*	,934**
p3 Sig. (2-tailed)	,081	,002		,047	,000
N	103	103	103	103	103
Pearson Correlation	,062	(,092)	(,196)*	1	(,100)
p4 Sig. (2-tailed)	,533	,357	,047		,314
N	103	103	103	103	103
Pearson Correlation	,502**	,441**	,934**	(,100)	1
I <sub>sds</sub> Sig. (2-tailed)	,000	,000	,000	,314	
N	103	103	103	103	103

**D. Innovation support index**

This index consists three variables and in Table 7 we can see different correlations between variables and the index. The strong correlation has the variable s3 (0.979) and the small correlation have the variables s1 (0.050) and s2 (0.068). The strongest correlation has the variable s3, where  $r = 0.979$ ,  $n = 103$  and  $p < 0.05$ .

This suggests that the main innovation support factors are innovations provided by the government for the company. The other two variables have a small correlation and they are not statistically significant ( $p > 0.05$ ), which means they don't have effect on the index.

In other words, the application of quality standards and the ability to find domestic services for obtaining certification of standards has no connection with innovation support.

The government of the Republic of North Macedonia, with its reforms to ease growth and innovation, has already put the country on the path of reform.

**Table 7:** Correlation between variables

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	I <sub>PI</sub>
Pearson Correlation	1	,350**	(,113)	,050
S <sub>1</sub> Sig. (2-tailed)		,000	,255	,618
N	103	103	103	103
Pearson Correlation	,350**	1	(,108)	,068
S <sub>2</sub> Sig. (2-tailed)	,000		,276	,498
N	103	103	103	103
Pearson Correlation	(,113)	(,108)	1	,979**
S <sub>3</sub> Sig. (2-tailed)	,255	,276		,000
N	103	103	103	103
Pearson Correlation	,050	,068	,979**	1
I <sub>PI</sub> Sig. (2-tailed)	,618	,498	,000	
N	103	103	103	103

**E. ICT use index**

This index consists five variables and in Table 8 we can see different correlations between variables and the index. The strong correlation has the variables d2(0.571), d4(0.834) and d5(0.922), and the small correlation has the variables d1(0.126) and d3(-0.087).

The strongest correlation has the variable d5, where  $r = 0,922$ ,  $n = 103$  and  $p < 0.05$ . This shows that the major factor for ICT use in the company is the use of innovative software solutions. Use of ICT tools in different departments in the company is the other one most important factor and funds invested for ICT in the company is the third most important factor.

Both factors have statistically significant correlation. The small correlation has the variables: use of ICT tools in the company and company web page and profile on social networks, which are not statistically significant.

ICT use in the companies means use of innovative software solutions (electronic archives, financial programs, e-commerce, etc.) in different departments in the companies, and that requires significant investment in financial assets on an annually basis. Although both variables have a small regression and are not statistically significant, company still needs them in order to get a better competitive position on the market.

**Table 8:** Correlation between variables

	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>5</sub>	I <sub>II</sub>
Pearson Correlation	1	,117	(,280)**	,003	,097	,126
d <sub>1</sub> Sig. (2-tailed)		,239	,004	,978	,331	,206
N	103	103	103	103	103	103
Pearson Correlation	,117	1	(,265)**	,454**	,449**	,571**
d <sub>2</sub> Sig. (2-tailed)	,239		,007	,000	,000	,000
N	103	103	103	103	103	103
Pearson Correlation	(,280)**	(,265)**	1	(,040)	(,107)	(,087)
d <sub>3</sub> Sig. (2-tailed)	,004	,007		,691	,283	,384
N	103	103	103	103	103	103
Pearson Correlation	,003	,454**	(,040)	1	,573**	,834**
d <sub>4</sub> Sig. (2-tailed)	,978	,000	,691		,000	,000
N	103	103	103	103	103	103
Pearson Correlation	,097	,449**	(,107)	,573**	1	,922**
d <sub>5</sub> Sig. (2-tailed)	,331	,000	,283	,000		,000
N	103	103	103	103	103	103
Pearson Correlation	,126	,571**	(,087)	,834**	,922**	1
I <sub>II</sub> Sig. (2-tailed)	,206	,000	,384	,000	,000	
N	103	103	103	103	103	103

Pearson Correlation Coefficients point the need of implementing of ICT in the companies as an innovative way that influences the company innovation. Accordingly, with this research we get an answer for a couple of questions related to innovation and ICT in the Republic of North Macedonia. In this regard, this part answers great deal of questions related to innovation and ICT in the Republic of North Macedonia, which up until today is not completely elaborated.

## 5. Conclusions

The results of this research provide the following conclusions:

- Usage different types of innovations in companies impact of the company's innovation. Therefore, the company can make many kinds of operations changes like: usage of new methods for product sale and sales channels, implementation of a new or significantly improved production process or delivery method, introduction of new or significantly improved products or services, introduction of significant changes in the product design or packaging, implementing new techniques for products promotion and implementation of new organizational method in the company, workplace organization or external relations.

- More and more managers are aware for the importance of innovation and they are focused on managing innovation in their organizations.
- Companies how use innovation are gaining more growth and profits from companies that don't accept innovation. In practice it has been shown that the production of the same standard product in the same way for decades couldn't make the same profit.
- Companies how use innovation are innovative organizations that improve themselves in competitiveness, and improve their processes or their products and / or services.
- ICT is the technological area with the highest innovation rate measured through registered patents. The data of patents point out to the innovative capabilities of the company. Intellectual property that is not patented allows other companies to copy and therefore it is necessary to remove the barriers of entrepreneurs for the realization and patenting of their ideas.
- External sources of financing are significant and encourage companies to innovate.
- Each company at every level should have employees who will be trained for the innovation principles, skills and tools with highly developed capabilities to apply ICT tools and to generate new business ideas. They have a major impact on the company's innovation and the of ICT use in companies.
- Companies should have employees, money, and talent and management support, to realize their ideas in successful market stories.
- Most of the surveyed companies have their own email, have a profile on social networks and have their web page (although they do not have quality content and use outdated technology and design, some are still under construction). However, the question here is why they would use and invest in advanced ICT technologies. Companies that cooperate with foreign companies are aware of the advantages of using ICT, how much they reduce communication costs and increase the quality of business. ICT has become a basic need, whose increased use can be reliably identified.
- It is necessary to improve the competitiveness of the ICT sector on one hand, and to facilitate the efficient take-up and application of ICTs in companies.
- It is important for companies to collaborate with all market participants in order to implement new ideas, create dynamic products or improve the existing services. They can be a catalyst for the growth and success of a business and help in adapting to the market. In this way they will be able to adapt to the changes occurring in the environment and contribute to better economic growth.
- For companies it is of particular importance to base their process of operation on knowledge, the links between business sector and the universities are weak, and the research shows that their relationship should be strong because it is needed for innovative and successful operation of the companies.
- Several institutions have been established in the Republic of North Macedonia in order to help companies to undertake innovative activities.
- The application of quality standards is one of the basic system that should be applied and respected by companies in order to be competitive both on the world and the domestic market. Because buyers are able to see and recognize the quality of services and products, and on the basis of that, companies will advance. By applying the standards, all other certification and accreditation processes are simplified, also is simplified their implementation, thereby reducing the cost of them.
- The disadvantages of business practice cause new risks and needs for companies. The needs require

technological improvements through the use of new ICTs, such as eliminating papers in the form of paper, better and more efficient communication between business subjects, etc. New ICTs provide a new business practice that will again demonstrate deficiencies and new opportunities, because this has provided a new starting-point for improvement. The new business practice and the application of new ICTs should always be in place, with continuous measurement and monitoring of the performance of new systems and practices being constantly present in this process of innovating business practice in companies and organizations.

- The introduction of an innovation strategy is important for companies. Innovation strategies create growth strategies, new types of services, products or business models that change the way they work and generate significant new value for customers, consumers and the company. Without an innovation strategy, efforts to improve innovation would be focused on collecting the best practices.
- The capacity of the innovation organization arises from the innovation system.
- A company without an innovation strategy will not be able to make the exchange decisions and choose all the elements of the innovation system. There is no one system that suits all companies or works equally well in all circumstances. However, there's nothing wrong with learning from others, but it's a mistake if we believe that what works, let's say Apple will work in another organization. A clear and accurate innovation strategy helps design a system that suits the specific competitive needs of the company. Without a strategy, a conflict of priorities can easily come to light, even if there is a clear business strategy for innovation. Mainly businesses are focused on their target markets and towards achieving profits and reducing losses. Engineers and R&D researchers want to see the possibilities of new technologies. The different perspectives are crucial for successful innovation.
- The role of ICT in advancing the innovation process is extremely complex and detailed. Companies that want to be successful must have a certain kind of innovation that they will know and follow the company. In this way, there will be persons employed precisely for the R&D and will be coordinated in making innovative decisions. Cases of the past indicate that one of the main reasons for the failure of the development of new products is the lack of staff and a certain kind of innovation that the company can follow.
- By testing indexes, we can see which variables have the strongest impact on their value and on the model;
- Empirical results show which variables have the strongest correlation on the model. In all indexes, most of the variables have a strong correlation which points on a significant correlation between them. Also, indexes have a significant correlation with variables that has a medium correlation. Only variables with small correlation are not statistically significant.
- In the past few years the government provides funding for: publishing; organization of national scientific conferences; purchase of foreign literature; access to electronic databases; scholarship for young researchers; public institutions' programs and study visits; participation of scientific researchers in international conferences, seminars, congresses and symposiums; scientific research projects (national and international);
- That means that the government has a key role for stimulation the company to invest in innovation and use the ICT innovation. The government achieves stimulating by funding the companies and helping

them in the realization of the aims abovementioned.

- Internet is the one that transferred companies from the traditional market to e-commerce and e-business. In order to participate in the new online business environment, companies have to make significant financial investments not only in the necessary technologies, but also in the processes and people that in indispensable for work. Creating value with e-business is one of the most important issues in making investment decisions in the company.
- From the research analyzes it can be concluded that the model of ICT and innovation approach is practical for use in the companies and represent a guide for implementation of ICT and innovation in the company;
- In the long run, infrastructure, institutions, reducing macroeconomic stability and improving human capital show lower returns, the standard of living can only be improved if it is focused on technological innovation, or the use of ICTs. Innovation is especially important for developing countries for economies that are approaching knowledge and where the ability to apply new technologies is great. However, for developed countries in the innovation phase, this is not enough in order increase productivity. Companies in these countries must design advanced products so as to remain predominant on the world stage. This requires an environment that encourages innovation activities supported by both, the public and the private sector. This means that there are sufficient investments in R&D and ICT, especially by private, high-quality scientific research institutions, with simultaneous cooperation between universities and industry supported by rigid protection of intellectual property.

## **6. Recommendations**

- Promoting proactive strategies for ICT development and innovation as a multipurpose document that will reflect the goals and objectives of our country that are proactive and targeted towards the future. They will have to be constantly revised, adapted and improved to ensure ICT efficiency in our country as one of the most dynamic sectors, with very short cycles of innovation and market activity. For their realization and for the realization of goals and tasks, human and financial resources are needed. Therefore, accent is put on continuing the development of information systems, infrastructure and the technical environment, the application of IT standards and methodologies because they drastically change the traditional way of working it and make it more profitable and more efficient.
- The IT strategy should be the main guiding document for implementation of solutions in the area of information and communication strategy;
- The provision of information systems, ICT infrastructure and innovation that will be in accordance with the standards because it is a necessary condition for a stable development;
- Developing and implementation of the latest and most up-to-date information systems and ICT infrastructure.
- Creating a single information space with an open and competitive market offering an access to electronic communication services and digital content, promoting the development of ICT as a motor force for the development of the digital society and creating an inclusive information society by overcoming the digital divide.

- The Government of the Republic of North Macedonia by the end of 2020, should establish an environment that will take advantage of the ICT industry and create an advanced information society. The process of building an advanced information society increases productivity, efficiency and innovation in the private and public sectors, which will lead to creation of jobs with higher added value.
- Rewarding the inventor of the new invention for his idea and effort, which is regulated with intellectual property rights regulated by the Law on Copyright and Related Rights and the Law on Industrial Property. This is important because it gives them the incentive to innovate what results in rewarding creativity.

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