

# Types of Innovation and Their Impact on ICT Use in Companies in the Republic of North Macedonia

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**Abstract**—A few decades forwards not much has been written about innovation, but in recent years the number of innovation theories has grown, especially among those that have been published. Some theories are focused on technological development, technological research and development functions for R&D in companies, other theories are focused on individuals who create and make new products and theories related to marketing innovations. Today, innovations are a common business strategy for most businesses and various researchers and academics. ICT and innovations are of a great importance for the economic development and prosperity in the developing countries, in this case the Republic of North Macedonia. From this point, the main hypothesis of the paper is: "ICT plays an important role in promoting innovations and innovation activities". The paper highlights the part where we can see the influence of different types of innovation on ICT used in companies. The results from the empirical research implied to accepting the certain hypothesis, which lead to accepting the main hypothesis, "Activities in the companies have an impact on the ICT use in the companies in the Republic of North Macedonia".

**Keywords** - ICT, innovation, types of innovation; company

## I. INTRODUCTION

During the years, great effort has been made to help countries in the application of ICT in their approach to social and economic development. Infrastructure development, technological advances, and price cuts have lead to the growth of ICTs, where through its use was enabled the connection of billions of people around the world. Today, the aim of companies is not just the deployment and acquisition of technology, but the ability to use technology in

an innovative way. Companies must create and commercialize a stream of new processes and products that move the edge of technology, to develop so quickly so their competitors cannot reach them.

Some of the recent changes in innovation could not have happened without ICT. The way ICT has the potential to integrate, complement and fit a wide range of knowledge and technologies from different areas into a traditional production environment, enables innovation to be the main driver for stimulation productivity in companies.

It's good to highlights the need to emphasize the approach of the innovative use of already established technology (mobile phones, television), not just to establish a new technology.

The main aim of the research is to accept and apply the benefits of different types of innovation, as well as incentives and constraints that affect this process at the firm level. There is a number of factors influencing ICT use in the company and in particular, explores the role that has the types of innovation that the company use.

The survey was conducted in order to identify the connection between ICT and innovation in the direction of strengthening innovation in the Republic of North Macedonia. This contributes to use different types of innovation in the company, and explains the need for proactive strategies, creating the necessary ambiance and connection of ICT with innovation and information society in the Republic of North Macedonia. The main hypothesis of the research is: "Activities in the

company have an impact on the ICT use in the company".

## II. TYPES OF INNOVATION

The company can make a lot of changes within its methods of operation, in order to use the factors of production and types of products that improve the company's productivity and market performance. There are several models, concepts, and types of innovation that cover a wide range of changes in the activities of companies, such as:

- Product innovation;
- Process innovation;
- Marketing-innovation;
- Organization innovation;
- Eco-innovation;
- Social Innovation;
- Sustainable innovation.

### A. *Product innovation*

Product innovation is the introduction of new or significantly improved products or services in terms of their features or intended uses [1]. This includes significant improvements in technical specifications, components, and materials, user-friendly software, or other functional features. They may use new knowledge or technologies or maybe a combination of existing knowledge and technologies. Product innovations include the introduction of new products and services and significant improvements in the functionality or use features of existing goods and services. With the development of new products, companies gain many benefits, such as:

- Promoting and increasing competitiveness;
- Increased corporate income;
- Stimulating export activities;
- Possibility of reducing business risk.

Product and service innovations can include significant improvements in the way they are used (for example, in terms of efficiency or speed), when adding new features to existing services, or introducing completely new services. An example of significant improvement is the internet banking services,

which is a result of the significantly improved speed and simplicity of using the services.

### B. *Process innovation*

Process innovations are the implementation of a new or significantly improved production process or delivery method. This includes significant changes in techniques, equipment, and software [2]. Process innovations can be designed to reduce unit costs in production or delivery or to contribute to the production or delivery of new or significantly improved products in order to increase quality. Manufacturing methods include techniques, equipment, and software used to produce products and services. Examples of new production methods are the implementation of new automated equipment for a particular product line or the use of a computer with a product development design program. A new method of delivery is the introduction of bar codes or an active RFID (radio frequency identification) tracking system. Process innovations also include new or significantly improved techniques, equipment, and software designed for additional support activities such as procurement, accounting, computers, and maintenance. Implementation of new or significantly improved ICT is an innovation of the process although it is designed to improve the efficiency and quality of additional support activities.

### C. *Marketing-innovation*

Marketing innovation is the introduction of significant changes in product design or packaging, the introduction of new product promotion techniques and new methods of product placement and sales channels. In addition, marketing innovations include new pricing policies for goods and services [2].

Marketing innovations are aimed at better addressing customer needs, new markets, or re-positioning a company's product in the market, with the aim of increasing company sales. A distinctive feature of marketing innovations compared to other changes to a company's marketing instruments is the implementation of a marketing method not previously used by the company. It must be part of a new marketing concept or strategy that is a departure from existing marketing methods. The new marketing method can either be developed by an innovative company or adopted by other companies or organizations. New marketing

methods can be applied to both new and existing products.

Product design change refers to changes in the form and appearance of the product that does not alter the functionality of the product or user characteristics or changes in form, appearance, packaging or taste. Marketing innovations include the introduction of new sales channels and the use of new product presentation concepts. Sales channels refer to the methods used to sell goods and services to customers and do not cover the logistics methods (transportation, storage, and handling of products) that are mainly concerned with increasing efficiency. New marketing methods to promote products include the use of new concepts to promote the firm's goods and services and the introduction of a fundamentally new brand symbol. Price innovations include the use of new pricing strategies in the market for goods or services. Seasonal, regular and other routine changes in marketing instruments are generally not marketing innovations. For such changes to be marketing innovations they must include marketing methods that were not previously used by the companies.

#### *D. Organizational innovation*

Organizational innovation refers to the implementation of a new organizational method in a company's business practice, workplace organization or external relations [2].

Organizational innovation can be designed to increase the efficiency of the company by reducing administrative or transaction costs, improving job satisfaction (and thus labor productivity), gaining access to resources that cannot be trading (such as unconfirmed knowledge) or reducing shipping costs.

Organizational innovation in business practice involves the implementation of new methods of organizing routine work and workflow procedures. These include, for example, the implementation of new practices to enhance learning and knowledge sharing within the firm. Innovations in the workplace organization involve the implementation of new methods for distributing responsibilities and decision-making among employees for the division of tasks in the firm (and organizational units), as well as new concepts for structuring activities, such as the integration of different business activities. New organizational methods implemented in a company's external relations

include implementing new ways of organizing relationships with other firms or public institutions, such as establishing new ways of collaborating with research organizations or clients, new methods of integrating with suppliers, outsourcing or first-time subcontracting for business activities in production, procurement, distribution, recruitment and system services. Changes in business practice, workplace organization or external relations that are based on organizational methods already in use in the company are not organizational innovations. The formulation of managerial strategies is not an innovation in itself. Innovations occur when the strategy is implemented through the use of new software and the practice of documenting information in order to encourage knowledge sharing between different parts. Merging with other firms or acquiring other firms is not considered an innovation of the organization, even if one firm merges or acquires another firm for the first time. Mergers and acquisitions can, however, be innovations to the organization as the firm develops or adopts new organizational methods during the merger or acquisition.

#### *E. Eco-innovation*

The term eco-innovation refers to innovations that contribute to reducing the negative impact on the natural environment. Eco-innovation is the creation of new products at competitive prices, processes, systems, services and procedures designed to meet human needs and provide a better quality of life for everyone throughout the life cycle with minimal use of natural resources (materials including energy and surface) at unit output and minimal release of toxic substances [3].

Eco-innovation involves new or significantly improved solutions introduced at any stage of the product life cycle, with the aim of improving resource productivity or reducing environmental impact.

Many companies have started using eco-innovations or similar terms to contribute to sustainable development. Several governments are also promoting the concept as a way to meet sustainable development goals to protect the industry and a competitive economy.

Among the key elements in determining the success of eco-innovations is the use of a business model that emphasizes eco-innovation in the market and promotes their spread. By

replacing old business practices, innovative business models enable firms to restructure their values and create new kinds of relationships between the manufacturer and the consumer and change the consumer culture and practices of use. That's why business models are especially important for eco-innovation, to see how business models and strategies can challenge and help diffuse eco-innovation and enable systemic change and transformation [4].

In a recent study, companies were interviewed about whether they saw any difference between innovations in general and environmental innovation, and many of the companies felt that there was no difference. Most companies find out that in all their innovations they take into account all environmental measures even when environmental improvements are not the main focus of their research and innovation efforts. Indeed, many environmental innovations link them to environmental benefits and benefits to the firm or user. In this context, the motivation of an eco-innovation company is to benefit from the benefits of investing in innovative technology, thereby reducing material inputs into the production process (e.g. fixed assets, energy) [5].

*F. Social innovation*

Social innovation can be defined as the development and implementation of new ideas (products, services and models) to meet social needs and to create new social relationships or collaborations. They are designed to improve human well-being. Social innovations are innovations that are social both in their goals and in their own way. They are innovations that are not only good for society but also for improving the capacity of individuals to act. They rely on the inventiveness of citizens, CSOs, local communities, businesses, and public servants. They are both an opportunity for the public sector and for markets so that products and services better meet individual as well as collective aspirations [6].

Social innovation is a significant innovation in the internationally recognized Oslo Handbook, but its primary purpose is to create social change.

It is particularly important to outline ten practical steps to implement social innovation, as these steps can help regions cope with existing problems, such as how to create jobs

for young people, how to integrate the migrant community in economic life, how to provide health solutions through new ICT solutions for the whole population, or how to cope with poverty (Fig. 1).

These table shows, what authorities can choose to promote social innovation. The steps are presented in order of increasing involvement in social innovation, but the order depending on the region's level of knowledge and development. Some can start with Step 3, while others might need to start from Step 1. Some might be interested in Step 9, while others might not want to implement it.

*G. Sustainable innovation*

Business Week and The Boston Consulting Group annually publish a list of the most innovative companies in the world, with 50 companies topping the rank of long-term sustainability. They are Microsoft, IBM, Toyota, GE, Nokia, Unilever or Tata.<sup>1</sup> While looking at the list of the 100 Most Sustainable Corporations in the World published by Corporate Nights and Innovest, we can see that many of the leading sustainable companies are on the top of the most innovative companies. The conclusion is that there is a link between innovation and sustainability.<sup>2</sup> There is no precise or defined definition of sustainable innovation, which is a result of the difficulties that arise in defining the concept of sustainability and sustainable development. Arthur Little defined "sustainable driving" innovations as "creating new market space,

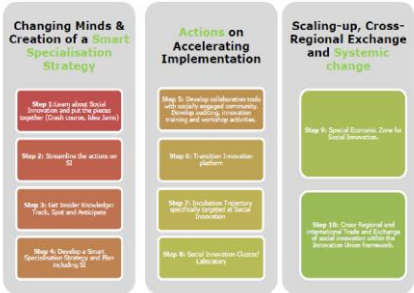


Figure 1. 10 Steps to implement social innovation. Source: European Commission (2013) Guide To Social Innovation Regional and Urban Policy p.59

<sup>1</sup> [https://www.bcgperspectives.com/content/articles/innovation\\_growth\\_most\\_innovative\\_companies\\_2013\\_lessons\\_from\\_leaders/?chapter=2](https://www.bcgperspectives.com/content/articles/innovation_growth_most_innovative_companies_2013_lessons_from_leaders/?chapter=2) (11.02.2017)  
<sup>2</sup> [www.global100.org/global-100-index/](http://www.global100.org/global-100-index/) (11.02.2017)

products, and services or processes driven by social, environmental or sustainable outcomes". Sustainable innovation is not only about new concepts, but also about commercializing technologies, products and services, and entrepreneurship. It can also be about accepting and adopting new processes and systems on a societal level [7].

Sustainable innovation is a process where sustainability considerations (environmental, social, and financial) are integrated into the company's systems from idea generation through IR and commercialization. This is important for products, services and technologies, as well as for new business and organizational models [8].

It is important for sustainable innovation to become internationally recognized that will make a significant contribution to economic and business opportunities. Sustainable innovation is characterized by four types of strategies (Figure 2.8) that help companies move toward set goals<sup>3</sup>:

- Building relationships to achieve higher goals - Sustainable innovation is a challenge. In addition to personal and business interests, innovators need to share their higher goals to work together. They need to build trust that will lead to new visions based on shared values.
- Enabling a Sustainable Lifestyle - Companies that focus on meeting basic needs, rather than fulfilling desires, will ensure prosperity so people can live in a healthy environment and a healthy society.
- Stakeholder Value Creation - Sustainable innovation is not about doing it yourself, it involves working with partners in society to create value that is honestly distributed and transparent to everyone.
- Responsible use of resources - Whether natural (metal, wood, petroleum, etc.) or human (people, knowledge, technology, etc.) resources are valuable. Their responsible use means starting a level of editing and anticipating potential impacts on users, society and the environment.

The innovation drive is very important because it determines the firm's innovation.

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<sup>3</sup><https://www.yumpu.com/en/document/view/250716/5686-innovation-booklet-extern-webversie/37> (23.05.2017)

Based on this, companies using research come to the conclusion that the core unit of innovation is not a department, but a network that aims to create public and private goods. And the basic conclusion is that now companies treating sustainable innovation as a new frontier [9].

Based on the models, concepts and types of innovation presented, it can be concluded that there is a continuous need for innovations that are essential to ensure the survival of companies and their competitive power. Due to their importance, the application of different types of innovations becomes necessary for evaluating the performance of companies and for creating policies. The positive impact that different types of innovation have on the economy is widely accepted, and their economic impact is very important.

### III. EMPIRICAL RESEARCH

The aim of this paper is to research the influence of different types of innovation on ICT use in companies in the Republic of North Macedonia. In Google Docs was prepared self-administered questionnaire and questions is created in closed-ended format and a 5-point Likert scale. The model of questions was based on the theory and methodology presented in the Oslo Manual. The questionnaire contained logically connected questions with introduction and five sections. Basic information for the companies is gathered in the introduction part, including a 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. The questionnaire was sent randomly to 400 companies in the Republic of North Macedonia, and the response was received from 103 companies. 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 present only the first and the second

analyses, especially the part where we can see the influence of different types of innovation on ICT use in companies in the Republic of North Macedonia as a part of the individual hypothesis: Activities in the company have an impact on ICT use in the company in the Republic of North Macedonia.

In the first part is presented a descriptive data analysis especially for the question: Has your company introduced any of these four types of innovations.

This question is asked precisely to identify what kind of innovation the surveyed companies are introducing. About 25% of surveyed companies have product innovations and marketing innovations, that is, they introduce new or improved products / services with new features and functionalities and target different distribution channels, different prices, market positioning, advertising, etc. Innovation in the organization introduces 20% of surveyed companies, 16% of surveyed companies introduce process innovation and 15% responded that their company does not innovate (Tab. 1).

TABLE I. USE OF THE DIFFERENT TYPES OF INNOVATION IN COMPANIES IN THE REPUBLIC OF NORTH MACEDONIA

Types of innovation	Number of companies	Percents
product or service innovation	41	25%
process innovation	26	16%
marketing innovation	41	25%
organizational innovation	33	20%
did not innovate	25	15%
sum	166	100%

Source: author's own research

The special and individual hypotheses is tested with Pearson  $\chi^2$  (Chi-Square) test for independence and given a margin of error of 5%, i.e.  $\alpha = 0,05$ .

Individual hypotheses have been tested in two ways when the dependent variable is company innovation and when the dependent variable is ICT use in the company

Due to the scope of the research, in this paper, we will present only the part where the dependent variable is ICT use in the company especially the first individual hypothesis which

conducts the special hypothesis "Types of innovation affect ICT use in the company".

Dependent variable: Using ICT in the company.

Independent variable (q1): Types of innovation.

H0: there is no dependency between the q1 variable and the use of ICT in the company.

H1: there is a dependency between the q1 variable and the use of ICT in the company.

TABLE II. CHI-SQUARE TEST OF THE INDEPENDENCE OF THE VARIABLES

		Using ICT in the company
Types of innovation	Chi-square	15,508
	Df	6
	Sig.	0,017

Source: author's own research

Based on the data obtained in Table 2, it can be seen that Asymp. Sig. (2-sided) or  $p < 0.05$ , which means that the null is rejected and the alternative hypothesis is accepted. This means that there is a statistically significant relationship between variables. That is, there is a dependency between the independent variable: types of innovation and the dependent variable: using ICT in the company (Tab. 2).

The results show that special hypothesis q1: Types of innovation affect ICT use in the company - accepted.

TABLE III. INDIVIDUALLY TESTING HYPOTHESIS

Individual hypothesis	Variables	Value	df	AsympSig. (2-sided)	Individually testing hypothesis
Q1.1	q1.1	15,508	6	0,017	is accepted
	q2.2	17,960	4	0,001	is accepted
	q3.3	15,546	6	0,016	is accepted
	q4.4	52,359	1	0,000	is accepted
	q5.5	10,780	6	0,095	is rejected
	q6.6	60,657	12	0,000	is accepted

Source: author's own research

Accepting of this special hypothesis and other special hypothesis in this section led us to accepting the individual hypothesis Q1.1: Activities in the company have an impact on ICT use in the company (Tab. 3).

From the research analysis of all individual responses and from the testing of the special hypotheses, we can see that, in general, all special hypotheses are accepted. Only q5.5 special hypothesis is rejected. Acceptance of special hypothesis lead to acceptance of individual research hypothesis Q1.1: Activities in the company have an impact on the ICT use in the company – is accepted (table 3).

#### IV. CONCLUSIONS

The results of this research provide the following conclusions:

- Usage of different types of innovations in company's impact of the company's innovation. Therefore, the company can make many kinds of operations changes like: introduction of new or significantly improved products or services, implementation of a new or significantly improved production process or delivery method, introduction of significant changes in the product design or packaging, implementing new techniques for products promotion, usage of new methods for product sales and sales channels, and implementation of new organizational method in the company, workplace organization or external relations.
  - More and more managers are aware of the importance of innovation and they are focused on managing and use if different types of innovation in their organizations.
  - Companies that use innovations are innovative organizations that improve themselves in competitiveness and improve their processes or their products and/or services.
  - Companies that use different types of innovation is gaining more growth and profits from companies that don't accept and use different types of 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.
  - ICT is the technological area with the highest innovation rate.
- 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 ICT use in companies.
  - The role of ICT in advancing the innovation process is extremely detailed and complex. Companies that want to be successful must use different types 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.

They are of great importance for the prosperity and economic development in the Republic of North Macedonia because every company uses ICT and different types of innovation. The survey was conducted in the period when the Republic of North Macedonia is 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 a special hypothesis, which led to accepting the individual hypothesis that Activities in the company have an impact on ICT use in the company in the Republic of North Macedonia. The obtained results of this research can be a guide when creating an innovative strategy in the Republic of North Macedonia. Research indicates that this trend continues. Managing innovation policy is becoming increasingly complex and increasingly dependent on governments' ability to find a strategic approach to harnessing the innovation potential of their economies.

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