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Exploring the role of innovation ecosystem actors in shaping new product development and firm innovation performance

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Abstract: Contemporary research in the field of innovation and sustainable development is being conducted to analyse and design different forms of organisation of economic actors that enable and facilitate innovation. The focus of this paper is on finding the symbiotic and reciprocal relationships among the actors and their impact, respectively, doing further in-depth research about the impact of the Innovation Ecosystem in the information and communication technologies (ICT) sector in Kosovo. The scientific contribution of this study lies in expanding the number of actors of the innovation ecosystem that have been studied by other authors and their correlation with the firm innovation performance. Furthermore, the heptagonal cooperation-influence model of innovation ecosystem actors on a firm's innovation and new product development designed by the authors of this paper will serve as a tool for measuring the impact of each innovation ecosystem actor on the firm's innovative performance.

Keywords: innovation ecosystem; ICT; information and communication technologies; firm performance; firm innovation; heptagon model.

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1 Introduction

The evolutionary history of living species has shown that species that have adapted to changes in the environment and those that have cooperated have managed to maintain their survival. Considering the prerequisite that humans also are 'Homo economicus', we must conclude that adaptation to change and cooperation must be applied in the economic arena. In a world with scarce resources, innovation should be considered the preserver of the trichotomic well-being of economic, social, and environmental factors. Innovation enables sustainable development by increasing productivity and decreasing resource usage. Consequently, it brings the necessity to research and find adaptation pathways to business survival as a way of dealing with consistent changes in the outer environment, which lately is more vibrant than before. This study examines the impact of the Innovation Ecosystem on firm innovation performance and the development of new products in the ICT sector in Kosovo. In this paper, the main actors of the innovative ecosystem in Kosovo's ICT sector are selected to be analysed. Then their impact on innovation and the development of new products is researched and measured separately. The scientific contribution of this research stands to enhance the definition of the innovation ecosystem. This research, among other contributions, paves the way for the recognition and acceptance of open innovation as a research field. The scope of this study extends as follows: Even though different scholars have emphasised a different number of Innovation Ecosystem (IE) actors, this paper studies seven of them (those that are predominantly active in the respected Innovation Ecosystem researched in this study).

As a new topic of study, the innovation ecosystem has attracted the attention of a wide number of scholars. Despite that, there is a limited amount of empirical research in this field. The vast majority of the studies on this topic are of a theoretical nature. Different authors chose different scopes of approaching this field of study. Carmona-Lavado et al. (2023) explore how cross-industry innovation (CII) is relevant in the context of increasing digitalisation and technological convergence.

According to Howells and Edler (2011), the literature on innovation has reflected a growing interest in the idea of an innovation ecosystem as a mechanism to improve the flaws in "structural innovation". Furthermore, as Adner and Kapoor (2010) explained, the strategy and the innovation literature have traditionally dealt with the innovation

challenges that are mainly faced by the focal firm, rather than the whole ecosystem. As Leon (2013) explains, the analysis of innovation ecosystems can be done at macro, meso, or micro levels depending on the emphasis placed on policy instruments and the type of activities of the research interest. Through this research, it is attempted to study a certain set of actors within the whole innovation ecosystem to get a more in-depth understanding of interactions taking place among the actors and give answers to the research hypotheses of the study. Different authors choose to study different sets of innovation ecosystem actors, the authors Matt et al. (2021) study the role of three ecosystem actors: companies, educational organisations, and regional policymakers in enabling and fostering the Industry 4.0 adoption. There is a limited effort in the contemporary scientific literature on systematising the innovation ecosystem actors and measuring their impact with a special emphasis on innovation. Moreover, to the best of our knowledge the concept of the innovation ecosystem, respectively the impact of the innovation ecosystem in new product development and firm innovation performance is not studied at all in the region (Kosovo and its neighbouring countries) therefore this research is the first study in this field. As a result, this study fills a considerable gap in the regional literature and even contributes to the gap in worldwide innovation ecosystem literature. Our study expands the scope of research by including a broader range of innovation ecosystem actors, seven of them, compared to previous studies, offering a more comprehensive analysis of the ecosystem's dynamics.

The general hypothesis of this study stands as follows:

H: *The innovation ecosystem has a significant impact on the overall firm innovation performance.*

Specific hypotheses are defined solely for each of the seven independent variables of this study. This research probably raises enthusiasm and interest among other scholars to conduct further research in this very attractive field of study.

2 Literature review

Innovation is an integral part of global trends and, as such, cannot escape the impact of these changes. As Archibugi and Iammarino (2002) explain, the concept of globalisation of innovation is the zip between two fundamental phenomena of modern economies: the increased international integration of economic activities and the rising importance of knowledge in economic processes. Therefore, as such, it cannot be monopolised by a single scientific discipline because the scientific research of this phenomenon would be shallow and not comprehensive due to the impact of innovation in social and economic aspects. As suggested by Fagerberg (2004), a cross-disciplinary perspective should be done because no single discipline deals with all aspects of innovation. An important finding in the innovation literature is that companies do not innovate in isolation but depend heavily on interaction with their outer environment. Different concepts have been introduced to enrich this phenomenon, the vast majority of them incorporate the terms “system” or “network”. Furthermore, the systemic interdependencies between the initial and induced innovations also imply that innovations (and growth) “tend to concentrate in certain sectors and their surroundings” or “clusters” (Schumpeter, 1939). In the following chapters, the innovation is studied, explored, and measured in a wider scope, as a part of an innovation ecosystem.

2.1 The history and evolution of innovation ecosystem

The base of an innovation ecosystem is the concept of a national innovation system (Wessner, 2007). The concept of the innovation ecosystem in the initial phases has been used related to the concept of business ecosystems as used by Moore (1993) and other authors in the field of business research. An Innovation Ecosystem refers to a loosely interconnected network of companies and other entities that coevolve capabilities around a shared set of technologies, knowledge, or skills and work cooperatively and competitively to develop new products and services (Moore, 1993). Mercan and Göktaş (2011) specify that an “innovation ecosystem consists of economic agents and economic relations as well as the non-economic parts such as technology, institutions, sociological interactions, and the culture”, furthermore, Granstrand and Holgersson (2020) have explained in more details the functioning of an innovation ecosystem, they explain it as a set of actors, activities, and artefacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors. Innovation ecosystems have been defined as human networks that generate extraordinary creativity and output on a sustainable basis Hwang and Horowitz (2012), specialising in the exploitation of a shared set of complementary technologies or competencies (Gobble, 2014). As Valkokari (2015) states that Innovation ecosystems occur as an integrating mechanism between the exploration of new knowledge and its exploitation for value co-creation in the business ecosystem. According to Howells and Edler (2011), literature on innovation and business research has shown a growing interest in the idea of an innovation ecosystem as a mechanism to improve the flaws in “structural innovation”. As Adner (2013), explains, scholars have proposed the construction of an innovation ecosystem to capture the cross-industry and cross-country complexity of the innovation process. In Table 1, there have been explained different types of ecosystems that are related to the economy.

Table 1 Different ecosystems that are related to the economy

<i>Type of ecosystem</i>	<i>Authors</i>
Business ecosystem	Galateanu and Avasilcai (2013); Iansiti and Levien (2004); Moore (1993, 1996); Peltoniemi and Vuori (2004)
Industrial ecosystem	Frosch and Gallopoulos (1989); Galateanu and Avasilcai (2013); Korhonen (2001); Peltoniemi (2005)
Digital business ecosystem	Isherwood and Coetzee (2011); Nashira (2002)
Entrepreneurship ecosystem	Ahmad and Hofman (2008); Guerrero et al. (2016); Isenberg (2010)
Innovation ecosystem	Adner (2006); Carayannis and Campbell (2009); Durst and Poutanen (2013); Still et al. (2014); Wessner (2007); Yawson (2009)
Platform ecosystem	Baldwin and Woodard (2009); McIntyre and Srinivasan (2016); Tiwana et al. (2010)
Knowledge ecosystem	Clarysse et al. (2014); Van der Borgh et al. (2012)

Source: Authors

2.2 *The need for innovation ecosystem*

In recent decades, the innovation process has been shifted from a closed to a more open process. This has been achieved from the collaborations and innovation ecosystems approach and mind-set. Innovation ecosystems have been identified as unique opportunities for all stakeholders of the industry to actively engage in solving future challenges and opportunities. Adner and Kapoor (2010), point out that the success of an innovative firm often depends on the efforts of other innovators in its environment, furthermore, Basole and Rouse (2008) explain the independence of firms that, from symbiotic relations create and deliver products and services. They shed light on how firms are increasingly interdependent in their business and innovation activities. Open-minded innovators approach innovation holistically. According to Adner (2006), innovation ecosystems can be defined as “the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution” on the other hand Iansiti and Levien (2004), explain a benefit of the businesses participating in an ecosystem, they state that ecosystems participants should enjoy high survival rates, either overtime or relative to other, comparable ecosystems. The participants of any ecosystem create their value chain which has been mentioned and explained by Porter (1985), where complimentary products supplied often by third parties outside the value chain (Teece, 1986) help in the increase of the production values in the ecosystem. This integration of these complementary products with the value chain results in a new term known as “value network” as mentioned by Amit and Zott (2001), known also as ecosystems. Their importance has been recognised in the different industries and in the scholarly area. The fundamental hope behind ecosystem thinking is to expand the capabilities of one actor beyond its boundaries and transfer knowledge into innovation in collaboration with others (Adner, 2006). For this, technology plays an important role, as Dodgson et al. (2006) emphasise the efficiency and effectiveness of cooperation between network member firms are often facilitated through the use of information technologies. An innovation ecosystem stimulates and provides a manageable flow of knowledge and information between its actors and offers an environment that embraces the culture of creativity, cooperation, and innovation.

2.3 *Characteristics of innovation ecosystem*

Since the genesis of the introduction of the term ‘ecosystem’ in the world of economics, different terms, characteristics, and forms of organisation have been added to this term. Scholars of this field in their scientific research have tried and are constantly trying to establish scientific frameworks to define these terms as accurately as possible to give us a more concise understanding of how different types of ecosystems differ, what are their characteristics, which are the actors, their interconnection, their value creation, etc.

For instance, in management and innovation studies, meta-organisations such as ecosystems have been approached with different concepts (Gulati et al., 2012), furthermore, it was Valkokari (2015) who agreed and added that there exist several partly overlapping concepts – such as business ecosystem, innovation ecosystems, and knowledge ecosystem – to describe the meta-organisations among economic actors.

It is worth mentioning that it is a matter of the scientific point of view or scientific approach followed by authors. As proposed by Weber and Hine (2015), rather than focusing on ecosystems as platforms, a scientific model of research shall be explored

where ecosystems are approached as structures of and relationships among interacting actors. Advancing above the basic circumstantial view, ecosystems have also been recognised as dynamic and purposive networks in which actors co-create values (Adner and Kapoor, 2010; Lusch et al., 2010). As Basole (2009) mentions, a defining characteristic of innovation ecosystems is their ability to adapt and evolve. Furthermore, other authors have highlighted different characteristics of the innovation ecosystem. Thomas and Autio (2019) identify four characteristics of innovation ecosystems: community heterogeneity, ecosystem-level out-puts, participant interdependence, and distinctive governance.

2.4 Innovation ecosystem actors

Adner and Kapoor (2010) mention that the strategy and the innovation literature have traditionally dealt with the innovation challenges that are mainly faced by the focal firm, rather than the whole ecosystem, Valkokari (2015) agrees with it, he seeks to have a more focused approach to, for example, a certain set of actors within the whole ecosystem to get a more in-depth view about the processes and interactions taking place. In this research, it is used the same approach. There have been pre-selected the innovation ecosystem actors to study their impact in the specified area of interest explained in the methodology part. Different scholars emphasise different actors of the innovation ecosystem. It is necessary to mention that the innovation ecosystem is not a static formation with fixed actors, on the contrary, it is a very dynamic form of organisation, which is acclimatised based on the environment where it operates. Based on that, we can mention these innovation ecosystem actors: research institutions and universities, government, entrepreneurs, start-ups and other enterprises, venture capitalists, angel investors, incubators and accelerators, non-government organisations (NGOs), collaborative networks, innovators, vendors, financial network (Adner and Feiler, 2019; Clarysse et al., 2014; Gulati et al., 2012; Oksanen and Hautamaki, 2015; Pellikka and Ali-Vehmas, 2016; Talmar et al., 2018; Viitanen, 2016). During the process of literature review on the topic of innovation ecosystem actors, there have been found, various participants or actors. In Table 2, there have been emphasised the actors of the innovation ecosystem mentioned by other researchers. For more information, see Table 2.

There are particularly important actors that facilitate and help businesses in an innovation ecosystem like, angel investors, venture capitalists, market facilitators and intermediaries, professionals in ecosystem building, but the reason for not choosing these particularly important actors are because they do not exist in the respective innovation ecosystem. The financial market in Kosovo is in the emerging phase, this explains the lack of these actors. The composition of this more advanced financial and market formation is extremely hard to be found in emerging financial markets like Kosovo. Nevertheless, as seen in this study, the Innovation Ecosystem in the ICT sector in Kosovo is a very promising market. As Murati-Leka (2018) explains, the absorptive capacity of knowledge and new technologies is more emphasised in the ICT companies in Kosovo; the incoming set of actors like mentioned above is highly likely to happen in the near future of the ICT innovation ecosystem in Kosovo. In Figure 1, there are mentioned the innovation ecosystem actors that have been selected in this paper.

Table 2 Innovation ecosystem actors

<i>Innovation ecosystem actor</i>	<i>Author/source</i>
Research Institutions & Universities	Clarysse et al. (2014); Guerrero et al. (2016); Mason and Brown (2014); Oksanen and Hautamaki (2015); Pellikka and Ali-Vehmas (2016); Striteska and Prokop (2020); Valkokari (2015)
Government	Corrente el al. (2008); Pellikka and Ali-Vehmas (2016), Albros-Garrigos and Barrera (2011)
Financial Institutions	Corrente el al. (2008); Mason and Brown (2014); Guerrero et al. (2016); Claryssen et al. (2014)
Start-ups & Enterprises	Gulati et al. (2012); Shane (2009); Striteska and Prokop (2020); Talmar et al. (2018) Viitanen (2016)
NGOs & Development Agencies	Jackson (2011); Viitanen (2016); Wallner and Menrad (2011)
Incubators & Accelerators	Miller and Bound (2011); Gertler (2003); Hughes, Ireland and Morgan (2007); Viitanen (2016)
Social & Cultural Norms	Carayannis and Campbell (2009); Corrente el al. (2008); Hwang and Horowitz (2012); Wallner and Menrad (2011)
Angel Investors	Guerrero et al. (2016); Mason and Brown (2014)
Venture Capitalists	Adner and Feiler (2017); Guerrero et al. (2016); Mason and Brown (2014); Mcdade and Malecki (1997); Miller and Bound (2011); Norton (2001)
Private Equity Firms	Porter (2000)
Professionals	Cohen (2006); Jackson (2011); Neck et al. (2004); Roper and Hart (2013); Valkokari (2015)
Market Facilitators & Intermediaries	Asheim and Isaksen (2002); Cooke (2001); Cooke et al (1997); Storper and Venables (2004)

Source: Authors' literature research and elaboration

2.5 Profiling the ICT innovation ecosystem in Kosovo

The domestic market of Kosovo is still small-scaled and undeveloped. Consequently, Kosovo's innovation and entrepreneurial ecosystem are still in its initiation phase. Therefore, this ecosystem suffers from the insufficiency of the branding position of the ICT industry. However, on the way to the development and positioning of the Kosovo ICT industry, we can find some advantages that will be able to help the development of the innovative ecosystem in Kosovo.

Initially, the Government of Kosovo, through the Kosovo IT Strategy, has demonstrated and recognised the crucial role of the ICT industry in its social and economic development.

Through this scientific research, it is attempted to be achieved the collection of all relevant information and engagement in mapping the ICT innovation ecosystem in Kosovo. The final product of this research should be the closure of all the gaps that will allow us to have a clear picture of this ecosystem. To the best of our knowledge, there are no efforts of mapping the ICT innovation ecosystem in Kosovo. In Figure 2, it is

elaborated the heptagonal cooperation-influence model of innovation ecosystem actors on a firm's innovation and new product development, which is the main purpose of this research. This model was designed by the authors of this paper as an attempt to map the ICT sector in Kosovo. The segments of the heptagon describe the cooperative relationships among Innovation Ecosystem Actors of the ICT Sector, while the outer lines of the heptagon describe the influence relationship of Innovation Ecosystem Actors on firm's innovation and new product development. The seven heptagon's angels (IE actors) chosen in this model are research institutions and universities, government, financial institutions, start-ups and enterprises, NGOs and development agencies, incubators and accelerators, social and cultural norms.

Figure 1 Innovation ecosystem actors



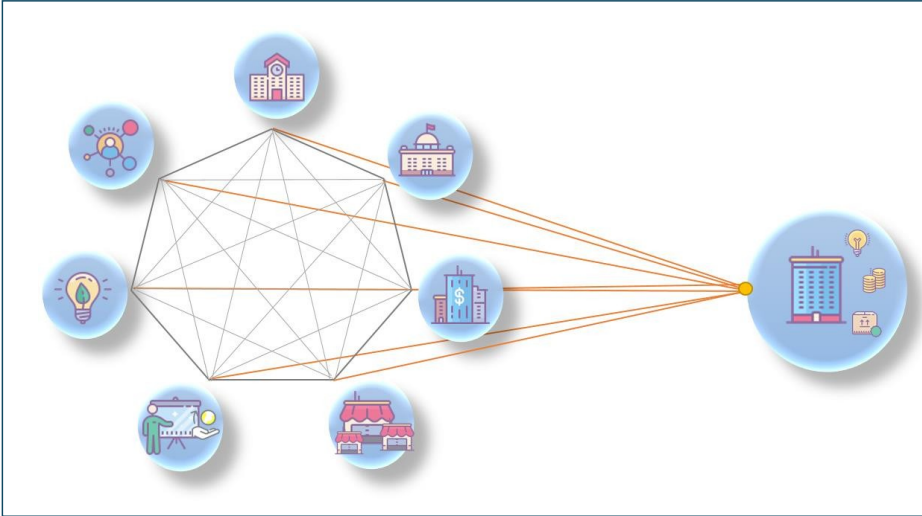
Source: Authors' elaboration

2.6 The ICT sector in Kosovo

Like any emerging market, Kosovo's financial market is not advanced enough to offer more facilitative service packages for new businesses, like venture capital financing, angel investors, and private equity firms. The banking sector in Kosovo is not an attractive and supporting actor due to businesses, especially start-ups. The high-interest rates loans and collateral are non-motivating factors of the collaboration of banking

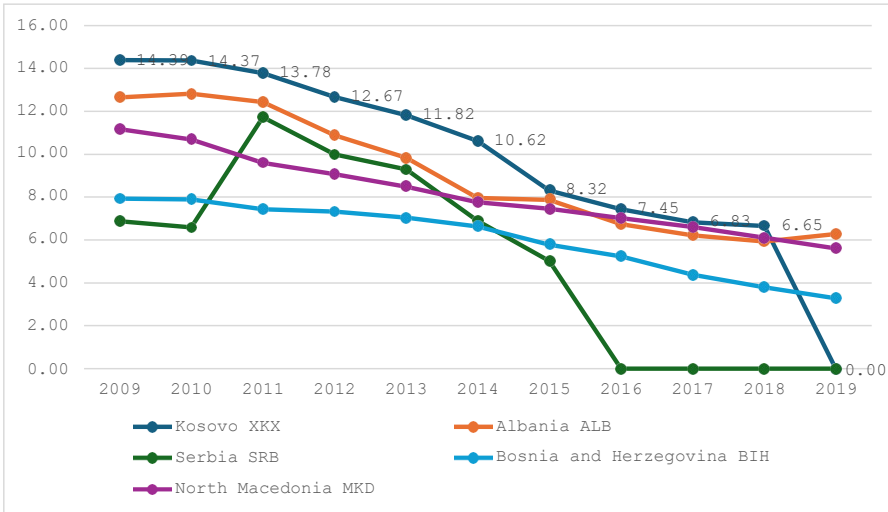
sectors and businesses in general. As shown in Figure 3, Kosovo has the second-highest lending interest rate in the region, standing behind Albania (The World Bank Indicators, 2019).

Figure 2 The heptagonal cooperation-influence model of innovation ecosystem actors on firm's innovation and newproduct development (see online version for colours)



Source: Authors

Figure 3 Kosovo and its neighbouring countries' lending interest rate (see online version for colours)



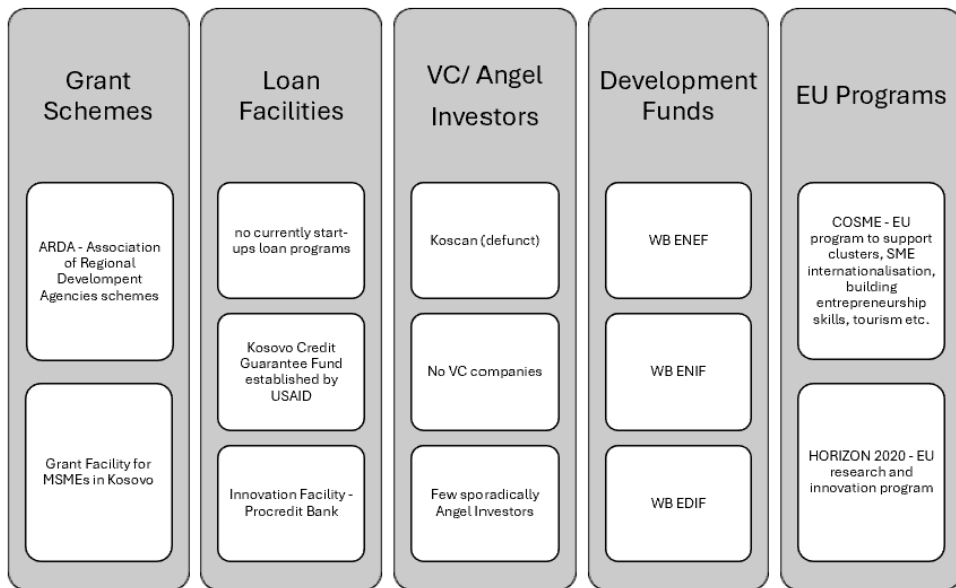
Source: Data obtained from The World Bank (2019) online database, and the graph is processed in Excel Sheet by the candidate

Lack of financing, or rather, high-interest bank loans is a serious obstacle for Kosovo's ICT industry growth and development. Furthermore, the absence of export financing

schemes for Kosovar companies, especially those in the ICT industry, is very challenging and non-supporting for the internationalisation of the domestic market of Kosovo.

However, there can be found sporadically some funding sources that are focused on the ICT sector in Kosovo. In Figure 4, there are listed the funding resources for ICT in Kosovo which are found in the Kosovo IT Strategy (2016) and Instrument for Pre-Accession Assistance (IPA II) 2014–2020, European Commission.

Figure 4 Funding sources of ICT sector in Kosovo



Source: Adapted from Kosovo IT Strategy (2016); Instrument for Pre-Accession Assistance (IPA II) 2014–2020

Countries with strong national ICT industries are randomly better in attracting foreign direct investments (FDI). Thus, the promotion of Kosovo's ICT industry can help stimulate foreign investors and attract FDI, by improving its image, the technical and skill base, and the business climate, Simnica and Jashari (2017). As Sanfey et al. (2016) find, the Western Balkan is an attractive region for FDI based on its macroeconomic stability, strategic geographic position, low labour cost, and comparatively educated population.

3 Methodology

3.1 The research approach

The deductive approach is considered the most suitable method to analyse information about this study. As Saunders et al. (2009) explain, when there is extensive literature on the chosen topic from which the hypothesis can be formulated (Rammal, 2023; Rana et al., 2023), the deductive method is more suitable. Additionally, other researchers

explained that the deductive method is associated with quantitative research studies (Bryman and Bell, 2015).

3.2 *Sample*

This study has used Convenience Sampling. The convenience sampling includes participants who are available and willing to be a part of the study (Creswell, 2005) and are easily accessible to the researcher (Given Lisa, 2008; Suen et al., 2014), and as Dornyei (2007) states, it should meet the preconditions like easy time availability and geographical proximity. It would be outstanding to use the whole population, but due to limitations and rationality, the majority of researchers does the random sampling technique. As Creswell (2013) says, a sample is a small set of cases that researchers select from a bigger pool and generalises to the population. Furthermore, this approach is considered more suitable since the questionnaire is planned to be allocated personally to the selected participants of the survey.

For the sample size it is used the Green's (1991) formula to calculate the optimal sample size of this research. Based on the calculation, the sample size requested to do correlation and regression analysis for this study has resulted to be more than 106 participants. The companies sampled for this study, as explained above, were ICT companies, which their locations were from different parts of the country of Kosovo. For the purpose of the study, this geographic dispersion of ICT companies among different cities of Kosovo was very helpful toward researching the impact of geographic proximity of ecosystem to the success of a company.

3.2.1 *Demographic characteristics of company's involvement in the ICT ecosystem in Kosovo*

The self-identification of relevant actors as part of an innovation ecosystem should be the essential step of the leaders of an ecosystem. Analysing in more detail the results of field research, it is noted that geographical proximity plays a huge role in being part of an ecosystem but is not always a decisive factor. Illustratively explained by the results of the survey of this paper, there have been cases when the business has been very close to the innovation ecosystem but has identified itself as not a member of the ecosystem. Alternatively, there have been businesses that have been geographically further away from the innovation ecosystem, but that have identified themselves as members of the innovative ecosystem. This suggests that the development of technology has diminished the essential impact that the geographical factor has had before. Now, businesses are technology-related and can be part of any kind of business formation, but always remembering that no matter how technology evolves, the physical factor still remains primary.

Based on the results presented in Table 3, we can understand that the ICT Innovation Ecosystem in Kosovo has a long runway to embrace all stakeholders or innovation ecosystem actors, to make them active part of it. As seen in the table above 31.1% of surveyed ICT businesses have identified themselves as a non-part of the ecosystem, 29.4% of them have identified themselves as part of the ecosystem. On the other hand, 29.4% of surveyed ICT businesses do not have clarity about their participation in the ecosystem. In the figure below it is shown visually the perception of the surveyed ICT businesses about their involvement in the ICT ecosystem in Kosovo.

Table 3 ICT company's involvement in the ICT ecosystem in Kosovo

<i>ICT Company's Involvement in the ICT Ecosystem in Kosovo</i>	<i>Frequency</i>	<i>Percentage (%)</i>
Yes	35	29.4%
No	37	31.1%
Maybe	47	39.5%

Source: Authors

3.3 *Source of data collection and research instrument*

The study has used primary quantitative data collected by questionnaires as the most suitable form of collecting data for this research. Since the study is conducted using the deductive approach, the questionnaire is considered to be the most suitable instrument for gathering data. As Saunders et al. (2003) and Sekaran and Bougie (2016) explain, a questionnaire survey is a methodology which is usually associated with deductive research and it is generally used to collect data from a large population in an economical manner, and according to Bryman (2006) it is found to be the most common technique for data collection in quantitative studies.

The survey questionnaire for this study is developed by using measurement scales adopted from prior studies and from the authors. The data are analysed using the Statistical Package for Social Science (SPSS). The Cronbach's Alpha reliability test will be executed to check the internal consistency of the questionnaire, then the data will be analysed using both descriptive and inferential statistical techniques such as Correlation and Multiple Regression, etc. The period of distribution and data collection was June-August 2021. The companies sampled for this study were ICT companies from Kosovo.

3.4 *Study variables*

The variables of the study have been carefully determined and grouped into dependent and independent variables. This study has seven independent variables, as follow:

- 1 research institutions and universities
- 2 government
- 3 financial Institutions
- 4 start-ups and enterprises
- 5 non-government organisations
- 6 incubators and accelerators
- 7 culture and social norms.

These independent variables are measured by adopting the previously used scale by Corrente et al. (2018), Striteska and Prokop (2020), and its researcher variable. On the other hand, the dependent variables are carefully selected from different authors to give a broader and comprehensive overview of the Firm's Innovative Performance, including new product development, culture to innovate, and firm performance. As Murphy et al. (1996) recommended to use multiple performance dimensions. As a result, following the

recommendations from above, the firm's innovative performance in this study is measured through four dimensions, such:

- 1 firm's introduction of new or significantly improved product
- 2 profitability
- 3 growth
- 4 efficiency

The items of the questionnaire (questions) have been grouped according to the variables selected to this study. Consequently, the questionnaire will contain three parts:

- 1 general and/or demographic information of the participants
- 2 innovation ecosystem variables
- 3 performance variables.

The measurement scale used on this study was Likert Scale. As suggested by Gliem and Gliem (2003) to measure the internal consistency of the variables, specifically those using Likert-scale items, it is recommended to test the reliability of scales by using the Cronbach's Alpha. The overall model of this study had a Cronbach's Alpha of 0.938.

In Table 4, there have been summarised the variables, their description, and their measurement scale.

Table 4 The description of study variables

	<i>Variable</i>	<i>Description</i>	<i>Type of variable *</i>	<i>No. item</i>	<i>Adapted from</i>	<i>Measurement scale</i>
Innovation ecosystem variables	RD	R&D that firm has contracted out to other firms (including other firms in them group) or to the public or private research organisations and universities	IV	2	Striteska and Prokop (2020)	Likert scale (from strongly disagree to strongly agree).
	GOV	"Government Programs" concern the presence and quality of programs directly assisting SMEs at all levels of government (national, regional, municipal)	IV	2	Corrente et al. (2018)	Likert scale (from strongly disagree to strongly agree).
	FIN	"Entrepreneurial Finance" represents the availability of financial resources for small and medium enterprises (SMEs).	IV	2	Corrente et al. (2018)	Likert scale (from strongly disagree to strongly agree).
	CO	Cooperation on any innovation activities with other firms or institutions.	IV	2	Striteska and Prokop (2020)	Likert scale (from strongly disagree to strongly agree).

Table 4 The description of study variables (continued)

	<i>Variable</i>	<i>Description</i>	<i>Type of variable *</i>	<i>No. item</i>	<i>Adapted from</i>	<i>Measurement scale</i>
	NGO	Non-government organisation projects to help start-ups and other enterprises of the innovation ecosystem	IV	2	Researcher	Likert scale (from strongly disagree to strongly agree).
	INC&AC	The cooperation with Incubators and Accelerators	IV	2	Researcher	Likert scale (from strongly disagree to strongly agree).
	CULT	“Cultural and Social Norms” represents the extent to which social and cultural norms encourage or allow actions leading to new business methods or activities that can potentially increase personal wealth and income.	IV	2	Corrente et al. (2018)	Likert scale (from strongly disagree to strongly agree).
Performance variables	INIP	Introduction of a new or significantly improved product.	DV	1	Rogers (1998); Striteska and Prokop (2020)	Likert scale (from strongly disagree to strongly agree).
	PRF	Profitability: The account-based measurement: ROA (Return on Assets), ROE (Return on Equity), and PM (Profit Margin).	DV	3	Gow et al. (1998), Santos and Brito (2012)	Likert scale (from strongly disagree to strongly agree)
	GRTH	Growth: Market-share growth, Asset growth, Net revenue growth, Net income growth, Number of employees growth	DV	3	Santos and Brito (2012)	Likert scale (from strongly disagree to strongly agree)
	EFF	Efficiency: Maximising outputs from given inputs, and so minimising the costs	DV	3	Murphy et al. (1996)	Likert scale (from strongly disagree to strongly agree)

*IV-Independent Variable DV- Dependent Variable.

Source: Authors

As Jackson (2015) and Myers (1990) emphasise, multiple regression analysis is concerned with the statistical relationship between two or more independent variables

and dependent variables. As a consequence, the multiple regression analysis is considered to be an appropriate model to gain a better understanding of the impact of the selected actors of the innovation ecosystem on new product development and firm innovation performance.

4 Findings

As suggested by Batterton and Hale (2017) and Boone and Boone (2012), the data analysis procedures for Likert scale data must include mean form central tendency, standard deviation in the descriptive statistics, Pearson's r in correlation analysis, also ANOVA, t -test, and regression in inferential statistics. These suggested analysis procedures have been used in the next sections of this study to analyse the Likert scale data. To have a clearer understanding of the composition of the respondents it is given a demographic respondents' profile (See Table 5).

Table 5 Descriptive data of respondents' demographic profile ($N = 119$)

<i>Variable</i>	<i>Frequency</i>	<i>%</i>
<i>Companies' headquarter location</i>		
Prishtine	58	48.7
Ferizaj	8	6.7
Peje	7	5.9
Gjilan	7	5.9
Others	39	32.7
<i>Company size</i>		
1 - 9 employees	98	82.4
10 - 49 employees	18	15.1
50 - 249 employees	2	1.7
Above 250 employees	1	0.8
<i>Geographic market of ICT companies</i>		
Local market (within your country)	111	93.3
Regional market (Balkan countries)	79	66.4
European Union's market	51	42.9
All other countries	23	19.3
<i>ICT company's involvement in the ICT Ecosystem</i>		
Yes	35	29.4
No	37	31.1
Maybe	47	39.5

Source: Authors

4.1 Inferential statistical interpretation of data – correlation and regression analysis

4.1.1 Correlation analysis of variables

Prior to the above steps taken in this study, it is found necessary to know whether it exists a relationship between variables incorporated in the study. As a consequence, correlation analysis is considered an indispensable method to measure the significance of correlation between the computed variables of this study. The results are presented in Table 6.

The results from Table 6 show that all correlation coefficients between variables of this study show a moderate to positive correlation.

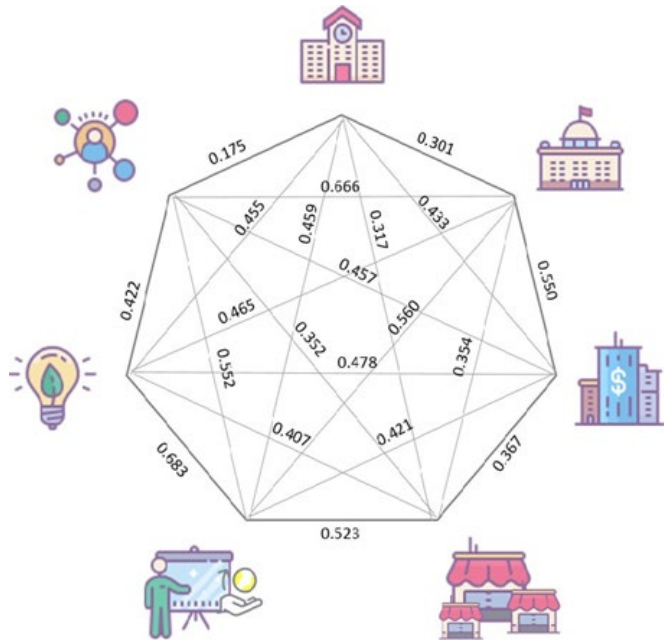
Table 6 Correlation analysis

		Correlations						
		Research Institutions and Universities	Government	Financial Institutions	Start-ups and Enterprises	Non-government organizations	Incubators and Accelerators	Culture and Social Norms
Research Institutions and Universities	Pearson Correlation	1						
	Sig. (2-tailed)							
Government	Pearson Correlation	.301**	1					
	Sig. (2-tailed)	.001						
Financial Institutions	Pearson Correlation	.433**	.550**	1				
	Sig. (2-tailed)	.000	.000					
Start-ups and Enterprises	Pearson Correlation	.317**	.354**	.367**	1			
	Sig. (2-tailed)	.000	.000	.000				
Non-government organizations	Pearson Correlation	.459**	.560**	.421**	.523**	1		
	Sig. (2-tailed)	.000	.000	.000	.000			
Incubators and Accelerators	Pearson Correlation	.455**	.465**	.478**	.407**	.683**	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000		
Culture and Social Norms	Pearson Correlation	.175*	.666**	.457**	.352**	.552**	.422**	1
	Sig. (2-tailed)	.057	.000	.000	.000	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).								
*. Correlation is significant at the 0.05 level (1-tailed).								

Source: Authors, based on SPSS Output. v. 22, 2021

To give a clearer picture of the functioning and interconnection of the actors of the innovation ecosystem, the authors have designed a model entitled “The Model of Heptagon”. The values presented in the inner segments of the heptagon represent the correlation that exists between the actors of the innovation ecosystem studied in this research. In Figure 5, it can be seen the output results of this correlation.

Figure 5 Heptagon cooperation model of IE actors with correlation metrics (see online version for colours)



Source: Authors

4.1.2 Regression analysis model

4.1.2.1 Regression model of the study

The model used in this study is derived from the study objectives and hypotheses and may be reformulated as follow:

$$\text{Overall Firm Innovation Performance} = f(\text{Innovation Ecosystem Actors})$$

Where, the overall firm innovation performance as the dependent variable is measured by four variables in this study, as follow:

- 1 firm's introduction of new or significantly improved product (INIP)
- 2 profitability (PRF)
- 3 growth (GRTH)
- 4 efficiency (EFF)

Correspondingly, the innovation ecosystem as independent variable has seven variables, which are:

- 1 Research institutions and universities (RD)
- 2 Government (GOV)
- 3 Financial Institutions (FIN)

- 4 Start-ups and enterprises (CO)
- 5 Non-government organisations (NGO)
- 6 Incubators and Accelerators (INC&AC)
- 7 Culture and social norms (CULT).

Consequently, the model for every dimension of firm performance can be formulated as follow:

- 1 $INIP = f(RD, GOV, FIN, CO, NGO, INC\&AC, CULT)$
- 2 $PRF = f(RD, GOV, FIN, CO, NGO, INC\&AC, CULT)$
- 3 $GRTH = f(RD, GOV, FIN, CO, NGO, INC\&AC, CULT)$
- 4 $EFF = f(RD, GOV, FIN, CO, NGO, INC\&AC, CULT)$.

Presented in the form of multiple regression, the above relationship can be represented as below:

$$INIP = Q_0 + Q_1RD + Q_2GOV + Q_3FIN + Q_4CO + Q_5NGO + Q_6INC\&AC + Q_7CULT + u_i$$

$$PRF = Q_0 + Q_1RD + Q_2GOV + Q_3FIN + Q_4CO + Q_5NGO + Q_6INC\&AC + Q_7CULT + u_i$$

$$GRTH = Q_0 + Q_1RD + Q_2GOV + Q_3FIN + Q_4CO + Q_5NGO + Q_6INC\&AC + Q_7CULT + u_i$$

$$EFF = Q_0 + Q_1RD + Q_2GOV + Q_3FIN + Q_4CO + Q_5NGO + Q_6INC\&AC + Q_7CULT + u_i$$

where:

INIP:	Firm's introduction of new or significantly improved product
PRF:	Profitability
GRTH:	Growth
EFF:	Efficiency
RD:	Research institutions and universities
GOV:	Government
FIN:	Financial Institutions
CO:	Start-ups and enterprises
NGO:	Non-government organisations
INC&AC:	Incubators and Accelerators
CULT:	Culture and social norms
β_0 :	regression constant (regression intercept)
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$:	regression coefficients
u_i :	error term.

To examine the impact of the independent variables on the four dimensions of firm innovative performance researched in this study, a new model that measures the overall firm innovative performance (OFIP) is developed. The newly developed model used the mean of the total sum of all four performance dimensions by deriving a new dependent variable. This relationship between the newly created dependent variable and the seven independent variables may be shown in the following model:

$$\text{OFIP} = Q_0 + Q_1\text{RD} + Q_2\text{GOV} + Q_3\text{FIN} + Q_4\text{CO} + Q_5\text{NGO} + Q_6\text{INC\&AC} + Q_7\text{CULT} + u_i$$

Where OFIP represents the average of the combined values of Firm's introduction of new or significantly improved product (INIP), Profitability (PRF), Growth (GRTH) and Efficiency (EFF).

A priori expectations of β coefficients based on the study hypotheses will be as follow:

$H_0: \beta_1 = 0$	$H_1: \beta_1 > 0$
$H_0: \beta_2 = 0$	$H_2: \beta_2 > 0$
$H_0: \beta_3 = 0$	$H_3: \beta_3 > 0$
$H_0: \beta_4 = 0$	$H_4: \beta_4 > 0$
$H_0: \beta_5 = 0$	$H_5: \beta_5 > 0$
$H_0: \beta_6 = 0$	$H_6: \beta_6 > 0$
$H_0: \beta_7 = 0$	$H_7: \beta_7 > 0$

The study hypotheses are tested using the Multiple Regression Analysis, from which there are derived the regression table and summary statistic as two very important outputs of this analysis. To test the hypothesis there have been used the values from the regression table in the column of significance or p-values which have helped to accept or reject the formulated null hypothesis prior in the study.

4.2 Test of hypotheses

As mentioned above, the regression analysis has been conducted to test the hypotheses of this study. Consequently, in order to test the impact of Research institutions and universities (RD), Government (GOV), Financial Institutions (FIN), Start-ups and Enterprises (CO), Non- government Organisations (NGO), Incubators and Accelerators (INC&AC), Culture and Social Norms (CULT) and Overall Firm Innovation Performance (OFIP) the multiple regressions were executed based on the following model:

$$\text{OFIP} = Q_0 + Q_1\text{RD} + Q_2\text{GOV} + Q_3\text{FIN} + Q_4\text{CO} + Q_5\text{NGO} + Q_6\text{INC\&AC} + Q_7\text{CULT} + u_i$$

Table 7 gives the results of the multiple regression analysis:

Table 7 Multiple regression analysis

		Coefficients ^a			
Model		Unstandardized		Standardized	
		Coefficients		Coefficients	
		B	Std.		t
		Error		Beta	
1	(Constant)	2.086	.304		6.864
	RD	.180	.081	.209	2.220
	GOV	-.048	.068	-.082	-.712
	FIN	-.008	.067	-.012	-.118
	CO	.196	.070	.260	2.818
	NGO	.054	.084	.081	.639
	INCAC	.193	.078	.275	2.469
	CULT	-.021	.073	-.032	-.289

a. Dependent Variable: OFIP

$R^2=0.339$, Adjusted $R^2=0.298$

Source: Authors, based on SPSS Output. v. 22, 2021

The coefficient of determination R-squared of this study is 0.339 or 33.9%. This indicates that 33.9% of the variations in the model are explained by the explanatory variables of the model of the study while 66.1% can be attributed to unexplained variations comprehended by the error term. The rules of the R-squared results vary from the research area of study. This can be justified in human and social sciences since human behaviour are hardly to be accurately predicted. According to Cohen (1988, 1992), the coefficient of determination (R^2) for linear regression of 0.339 which falls in the categorisation $R^2 \geq 0.26$ is a substantial result of this coefficient.

According to the regression results, the regression model of this study may be presented as follows:

$$\text{OFIP} = 2.086 + 0.180\text{RD} - 0.048\text{GOV} - 0.008\text{FIN} + 0.196\text{CO} + 0.054\text{NGO} + 0.193\text{INCAC} - 0.021\text{CULT}$$

In Figure 6, the authors have built a model that will show in graphical form the metrics of correlation and regression analysis. In this way, the authors try to give a clearer picture about the cooperation and influence that exists between innovation ecosystem actors, and their sole impact on the overall firm innovation performance. As mentioned before, this model is an extended form of the Heptagon Model of IE Actors, and in such form, it may be used in other research in the same field of study. The following metrics are represented in the Figure 6.

Proceeding further, the above regression result was used to test the seven hypotheses of this study. The results are shown in the tabular form in Table 8.

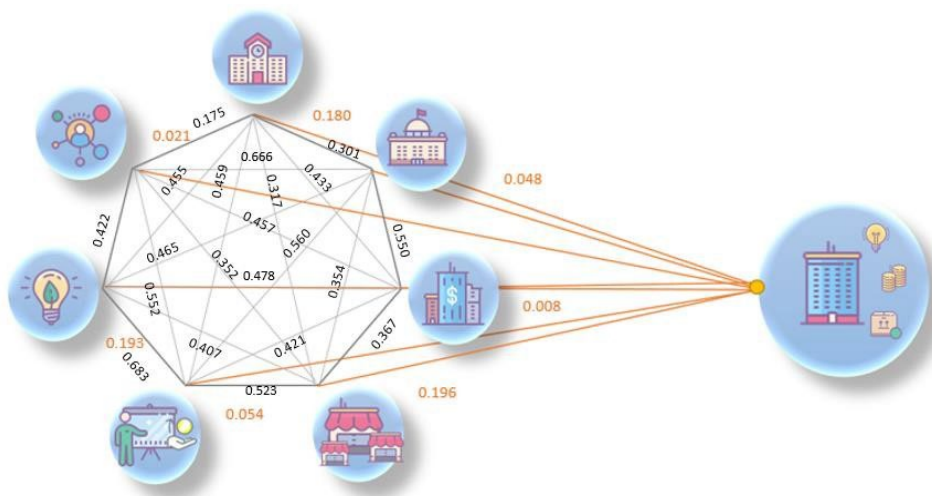
Table 8 The results of testing the seven hypotheses of the study

<i>Hypotheses</i>	<i>Independent variables</i>	<i>p-value</i>	<i>t-value (Critical value 1.6579)</i>	<i>Results</i>
<i>Hypothesis one</i> <i>H0</i>: Research institutions and universities have no significant impact on overall firm innovation performance. <i>H1</i>: Research institutions and universities have significant impact on overall firm innovation performance.	<i>Research institutions and universities</i>	0.028 < 0.05	Positively surpasses the critical value	Confirming the alternative hypothesis
<i>Hypothesis two</i> <i>H0</i>: Government has no significant impact on overall firm innovation performance. <i>H2</i>: Government has significant impact on overall firm innovation performance.	<i>Government</i>	0.478 > 0.05	Less than critical value	Confirming the null hypothesis
<i>Hypothesis three</i> <i>H0</i>: Financial Institutions have no significant impact on overall firm innovation performance. <i>H3</i>: Financial Institutions have significant impact on overall firm innovation performance.	<i>Financial Institutions</i>	0.907 > 0.05	Less than its critical value	Confirming the null hypothesis
<i>Hypothesis four</i> <i>H0</i>: Cooperation with other start-ups and enterprises has no significant impact on overall firm innovation performance. <i>H4</i>: Cooperation with other start-ups and enterprises has significant impact on overall firm innovation performance.	<i>Cooperation with other start-ups and enterprises</i>	0.006 < 0.05	Positively surpasses the critical value	Confirming the alternative hypothesis
<i>Hypothesis five</i> <i>H0</i>: Non-government organisations and development agencies have no significant impact on overall firm innovation performance. <i>H5</i>: Non-government organisations and development agencies have significant impact on overall firm innovation performance.	<i>Non-government organisations and development agencies</i>	0.524 > 0.05	Less than its critical value	Confirming the null hypothesis

Table 8 The results of testing the seven hypotheses of the study (continued)

<i>Hypotheses</i>	<i>Independent variables</i>	<i>p-value</i>	<i>t-value (Critical value 1.6579)</i>	<i>Results</i>
<i>Hypothesis six</i> <i>H0</i> : Incubators and Accelerators have no significant impact on overall firm innovation performance. <i>H6</i> : Incubators and Accelerators have significant impact on overall firm innovation performance.	<i>Incubators and Accelerators</i>	0.015 < 0.05	Positively surpasses the critical value	Confirming the alternative hypothesis
<i>Hypothesis seven</i> <i>H0</i> : Culture and social norms have no significant impact on overall firm innovation performance. <i>H7</i> : Culture and social norms have significant impact on overall firm innovation performance.	<i>Culture and social norms</i>	0.773 > 0.05	Less than its critical value	Confirming the null hypothesis

Source: Authors, based on SPSS Output. v. 22, 2021

Figure 6 The heptagonal cooperation-influence model of innovation ecosystem actors on firm's innovation and new product development with metrics (see online version for colours)

Source: Authors

4.3 Ranking analysis

In this section through Ranking Analysis, it is measured the relative impact of every IE actor individually on the dependent variable based on the regression model that has been

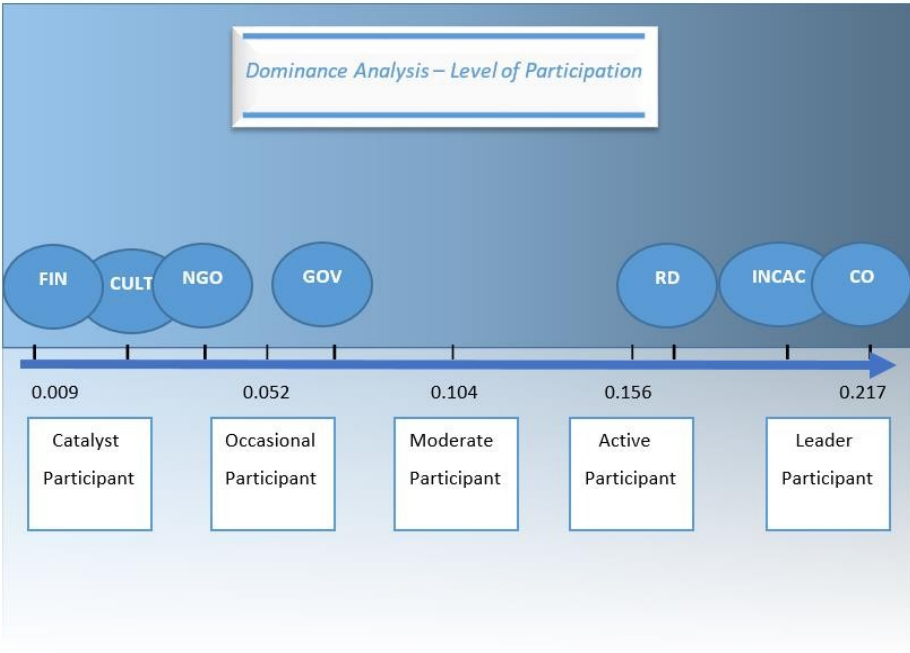
used in this study. The results are derived by calculating Partial Analysis on the Correlation Model. The Partial Results are taken from the each IV, and then these results are squared and then there has been conducted the ranking analysis from the largest result to the smallest. The partial statistics taken into consideration on this section measure the change in the R^2 by dropping each one IV variables repeatedly to see their impact on the DV. The results are presented in Table 9.

Table 9 Dominance analysis

<i>Performance</i>	<i>Part correlation</i>	<i>Squared Part correlation ($\wedge^2$)</i>	<i>Ranking</i>
CO	0.217	0.047089	1
INCAC	0.191	0.036481	2
RD	0.171	0.029241	3
GOV	0.055	0.003025	4
NGO	0.049	0.002401	5
CULT	0.022	0.000484	6
FIN	0.009	0.000081	7

Source: Authors, based on SPSS Output. v. 22, 2021

Figure 7 Dominance analysis – level of participation (see online version for colours)



Source: Authors

Based on the above results presented in Table 9, Cooperation with other Start-ups and Enterprises resulted as the most important IE actor regarding to the Overall Firm

Innovation Performance, followed by Incubators and Accelerators, Research Institutions and Universities, Government, NGOs, Culture and Social Norms and Financial Institutions.

In the following figure, it is designed a chart showing in graphical form the dominance results of the Innovation Ecosystem Actors of this study. The authors, through this graphical form, try to build a model that can be applicable to further studies in this field.

The authors of the paper have categorised the level of the impact of the innovation ecosystem actors into five categories, starting from the actors with the lowest impact to the actors with the highest impact. The actors with the lowest impact have been categorised as Catalyst Participants, on the other hand, the actors with the highest impact have been categorised as Leader Participants. The results are shown in Figure 7.

5 Conclusion remarks

5.1 Implications

There are not many empirical studies conducted on this topic even though in the last decade it has been a very attractive research field among the scientific community. The expected outcome of this research is to contribute to the gap in the literature by providing a first study that examines the impact of the innovation ecosystem on product development and firm innovation in Kosovo. Moreover, by answering the research hypothesis, this research fills the gap also in the international literature about this topic since there is a deficiency of empirical studies. The results of the study can be helpful for economic policymakers. Therefore, they may use the results derived from the research to create better policies to improve the entrepreneurship and innovation climate so the innovation ecosystem performance may progress. The models designed by the authors can be used by other researchers to compare with their studies, while in practical applications, the models can be used as the guidance to build an ecosystem in their respective locations.

5.2 Limitations

The limitations of the study are outlined below. First, even though different scholars have emphasised a different number of Innovation Ecosystem (IE) actors, this study has researched seven of them (those which are predominantly active in the respected Innovation Ecosystem researched in this study). Secondly, the focus of the study was only on the ICT sector in Kosovo. Third, considering that there is no consensus about the performance measurement among the scholars (Al-Matari et al., 2014; Birchall et al., 2011; Murphy et al., 1996; Santos and Brito, 2012; Venkatraman and Grant, 1986), and taking into account that if several dimensions exist, a researcher should choose the dimensions most relevant to his or her research and judge the outcomes of this choice (Richard et al., 2009), there have been selected carefully financial and non-financial measurements. This study has used profitability, growth, efficiency, and firm introduction of new products as the dimensions of the overall firm innovation performance. Fourth, the study was based on analysing subjective data collected directly by ICT companies' owners or representatives, instead of objective data sources like financial statements and

other internal company records, so, the answers collected through survey may be not fully truthful. Even though, the researcher has been very persuasive collecting the information as correctly as possible. Lastly, this study was performed in one country, in Kosovo, so the results may not be replicable to other countries. However, the generalisation of results of this study and adoption to other countries may offer different results. Nevertheless, this study may pave the way to make comparisons with other countries and expand areas for further research.

5.3 Future research directions

The aim of this study was to make a significant contribution to the Innovation Ecosystem literature.

Second, the results of the current research show that Financial Institutions, Culture and Social Norms, NGOs and Development Agencies, and Government do not have a significant impact on the overall firm innovation performance; consequently, there is a need to do further research to determine the cause of this non-significant relationship.

Third, comparable and complementary studies may be conducted into different industries to see if the dominance results of the impact of innovation ecosystem actors differ among industries.

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