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Innovation Policy and Practice: Special focus on Kosovo

Why Kosovo is in a "trailing edge" position?

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Abbreviations

3CIS	Carriers Class Consulting & Integration Services
BSS	Business Support Systems
BSCK	Business Support Centre Kosovo
CBK	Central Bank of Kosovo
CIS	Community Innovation Survey
CEO	Chief Executive Officer
CATI	Computer-Aided Telephoning Interview
CISCO	Computer Information System Company
CNA	Cisco Networking Academy
CPGP	Pharmaceutical Good Manufacturing Practices Professional Certification
CRO	Contract Research Organization
CSR	Corporate Social Responsibility
DEA	Data Envelopment Analysis
DUI	Doing Using Interacting
EIS	European Innovation Scoreboard
ECS	European Company Survey
EWCS	European Working Conditions Survey
EBRD	European Bank for Reconstruction and Development
ESC	Embedded Signalling Channel
EU	European Union
EC	European Commission
EYE	Enhancing Youth Employment
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GMP	Good Manufacturing Practices
GVC	Global Value Chain
ICK	Innovation Centre Kosovo
ICT	Information and Communications Technology
IoT	Internet of Things
IP	Internet Protocol
IPA	Industrial Property Agency
IPA	Instrument for Pre-Accession
ISO	International Organization for Standardization
IT	Information Technology
JIT	Just in Time Manufacturing
JSC	Joint Stock Company
KAA	Kosovo Accreditation Agency
KCC	Kosovo Chamber of Commerce
KCGF	Kosovo Credit Guarantee Fund
KBRA	Kosovo Business Registration Agency
KIBS	Knowledge Intensive Business Service
KPI	Key Performance Indicator
KSA	Kosovo Statistical Agency
LEC	Local Exchange Carrier
MESTI	Ministry of Education Science Technology and Innovation
MIE	Ministry of Innovation and Entrepreneurship
MSO	Multiple System Operators
MTI	Ministry of Trade and Industry
NIC	National Innovation Council

NDS	National Development Strategy
NRC	National Research Council
NRP	National Research Program
NCMP	Network Capacity Management Programs
NETCONF	Network Configuration Protocol
NGN	Next Generation Network
NOC	Network Operations Center
NSO	Network Services Orchestrator
NSI	National Systems Innovation
NGO	Non-Governmental Organizations
NVF	Network Function Virtualization
Off-JT	Outside of the Job Training
OJT	On the Job Training
ORCA	Organization for Improving the Quality of Education
OSS	Operations Support Systems
OECD	Organisation for Economic Co-operation and Development
PBL	Problem Based Learning
PCRF	Policy and Charging Rules Function
QC	Quality Circle
QoS	Quality of Service
R&D	Research and Development
R&D&I	Research and Development and Innovation
RDC	Research and Development Council
RAN	Radio Access Network
SII	Summary Innovation Index
SDN	Software Defined Networking
SMF	Single Mode Fibber
SPT	Service Provider Technology
STEM	Science, Technology, Engineering and Mathematics
STI	Science Technology and Innovation
STIK	Association for Information and Communication Technology of Kosovo
STS	Science Technology and Statistics
TAC	Technical Assistance Center
TDM	Time-Division Multiplexing
UBT	University of Business and Technology
UI	User Interface
UP	University of Prishtina
UPF	User Plane Function
USA	United States of America
USAID	United States Agency for International Development
UT	University of Tirana
VIM	Virtualized Infrastructure Manager
VM	Virtual Memory
VNF	Virtualized Network Function
VNOC	Voice Network Operation Centre
WAN	Wide Area Networks
WHO	World Health Organization
YANG	Yet Another Next Generation

Abstract

As the market increasingly powers economies, it is a clear sign that innovation has become a crucial issue in firms' performance, in producing innovative products and services as required by market needs and it plays an essential role in the competition. Hence in this dissertation, we have taken a step towards enhancing the understanding of advances in the field of innovation. In this research we aimed to contribute to the under-researched area of innovation in Kosovo, and tried to understand the perception, attitudes, and the problems of the critical knowledge suppliers and users or key institutions. In this context, the findings show that many developments are present, but many challenges remain. The core research tool is the so-called "multi-case study" method carrying out at the Kosovo innovation ecosystem's key organisations. The three case studies' reasoning was to map the factors that shape innovation in the institution of knowledge creation or knowledge developing and transferring institutions, such as the university, the business service firm, and the pharmaceutical manufacturing company, within the innovation ecosystem in Kosovo. This research's empirical experiences were based on the times consuming personal semi-structured 24 interviews with key innovation process related actors before and during the COVID-19 pandemic situation. The study's fundamental purpose has been considerably fulfilled. The research answered the research questions regarding the innovation activities; however, many challenges remain; therefore, the research offers future scholars an avenue to further examine advanced input and output innovation activities at the national and firm-level innovation performance.

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Declaration of the originality

This is to certify that:

The thesis comprises my original work towards the PhD except where indicated, and appropriate reference has been made in the text to all other material used.

Introduction

Innovation has a crucial role in firms' performance and plays a vital role in the competitiveness productivity of the firm level and national economy. Many authors have recognized the importance of innovation and its role both at the firm and economic level. Schumpeter (1934), as the pioneering scholar researcher on innovation, has highlighted the importance of innovation in economic development and he was the first scholar who defined innovation as an introduction of new product or services, new production methods, new markets, new sources of supply of raw materials and new organization of any industry. Besides, he states that innovation is viewed as a new concept of a created or modified good or service, which may be either radical or incremental.

Recent years is seen an increasing focus on 'broad-based innovation policies,' or systemic innovation policies, the so-called demand-pull view' and 'demand-driven policy instruments. In fact, this might be the start of a shift from linear to 'holistic innovation policy' that is defined as a policy that aims to incorporate all public activities that affect or influence innovation processes or addresses all policies that influence innovation; in contrast, the narrow approach, or linear focuses mainly on specific policies that are intended to have a particular effect on innovation. However, while the holistic policy is viewed as a guiding vision, innovation policies in most EU countries are still driven by a linear approach (Edquist, 2016); (Makó & Illéssy, 2015). Nevertheless, the formation of the Swedish National Innovation Council (NIC) in 2015, consisting of industry members, Chief Executive Officer (CEOs) of large and small companies, entrepreneurs and business angels, government, trade unions, and academia, and university professors, has the potential to enable Sweden to gradually abandon the linear paradigm of innovation policy and shift towards the development of a holistic innovation policy. NIC has progressed in identifying and addressing a range of innovation policies, and practices in a systemic way, such as risk capital, the role of life sciences in innovation, digitization, enhancing practical public procurement, innovation program collaborations, e.g., cooperation projects between companies' universities and public agencies. Therefore, the Swedish case will offer insights of importance to other countries wishing to move in a similar direction (Edquist, 2018).

Methodology and research questions

In this dissertation, we employ a qualitative methodology, consisting of a review of relevant policy documents and in-depth interviews with key stakeholders. The general problems of the lack of data on innovation in Kosovo are evident; therefore, this research uses a qualitative research technique instead of a quantitative method. This dissertation aims to contribute to the under-researched area of innovation in Kosovo. Besides the literature review and the secondary analysis of the available European surveys on innovation, the core research tool is the so-called "multi-case study" method carrying out at the key organizations of the Kosovo innovation ecosystem. To test how innovation is emerging, developing, or lacking in Kosovo, several organizations of knowledge transfer and use have been selected. The empirical experiences used in this research based on the times consuming personal semi-structured interviews with key innovation process related actors before and during the COVID-19 pandemic situation. In total, the following three organizational case studies were carried out.

1. The Carriers Class Consulting & Integration Services Joint Stock Company (3CIS J.S.C), or shortly 3CIS, business service firm integrated into the global networks of knowledge intensive business service (KIBS) sector.
2. The State University of Prishtina a key knowledge creation and transferring institution in the country.
3. Pharmaceutical manufacturing as a knowledge-intensive sector: the case of Tre Pharm Company.

In the cases of 3CIS J.S.C. business service firm and the bulk of interviews in the case of the State University of Prishtina, were conducted before the COVID-19 crisis. In contrast, the few university interviews and the entire third case study of pharmaceutical manufacturing as knowledge-intensive sector-related interviews were conducted during the pandemic situation using the Computer-Aided Telephoning Interview (CATI) method. Considering the role of organizational case studies in the innovation ecosystem, the main objective of this study is to answer the following research questions:

1. How has the business service firm undertaken innovation efforts to implement open innovation and enhance its market participation in the global value chain (GVC)?

1. How does the university contribute to the process of knowledge creation through R&D and transferring knowledge to the innovation ecosystem actors in Kosovo?
2. How manufacturing company establishes relationships with knowledge transfer institutions such as the university, consulting firms like 3CIS, or other research institutes, and how it evaluates the role of the knowledge-suppliers?

Structure of the dissertation

Besides abstract and the introduction part, the dissertation is structured in six chapters in the following manner:

Chapter 1: Literature review or state of the art as part of the theoretical foundation. This Chapter provides a detailed overview of the evolution of innovation from narrow to the broad-based concept of innovation along with the modes of innovation and the shift from linear to holistic approach and continues with the presentation of the role of NIC Sweden as a pioneering model of the innovation governance in European Union.

Chapter 2: Analyses and assesses the EU country-level innovation performance based on European Innovation Scoreboard (EIS) through the Summary Innovation Index (SII).

Chapter 3: The innovation ecosystem is a complex subject. Chapter three consist of two parts: First part gives an overview of the emerging innovation ecosystem in the Balkan countries, then it examines the innovation ecosystem in Kosovo.

Chapter 4: This chapter outlines the research methodology used in the dissertation with the focus on the type of qualitative research, multiple case study procedures, the selection of indicators, designing fieldwork and data collection and finally trustworthiness of the case studies method. Given this, the role of research questions becomes crucial; therefore, they are addressed in this chapter.

Chapter 5: Chapter five presents the analysis and finding of the case studies on the key players in the emerging Kosovo innovation ecosystem and answers to the research questions addressed in chapter four.

Chapter 6: The last chapter on concluding remarks and future research challenges presents key lessons and challenges faced with and outline the new contribution of the dissertation and finally call attention to future research challenges along with the recommendations.

Chapter 1 Theoretical foundation and innovation policy development

The first chapter aims to offer a clear understanding of the role of innovation in world economic growth, the so-called theoretical foundation or 'state of the art' of the literature review, which consists of credible scientific, scholarly work. Furthermore, the chapter discusses the evolution of innovation theory, the shift from the narrow to the broad concept of innovation, and the two modes of innovation. Finally, the chapter ends by explaining a holistic dominated innovation policy approach through an accurate illustration of the Swedish case study on the separation of R&D from innovation, which is considered very useful in Sweden.

1. Theoretical foundation: a state-of-the-art literature review

Innovation is an important source of growth and plays a vital role in determining the competitive advantages for many firms (Lam, 2011), and it has been shown in recent centuries that it is essential for sustained long-term economic development (Baumol, 2002). In a general sense, economists have long recognised the critical role of innovation for economic success; thus, the famous first chapter of Adam Smith's Wealth of Nations dives right into a study of "improvements in technological innovation and machinery" (Freeman & Soete, 1997). The pace of innovation and the emergence of new technologies has increased dramatically in recent years so that innovative changes are frequently happening (Granstrand & Holgersson, 2020). Innovation is not a new phenomenon, but first, invention and innovation need to be separated (Rogers, 1995). While invention means the first idea for a new product, service, or process, innovation is known as the implementation of ideas or, in other words, commercializing them into practice. Furthermore, inventions are typically carried out by universities and academic institutions, while innovations happen at the business level; therefore, inventions and innovations are both important and should be associated with each other (Fagerberg, 2003). In this context, on the one hand, (Mokyr, 1990) stresses the role of innovation by arguing that without innovation, inventors would be faced

with a lack of focus and have limited economic incentives to pursue new ideas, on the other hand, the author acknowledges that innovation would slow down somewhat without invention; consequently, invention and innovation should be mutually complementary. According to Schumpeter's concept, innovation has been defined as "new combinations" of existing resources. In his study, innovation is the strategic motivation for economic growth, defined as:

- Commercial or industrial introduction of new goods or services.
- Introduction of new production methods.
- Opening new markets.
- Conquest of new sources of supply of raw materials or semi-manufactured goods and the conduct of a new organization of any industry (Schumpeter, 1934, p. 29).

Such combinations of existing resources, in particular skills and capacities, have been viewed as a good source of change creation and have turned invention into innovation in many economic activities in both developing and developed countries, including services (Edler & Fagerberg, 2017) and manufacturing sector (Osborne & Brown, 2013). It is worth noting, though, that if there are long gaps between invention and innovation, the entire process of applying the new idea in practice or its commercialization makes it challenging and slow due to a lack of skills, capabilities, and other resources from the firm (Fagerberg, 2003). Similar to Schumpeter (1934), (Edquist, 2001) offered an excellent explanation of innovation, assuming that innovations are new creations of economic importance typically undertaken by firms, e.g., it may be a new brand, but often new combinations of existing elements; however, it is about what and how firms produce it. The author further explains that product innovations may be goods or services, which is a question of what is being produced while process innovations can be technological, and it regards how goods and services are produced. Thus, product and process innovations are tightly interlinked, whereas organizational process innovations like services are 'intangible', which are essential and should be considered as they are both increasingly important for economic growth and jobs. In this relation, (Schmookler, 1966), in his early studies, claimed that innovation as knowledge is about creating or improving products, and the final stage as knowledge is about producing. In the same way, the terms "product innovation" and "process innovation" have been used to define the phenomenon of new or improved goods or services, respectively, as well as to improve the process used to manufacture (Fagerberg, 2003).

As for invention and innovation, (Schmookler, 1966) strongly highlights the importance of the patents that are more related to the inventive activity; moreover, according to (Dewar & Dutton, 1986, p. 1422), *"innovation is seen as an idea, method or material that is perceived to be new by the respective adoption unit, although it may be an imitation or recombination of old ideas."* Based on research conducted by (Nooteboom & Stam, 2008), innovation can be either radical or incremental. In a way, radical innovation or game-changing is understood to create waves of related and subsequent innovations, while incremental innovations make improvements and differentiate them between varieties. Likewise, radical innovations are more drastic than incremental innovations that are much more frequent. Indeed, through a series of incremental innovations, radical innovations have most of the economic impact. The majority of incremental innovations involve minimal creation of new knowledge and limited R&D, mostly based on existing knowledge, with some adjustments in design, branding, distribution, and added services. Schumpeter has also classified innovation according to how radical they are, often categorized as "incremental" or "radical" innovations. However, Schumpeter mainly focused on the latter category, who believed that was of greater importance (cited in Fagerberg, 2003). Similar to Schumpeter (1934) (Lundvall, 2013) claimed that the innovation process is supposed to be considered one that starts with a mixture of existing components, skills, and knowledge and ends with new knowledge as an output meaning. In this sense, therefore, innovation may be understood as a new combination of more or less distinct elements of knowledge and skills. As more disparate the elements are, the more radical innovation can be.

Furthermore, according to (Kim & Nelson, 2000, p. 5) theory, *"innovation is defined as a pioneering activity that is specifically rooted in the firm's internal competencies and capabilities, that enables for the first time to develop and introduce a new product or service in the market."* However, the authors note that most innovations are profoundly rooted in existing ideas and do not involve breakthrough inventions. On the one hand (Rogers, 1995) claims that innovation is seen as an idea, practice, or object occurring as unique or new to a person and that the perceived novelty of the idea for the individual determines the reaction to it, and if it shows to be new to the individual, then is considered as an innovation. On the other hand, (Kline & Rosenberg, 1986, p. 283) claimed in their early work that *"the greatest important innovations go through drastic changes over their lifetimes-changes, and often*

can, transform the economic significance." This leads to Schumpeter's study, believing that it would be easier to carry out innovative activities in recent years than ever when innovation is reduced to routine, as a result of technological evolutions that have allowed many companies with expertise and capacities to transform what is needed into predictable forms (Schumpeter, 1943). Innovation is often understood as the ability that turns innovation inputs into outputs; thus, it transforms the innovation capability into market implementation (Zizlavsky, 2016). Although (Krugman, 1979) emphasized that innovation is the process by which new goods are created. It is worth mentioning that Schumpeter's early writings focused on the innovation of individual entrepreneurs and the outcome of a continuous historical struggle between individual entrepreneurs. He argued, therefore, that he could advocate some novel solutions to specific problems and that he saw them as innovation-based growth; (the so-called "Schumpeter Mark I"), which failed to consider all organizational dimensions properly. However, Schumpeter (1943) acknowledged this weakness and this shifts to the emphasis to his later work, who stressed the need for more attention to the importance of innovation that can be achieved through "collective entrepreneurship" of industrial R&D in large firms (the so-called "Schumpeter Mark II") though without analysing the phenomenon in detail (cited in Fagerberg, 2003). In this regard, (Baumol, 2002) supports the role of large firms engaged in routine innovation, competing neck to neck with each other to launch innovations on the market.

Moreover, firms would face difficulties entering the international market without offering more attractive, better quality, and cheaper products (Bush, 1945). Hence, there must be a stream of science that turns the wheels between public and private enterprises, and therefore, what is important to note here is that innovations require different types, forms, skills, and knowledge that a single company can rarely present. Thus, close cooperation between universities, firms, public and private research organizations is necessary for significant innovations. In this respect, policy interventions are aimed at creating incentives and increasing private R&D, often through subsidies as well as protecting intellectual property rights (Havas, 2015).

From a theoretical point of view, in terms of what and how innovation policy is assessed, it remains infancy; nevertheless, there is the so-called broad and narrow approach as the two main approaches related to innovation policy. While the broad approach considers all

policies that, in one way or another, affect innovation, the narrow approach deals explicitly with those designed policies which are intended to have a particular impact on innovation (Makó & Illéssy, 2015). The key differences between the two narrow and broad approaches are shown in Table 1.

Table 1: Innovation theory evolution: from the narrow to the broad innovation concept

Dimensions	Narrow approach	Broad approach
Model of innovation	Linear	Recursive
The dominant form of innovation	Radical technological	Incremental non-technological
Knowledge base	Scientific, explicit, and individual	Practical, tacit, and collective
Mode of innovation	STI-mode	DUI-mode
Sector	Manufacturing	No focus on a specific sector
State intervention	Market failure approach	System approach

Source: Author's compilation based on Makó & Illéssy, (2018, p. 8)

1.1. Modes of innovation: underestimated approach of doing-using-interacting (DUI) compared to science-technology-innovation (STI)

This section elaborates on two innovation concepts: The Science, Technology, and Innovation (STI) mode and the Doing, Using, and Interacting (DUI) mode, as an underestimated innovation approach. Furthermore, a detailed description of the various fundamental concepts of STI and DUI modes is given in Table 2 below:

Table 2: STI and DUI concept of innovation modes

The STI mode	The DUI mode
STI mode of knowledge contains codified knowledge and applies to 'know-why' and 'know what' essentially obtained from studying books, training, and lectures.	DUI mode that is based learning method focuses on 'know-how' and 'know-who' rooted in practical experience, which is tacit.
Firm's problem-solving oriented.	Problem-solving oriented groups by performing job rotation tasks that can contribute to better innovation performance. Finding solutions in this way enhances the skills of employees in the company.
STI mode learning begins with the local problem and ends with the global knowledge that can be widely used unless it is protected by intellectual property rights (IPR)	Often very localized.

Source: Author's compilation based on Jensen, et al., (2007, pp. 682-684)

As explained in Table 2, the STI model focuses on production and uses a codified scientific technology and innovation, whereas the DUI is more experienced based on doing using and interacting. However, as far as the economy is concerned, the central tension between these

two modes is the need to combine approaches to national innovation systems with a particular focus on R&D that can produce explicitly codified knowledge while learning interaction between firms. Tension on the part of the firm is seen as a need to reconcile knowledge about the use of Information and Communication Technology (ICT) in order to codify and exchange knowledge. To summarize, based on empirical analysis, both modes of learning can complement each other; though, the combination of the strong version between STI&DUI modes by the firm can result in an excellent performance of product innovation in terms of producing innovative products and services rather than depending on one of two methods (Jensen, et al., 2007).

1.2. Development of innovation policy and policy learning

Innovation policy is needed, in particular, if they focus on helping the new one to emerge, e.g., product innovations, but does not, for example, replace or duplicate what the private sector can do. Producing and developing goods and services is, of course, the main task of firms, while the role of public policy, particularly innovation policy on the part of the government towards the private sector, should help to solve the problems that businesses cannot cope with; thus, innovation policy should be clearly oriented and formulated appropriately (Edquist, 2014). The fundamental point here is that public institutions should not interfere or do things that individuals or firms can do, either better or worse, instead of that innovation policy should focus on issues that have not been done before by firms; therefore, government intervention, in this case, would be beneficial (Mazzucato, 2014).

Innovation policy usually lies on the responsibility of relevant bodies of industry, education, and economy ministries and agencies. In this relation, there is a need for the active participation of relevant ministries and agencies in shaping valuable innovation policies; however, lack of independence, particularly at the level of agencies, may often be a challenging issue, mainly if it contributes to these innovation policies becoming high risk averse. However, formulating appropriate innovation policies is a demanding task since it requires a deep understanding of the context, e.g., the national innovation system, that includes innovation policies. It, therefore, requires sufficient skills and capabilities for policymakers that cannot only be used for granted but must be learned. The key challenge for innovation policy in the coming years will be to increase the skills and capacities of

policymakers as well as other important stakeholders who could be interested in innovation policymaking (Edler & Fagerberg, 2017).

It is worth noting that innovation is related to many variables. It needs not only science, technology, and entrepreneurship but also critical education and training and finance and the numerous organizations and agencies dealing with intellectual property rights regulations, laws, and competition. As a consequence, most innovations are the result of new ways of collaboration between firms and diverse organizations, rather than the individual activities of single dominant innovation firms (Nooteboom & Stam, 2008). It is essential for innovation to have a strategic collaboration and a high value-added relationship between firms and institutions. For example, companies are highly affected and shaped by institutions; organisations may be 'embedded' in an institutional setting where rules, legal systems, norms, and standards are established, although institutions are somehow 'embedded' in organisations. Collaboration between organisations and institutions is very complex and characterised mainly by reciprocity; therefore, it is essential to know what firms are doing with innovation processes and how institutions restrict/prevent or enable companies to do such things related to innovation (Edquist, 2001). Therefore, the focus is on the concept of the National Systems Innovation (NSI), which in this case is the critical theoretical tool that considers and incorporates the importance of the economic situation for the possible firms to innovate.

In a broad sense, the connection between public and private sector entities whose key activities and interactions initiate, import, adjust and disseminate emerging technology can be characterized as NSIs (Vertova, 2014). Lundvall and Nelson were the two pioneers of developing an approach to innovation systems. The narrow definition of NSI would include, in particular, organizations and institutions interested only in science and research, such as R&D departments, technology institutions and universities (Lundvall, 1992). In this regard, organizations are firms, universities and policy organizations intentionally designed and have a clear purpose. At the same time, institutions are laws, guidelines, rules, and as the leading institutions engaged in innovation systems, are patent laws, regulations, and laws governing the interaction between firms and universities (Edquist, 2014). In his early work (Edquist, 2001) pointed out that firms do not typically innovate in an isolated environment; thus, in this case, the role of institutions is critical for innovation processes as they shape the

activities of organizations and connections between them. The approach of the innovation system emphasizes that innovation is carried out under particular conditions; so, the starting point is to consider innovation policy as part of the innovation system as the overall objective of the innovation policy is to form the environment in which innovation activities take place (Borras & Edquist, 2014).

It is worth noting that the innovation system has been accepted by a vast number of independent researchers as well as regional and national authorities, and the institutions have adopted it, including international organizations such as the OECD, the European Commission, UNIDO, and others (Bergek, et al., 2008). Innovation policy defines all activities conducted by relevant public institutions that influence innovation processes and should encompass all policies that impact innovation processes, such as research policy, education policy, regional policy, defence policy and public innovation procurement. In this sense, such innovation policies must include designed and applied policies holistically (Edquist, 2014). The key characteristics of the NIS, reflecting a holistic approach to innovation, are summarised in Table 3:

Table 3: Key activities that characterize NIS

Provision of knowledge inputs to the innovation process

- Provision of R&D results and creation of new knowledge, especially in engineering, medicine, and natural sciences.
- Competence building, e.g., through individual learning (education and training of the workforce for innovation and R&D activities) and organizational learning, including formal and informal learning.

Demand-side activities

- Development of new products through public procurement innovation.
- Articulation of new product quality requirements originating from the demand side.

Provision of constituents for the System of Innovation (SI)

- Creating and changing organizations are required for the development of new areas of innovation. For example, enhancing entrepreneurship to create new firms and intrapreneurship to diversity existing firms, and building new research organizations, and policy agencies.
- Networking across markets and other tools, including interactive learning between various organizations that could be involved in the innovation process. This means combining new knowledge factors, built in different areas of the SI, and coming from outside, with elements already available in innovation firms.
- Building and developing relevant institutions like patent laws, tax laws, environmental and safety regulations, R&D investment routines, cultural norms, etc. that impact innovation firms and innovation processes by offering incentives to remove barriers to innovation.

Support services for innovating firms

- Incubation actions such as having access to facilities and administrative assistance for innovation activities.
- Financing of innovation processes and activities that will lead to commercialization of knowledge and its adoption.
- Provision of consultancy assistance that is relevant for innovation processes, e.g., technology transfer, commercial information, and legal advice.

Source: Author's compilation based on Edquist, (2014, p. 17)

Additionally, the author underlines the importance of the ten activities by noting that they are vital to the innovation process since they are very complex and are typically influenced by many factors; thus, all of these ten activities can be connected to innovation policy instruments but acknowledges that these activities can be more evolved and further advanced in the future. However, he stressed the need to concentrate on critical activities as they will help determine the causes of the problems. For example, if the lack of research is perceived to be one of the significant activities that could cause an issue, then it is a matter of R&D that should be focused on as it plays a key role in innovation. Another crucial activity is predicted to be the role of public procurement, e.g., if there is a lack of demand for product innovations, it calls for public procurement to be the priority that can be applied to the innovation demand instrument. This can be important as it stimulates innovation to a much more substantial degree, as the demand-driven policy can continue to shift towards a holistic

approach to innovation; however, the substance of innovation policies still dominates the linear paradigm (Edquist, 2014).

Innovation policies are mainly focused on fostering innovation; thus, they need to be carefully developed and designed to identify challenges in the innovation system in ways that address such complex concerns in the innovation process. Nevertheless, innovation is rarely a goal per se but a means of achieving overall political priorities such as economic development, environmental protection, increased employment, military capability, public health, etc. In other words, innovation policies are structured to affect the whole mechanism of innovation. In this respect, intellectual property rights, tax credits, environmental protections, funding for technology transfer offices, competitive public research funds, industrial and public-private knowledge infrastructure collaborations, soft loans for innovation in specific industries are widely seen in many countries as leading innovation policies (Borrás & Edquist, 2013).

To understand the crucial role of innovation as a whole process, it should include the nature and effects of learning within policy systems; thus, the policy learning process should not be isolated from innovation development (Mytelka & Smith, 2002). In order to establish better conditions for policy learning, policymakers need to design an effective and adaptable system, i.e., to enhance institutional and individual learning in the context of innovation policy, and in particular, to improve the conditions for the learning innovation policy process. In this regard, the broader use of external and independent sources for policy re-formulation, the enhancement of social and political engagement, and the improvement of learning opportunities for others are the three vital explicit steps to encourage policy learning (Lundvall & Borrás, 1997). In addition to accelerating policy learning, there is a need to enhance dialogue between policymakers and the academic community.

1.3. A holistic view dominated innovation policy

As far as innovation approaches are concerned, it might be worth bringing up the distinctions between narrow and holistic viewpoints. The narrow approach considers the invention (only the first occurrence of the idea), while the so-called holistic perspective stresses the importance of understanding the entire cycle of innovation, e.g., beginning from the creation of novel ideas to their commercialization or application and diffusion of the idea in practice

(Edler & Fagerberg, 2017). A holistic approach to innovation policy can be seen as an innovation policy that incorporates all the different aspects that affect innovation processes into a single context needed to determine the operational form of the innovation method. More precisely, *"a holistic innovation policy is defined as a policy that integrates all public actions that affect or influence innovation processes by approaching all activities in a coordinated manner"* (Edquist, 2014, p. 4). However, the author insists that certain requirements are needed to adequately formulate and enforce a holistic innovation policy. First, a deep understanding of the process of innovation is vital. Skills, knowledge, and competencies are critical, as well as to compile a valuable holistic innovation policy, political willingness, and courage in terms of innovation policy priority over other policy areas is a necessity. As a result, the difference between "linear" and "holistic" approaches is placed within the community that is composed of policymakers, and elected politicians, where innovation policies are designed and enforced or taking place (Edquist, 2016).

As mentioned above, in the sense of problem identification, innovation policy within a holistic dominated perspective is seen as a division of labour between private and public bodies. In this approach, two factors must be considered: first, companies must show that they are unable to accomplish their key goals or instead claim that they have been unsuccessful in addressing and solving their problems, and second, the state or related agencies must have the ability to solve problems through innovation policies (Edquist, 2018). Innovation policies in most EU countries are still linear and not holistic, and research that works on the supply side is the most important innovation policy instrument in these countries, and the importance of the demand side is underestimated (Edquist, 2016). In order to achieve a more coordinated innovation policy, it is therefore essential to set up innovation councils, even though they already exist in some countries where representatives of relevant ministries, agencies, public research organizations, businesses, and Non-Governmental Organizations (NGOs) come together to discuss innovation policy guidelines (Serge & Wise, 2015). The next section will examine in depth the case of the establishment of the Swedish NIC.

1.3.1 The need to renew the system of innovation governance: the case of National Innovation Council in Sweden

This part will explain in detail the case of the creation of the NIC in Sweden, initiated by Charles Edquist as an innovation researcher working at Lund University, and at the same time, he became a member of the NIC. In February 2015, the Prime Minister of Sweden took a vital decision to establish the NIC headed directly by him. The key characteristic of the NIC was to make Sweden potentially move from a linear innovation policy paradigm to a holistic innovation policy approach. In Sweden, there is also a Research and Development Council (RDC) chaired by the Minister of Education and Research and the NIC.

Given that research policy and innovation policy are different phenomena, and they have different goals and use almost different policy instruments, a separation between the two is a reason to promote the transformation from a linear innovation approach towards a holistic innovation perspective. Hence, the NIC is committed to dealing with innovation policy much broader than most science, technology, and innovation policy councils in other countries. Thus, the Swedish NIC somehow deals with research policy issues but in the broader context of innovation (Edquist, 2018). The key concept was to separate innovation from R&D but ensure that they are well integrated and mutually supportive of implementation. Here the focus will be more on NIC analysis, given that Sweden is a "leading edge country" in the field of governance innovation (separation of R&D&I by initiating an independent NIC). The NIC involves external advisors from industry, unions, and academia, including three university professors, a trade union representative, and a relevant member of large and small firms in Sweden. In addition to the Prime Minister, the responsible Ministers for Economy and Finance, Enterprise and Innovation, Research and Environment are members of the Council, and the meeting is organized at least four times a year. Thus, the NIC is fully committed to dealing with innovation policy much broader than most Science, Technology and Innovation Policy Councils in other countries, which are strongly dominated by a focus on research issues.

Establishing such a Council ensures that Sweden is fully oriented and can become the first leading country to move away from the linear paradigm of innovation policy and develop a holistic approach to innovation policy. To date, numerous issues have been discussed and settled via the NIC. For instance, among other things, the case analysis of the role of state

capital risk issues and innovation concerning public procurement issues has turned into a political decision, and the direct transitions of innovation policy have also been successful, whilst the holistic perspective for innovation development and additionality have been seriously debated. Additionality is understood as a division of labour between what businesses are capable of doing in the innovation system and what public institutions perform in terms of tasks essential for the innovation system. To create a connection between the main activities of the private sector and the public sector, an important issue to be tackled in the implementation of innovation policy is to identify the problems that need to be handled by the public sector to fix issues that the private sector cannot address. In other words, Sweden aims, through the Council, to determine which innovation policies should be introduced and to examine how existing policies can be modified when designing innovation policies.

To sum up, significant progress has been made on innovation-related public procurement and the provision of state risk capital. Similarly, developing holistic innovation policies demands that these existing innovation policy components be organized and integrated. Therefore, innovation policy is slowly being developed as an independent policy area in Sweden; simultaneously, there is a clear tendency to turn this policy area into an increasingly holistic view in Sweden. The Swedish innovation agenda has evolved from a mostly linear innovation policy towards a more holistic approach. Innovation policy and research policy are distinct, but they tend to be integrated and mutually supportive. Given these innovation trends, there is no question that Sweden has the potential to become a frontier country that breaks away from the linear paradigm of its innovation policy and proceeds to evolve innovation policy in a holistic direction (Edquist, 2016).

Chapter 2 Innovation performance of the European Union: (visible cross-country differences)

The second chapter focuses on analysing European Member States' innovation performance based on the European Innovation Scoreboard (EIS) reports (EIS, 2009 - 2018). More precisely, the cross-country analysis of EU countries will be analysed in-depth and compared with each other. While EIS 2009 aims to analyse the era of EU innovation performance in the run-up to the financial crisis, EIS 2018 will analyse the performance of EU innovation after the financial crisis. Therefore, the objective of the second chapter is to provide a

comparison of the innovation performance of cross-country groups in the EU before and after the financial crisis and the economic downturns of 2008. It should be noted that there are different surveys and methods for measuring the innovation performance of the EU Member States, such as the Community Innovation Survey (CIS), the European Company Survey (ECS), the European Working Conditions Survey (EWCS) and the EIS. A brief explanation of the objectives of these surveys and the rationale for selecting the EIS for the second chapter analysis is provided below.

2.1. Variety of surveys focusing on the innovation performance at the national and company level

The CIS measures the innovation activities of businesses based on the view of employers and innovation statistics, which are part of the EU science technology and statistics (STS). Besides, CIS is a survey of innovation practices emphasising the company, different mapping types of innovation, such as goods and services and process innovation, including marketing and organisational aspects. The adapted and harmonised survey aims to provide information on sector innovation by type of organisation, on various forms of innovation, and different aspects of innovative developments, such as objectives, data sources, public financing, and investment in innovation. In the first phase, CIS data collection was carried out every four years, the first was initiated as a pilot exercise in 1993, and the second phase took place in 1997/1998 for most EU Member States, and the third study was carried out in 2000/2001, while the CIS is carried out every two years in each EU Member State since 2004. In order to ensure comparison across EU countries, Eurostat has developed a consistent basic questionnaire in close cooperation with countries, and the CIS concept and methodology is also based on the Oslo Manual (Eurostat, 2019).

The ECS also takes place every four years since its inception in 2004-2005. The first stage of the ECS addressed various topics relating to forms of working time and working life, the style and quality of social dialogue at the firm level and innovation in the workplace. The second phase of the ECS was carried out in 2009 and involved the practice of flexibility and the practice of social dialogue at the establishment level and the documentation of job processes and the social dialogue at the workplace. Besides, the third version of the ECS was carried out in 2013 at the European firm level, which provided policymakers with extensive data and knowledge on operating methods in terms of work organization, Human Resource

(HR) management and social dialogue. The ECS, in principle, is an employer survey performed by Eurofound in Dublin based on a questionnaire survey. The distinguishing characteristic of this business survey is that ECS is focused on a telephone survey; it includes all 28 EU members, of which management representatives are expected to perform an interview, most responsible for HR in the organization, as well as a representative responsible for setting up the firm (Eurofound, 2015).

Another valuable survey is the EWCS, where Eurofound has been actively tracking working conditions in European countries through the EWCS since 1991. The goal of the EWCS is to measure working conditions in a harmonized framework system focused on the European Member States. It also analyses the relationship between different variables of working conditions in firms, identifies risks and issues and also highlights progress by tracking them regularly, and finally contributes to the development of EU policy in particular on the quality of work. In doing so, EWCS focuses on interviewing employers and self-employed staff at the company level in 28 EU Member States. Respondents interviewed within the company are asked different questions, e.g., concerning employment status, their work with the organization, learning and training, length of working time in the company, physical and psychosocial risk determinants, health and safety of work-life balance, involvement, earnings they collect, as well as financial security (Eurofound, 2016).

Subsequently, unlike other surveys outlined above, which focus mainly on employers at the firm level, the EIS is an annual report published by the European Commission (EC) which aims to provide a comparative analysis of innovation performance research at the country level for 28 EU countries and selected third countries. The EIS estimates the relative strengths and weaknesses of national innovation systems and encourages EU countries to identify key areas that need to be addressed in order to boost innovation performance in the countries (EIS, 2018). Therefore, considering all the surveys listed above in this chapter, we pick the EIS 2009 and EIS 2018 reports to be analysed in-depth, as this seems to be the most suitable survey and is more relevant to the entire purpose of the study compared to other types of surveys. Furthermore, a total of 28 EU Member States are included in the research of this chapter, the innovation performance of which will be analysed based on a cross-country comparative group, such as the Nordic countries, the Continental countries, the Anglo-Saxon countries, the Mediterranean countries, and the Central and Eastern

European countries. Most notably, the reasoning for using the EIS study rather than other surveys for the second chapter of the analysis is that EIS is a country measure report on innovation performance relative to other reports, which are employer oriented. Hence, the second chapter focuses on assessing the innovation success of the 28 EU Member States, for which analysis of the EIS studies before and after the financial crisis is essential.

2.2. Measuring the EU country-level innovation performance

Why using EIS as an evaluation tool? As defined above, the EIS annual reports provide a comparative evaluation of the innovation performance of the 28 EU countries at the country level and identify the strengths and weaknesses of the country's innovation performance. The report shows that the performance of EU innovation continues to improve and that such development has increased, especially in recent years; however, progress remains unequal within EU countries. In this regard, it is worth noting that, according to the EIS 2018 survey, the average innovation performance of EU Member States in 2017 has improved by 5.8 percentage points since 2005. Although in terms of performance and composition of the EU economy in 2017, GDP per capita of the EU was 28,600 with average GDP growth of 2.2 percent, while employment share manufacturing was 15.5 percent compared to employment share services that were 41.6 percent, and it is worth noting that small and medium-sized enterprises had a turnover of 38.0 percent. When assessing EU innovation performance, the EIS has grouped the EU Member States into four performance groups, considering their average innovation performance scores. By calculating the Summary Innovation Index (SII), EU Member States fell into four separate groups:

- Innovation leaders
- Strong innovators
- Moderate innovators and
- Modest innovators

According to the EIS, countries under the 'innovation leaders' group are characterized by innovation performance above the EU average. The second group is 'strong innovators' with an innovation performance close to the EU average. However, countries in the group of 'moderate innovators' are those with innovation performance below the EU average. Lastly, the 'modest innovators' are countries whose performance is far below the EU average. More detailed information is given in Table 4, but first, a brief explanation for separating the

following EU Member States from the five categorized geographical areas is provided below:

- Nordic countries (Sweden, Finland, and Denmark)
- Continental countries (Germany, Netherlands, Austria, Luxemburg, France and Belgium)
- Anglo-Saxon countries (the United Kingdom and Ireland)
- Mediterranean countries (Spain, Portugal, Italy, Greece, Malta, and Cyprus)
- Central and Eastern European countries (Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, Slovenia, Romania, Croatia, and Bulgaria)

Nordic countries are characterized by the highest degree of social protection and general health service. However, there was a need to make a fiscal intervention in labour markets based on a range of "active" policy instruments compared to Anglo-Saxon countries with relatively high social assistance, and money flows were seen to be oriented to people of working age. As for the labour market, the model was based on a mixture of weak unions, comparatively broad distribution and wage growth, and a relatively high rate of low-wage employment. In contrast, Continental countries depend heavily on insurance-based, non-employment, and old-age pensions. While Mediterranean countries have focused on their social expenditure on old-age pensions, and their social welfare schemes have generally benefited from job safety and early retirement allowance in order to exempt parts of the working-age population from inclusion in the labour market. Finally, the segmented approach to capitalism was of particular significance in the case of the Central and Eastern European countries, where one of the key factors of post-socialist economic development centred on Foreign Direct Investment (FDI) and multinational companies (Sapir, 2005); (Makó & Illéssy, 2016). Table 4 indicates how the grouped EU Member States are divided into these categories based on their average performance scores, determined by a composite predictor.

Table 4: Performance of innovation systems of EU states classified into four groups for 2018

EU Country groups comparison	Innovation Leaders	Strong Innovators	Moderate Innovators	Modest Innovators
Nordic countries				
Sweden	X			
Finland	X			
Denmark	X			
Continental countries				
Germany		X		
Netherlands	X			
Austria		X		
Luxembourg	X			
France		X		
Belgium		X		
Anglo-Saxon countries				
United Kingdom		X		
Ireland		X		
Mediterranean countries				
Spain			X	
Portugal			X	
Italy			X	
Greece			X	
Malta			X	
Cyprus			X	
Central and Eastern European countries				
Estonia			X	
Latvia			X	
Lithuania			X	
Poland			X	
Czech Republic			X	
Slovakia			X	
Hungary			X	
Slovenia		X		
Romania				X
Croatia			X	
Bulgaria				X

Source: Author's contribution based on EIS, (2018, p. 7)

As regards cross-country comparisons, Table 4 reveals that Sweden, Finland, and Denmark (which belong to the Nordic countries), as well as the Netherlands and Luxembourg (members of the Continental Country Group), are categorised as the first group of innovation leaders in the 28 EU Member States. At the same time, the remaining Continental countries such as Germany, Austria, France, and Belgium are part of the second category of strong innovators. Interestingly enough, Luxembourg, which used to be a prominent innovator, has

recently joined the innovation leaders' group, and Germany was previously rated as an innovation leader and has recently become the second-largest group of strong innovators. It is worth noting, though that the differences in innovation performance are very slight between innovation leaders and strong innovators. Not surprisingly, the United Kingdom and Ireland (Anglo-Saxon countries) are part of the strong innovator's group, while all Mediterranean countries (Spain, Portugal, Italy, Greece, Malta, and Cyprus) belong to the moderate innovators' group. Similarly, in the Mediterranean countries, most CEE countries except Slovenia are moderate innovators. Finally, Bulgaria and Romania are among the last group of modest innovators in the 28 EU countries.

Although comparing the pre-and post-financial crisis (2008) periods of innovation performance by country, the study reveals discrepancies in ranking between the 27 EU Member States in four different categories. For example, Denmark, Germany, Finland, Sweden, and the United Kingdom were among the leading innovation categories with innovation performances above the EU 27. However, the Nordic countries were all part of the Innovation Leaders Group, including the United Kingdom from Anglo-Saxon countries, except Germany, which has recently dropped in the second group. Continental countries such as Austria, Belgium, France, Ireland, Luxembourg, and the Netherlands were listed in the second category of so-called innovation followers before the financial crisis, with innovation performance below but similar to those of the innovation leaders but above the 27 EU Member States. Comparing the periods before and after the financial crisis, the Netherlands and Luxembourg have improved their results, moving from the second group before the financial crisis to the first group. On the other hand, many of the Mediterranean and Central and Eastern European countries, such as Cyprus, Estonia, Slovenia, Czech Republic, Greece, Italy, Portugal, and Spain, have been rated as moderate innovators with innovation performance under 27 EU Member States.

Finally, Bulgaria, Hungary, Latvia, Lithuania, Malta, Poland, Romania, and Slovakia ranked in the so-called catch-up countries, and their innovation score was far below the EU average. Compared to the pre-crisis period, the current analysis ranks Hungary, Latvia, Lithuania, Malta, Poland, and Slovakia better, while Bulgaria and Romania remain among the last group of 'modest innovators.' Croatia was not included in the analysis of 2008 since it entered the EU in 2013 (EIS, 2009).

2.3. Analysing the Summary Innovation Index of the EU innovation performance

This section would analyse the innovation performance of EU nation groups before and after the 2008 financial crisis. The SII measures the performance of EU countries in innovation. This index distinguishes between the four major types of categories, ten distinct innovation measurements using a total of 27 SII indicators (calculated by weighted average) for the EIS 2018 report. From this point of view, the data for 2005 and 2017, reflecting improvements both before and after the financial crisis, will be compared. In terms of the EIS 2018 report, the number of categories and dimensions increased while the number of metrics decreased. For example, the 2005 EIS consisted of three major categories, seven innovation dimensions, and contained 29 indicators. The innovation performance SII is calculated for each country and the EU Member States as a whole. For the sake of clarity, the two forms (before and after the financial crisis) of innovation dimensions (Table 5) and indicators (Table 6) are presented below.

The average innovation performance of the SII of 28 EU members increased by 5.8 percentage points. Compared with the pre-and post-financial crisis (2008) periods, the analysis shows substantial changes in the overall innovation performance. According to the EIS study (2009), the innovation performance growth rate in 27 EU countries has seen an average annual increase of 2.3 percent over the five years. The country with the highest level of SII means that it does well with innovation performance. From 2005 to 2017, it is worth noting that in principle, innovation performance in the EU has improved, but not for all members; more precisely, between this period, innovation performance has been increased members while at the same time it has decreased to 10 EU countries. Table 5 describes the performance indicators of innovation available since the financial crisis.

Table 5: Measurement framework of the EIS

Dimensions of innovation performance and indicators for the EIS 2017	
FRAMEWORK CONDITIONS	INNOVATION ACTIVITIES
Human resources	**Innovators**
1.1.1 Doctorate graduates	3.1.1 SMEs with product or process innovators
1.1.2 Tertiary education	3.1.2 SMEs with marketing or organisational
1.1.3 Lifelong learning	3.1.3 SMEs innovating in-house
Attractive research systems	**Linkages**
1.2.1 International co-publications	3.2.1 Innovative SMEs collaborating with others
1.2.2 Most cited publications	3.2.2 Public-private co-publications
1.2.3 Foreign doctorate students	3.2.3 Private co-funding public R&D
Innovation – Friendly Environment	**Intellectual Assets**
1.3.1 Broadband penetration	3.3.1 PCT patent applications
1.3.2 Opportunity driven entrepreneurship	3.3.2 Trademark applications
	3.3.3 Design applications
INVESTMENTS	IMPACTS
Finance and Support	**Employment Impacts**
2.1.1 R&D investment in the public sector	4.1.1 Employment in knowledge-intensive act
2.1.2 Venture capital expenditures	4.1.2 Employment fast-growing firms' intensive sectors
Firm Investments	**Sales Impacts**
2.2.1 Business R&D expenditure	4.2.1 Medium & high-tech product exports
2.2.2 Non-R&D Innovation expenditure	4.2.2 Knowledge-intensive services exports
2.2.3 Enterprises providing training to develop or upgrading ICT skills	4.2.3 Sales of new to the market and new to firm product innovations

Source: Author's compilation based on EIS report (2018, p. 8)

As seen in Table 5 and Table 6, the key innovation dimensions used in the EIS 2018 post-financial crisis reports being analysed in this chapter are as follows: human resources, attractive research programmes, innovation-friendly environment, finance and support company investments, innovators, linkages, intellectual properties, job impacts, and sales impacts. The following innovation aspects were assessed in the EIS before the financial crisis: human resources, financing and support, firm investment, linkages and entrepreneurship, innovators, and economic effects. Despite several uniform categories, innovation dimensions and indicators, some minor variations are visible in comparing the two tables. Table 6 summarises the performance indicators for innovation that were relevant until the financial crisis.

Table 6 Measurement framework of the EIS

Dimensions of innovation performance and indicators for the EIS 2005
ENABLERS
Human resources
1.1.1 S&E and SSH graduates per 1000 aged population 20-29 (first stage of tertiary education)
1.1.2 S&E and SSH doctorate graduates per 1000 aged population 25-34 (second stage of tertiary education)
1.1.3 Population with tertiary education per 100 population aged 25-64
1.1.4 Participation in life-long learning per 100 population aged 25-64
1.1.5 Youth education attainment level
Finance and support
1.2.1 Public R&D expenditures (% of GDP)
1.2.2 Venture capital (% of GDP)
1.2.3 Private credit (relative to GDP)
1.2.4 Broadband access by firms (% of firms)
FIRM ACTIVITIES
Firm investments
2.1.1 Business R&D expenditures (% of GDP)
2.1.2 IT expenditures (% of GDP)
2.1.3 Non-R&D innovation expenditures (% of turnover)
Linkages & entrepreneurship
2.2.1 SMEs innovating in-house (% of SMEs)
2.2.2 Innovative SMEs collaborating with others (% of SMEs)
2.2.3 Firm renewal (SME entries plus exits) (% of SMEs)
2.2.4 Public-private co-publications per million population
Throughputs
2.3.1 EPO patents per million population
2.3.2 Community trademarks per million population
2.3.3 Community designs per million population
2.3.4 Technology Balance of Payments flows (% of GDP)
OUTPUTS
Innovators
3.1.1 SMEs introducing product/process innovations (% of SMEs)
3.1.2 SMEs introducing marketing/organisational innovations (% of SMEs)
3.1.3 Resource efficiency innovators
Economic effects
3.2.1 Employment in medium-high & high-tech manufacturing
3.2.2 Employment in knowledge-intensive services (% of the workforce)
3.2.3 Medium and high-tech manufacturing exports (% of total exports)
3.2.4 Knowledge-intensive services exports (% of total services exports)
3.2.5 New-to-market sales (% of turnover)
3.2.6 New-to-firm sales (% of turnover)

Source: Author's compilation based on EIS report (2009, p. 7)

Analysing the SII, innovation performance improved by ten percentage points or more for six Member Nations, including Lithuania, the Netherlands, Malta, the United Kingdom, Latvia, and France. The performance has risen between five and ten percentage points for the following six nations, such as Austria, Ireland, Spain, Belgium, Luxembourg and Sweden. Similarly, the performance of six other Member States improved by less than five

percentage points, notably for Slovakia, Poland, Finland, Italy, Slovenia, and Denmark. On the other hand, the performance of the following eight Member States decreased by up to five percentage points: Hungary, Greece, Germany, Portugal, Bulgaria, Croatia, the Czech Republic, and Estonia, while the performance of Cyprus and Romania decreased by more than five percentage points.

Analysing the comparison of EU nation groups as seen in Table 7, the Nordic countries stay at the top of the EU Member States with the best innovation results with the highest scores, led by the Anglo-Saxon countries, where the SII improved innovation performance with reasonably high scores in 2017, respectively. Not far from the Nordic and Anglo-Saxon nations, with decent scores in a strong ranking position, there are also Continental countries; however, relative to the time before the financial crisis, the SII showed marginally better results in 2017. Despite this, the innovation performance of the Mediterranean and CEE countries is comparatively slow compared to the others above.

According to the SII, most countries had marginally improved performance; however, few had decreased, as seen in Table 7. In terms of innovation dimensions, innovation performance has increased mainly by 33.8 percent in the innovation-friendly environment, including indicators under this category. A significant rise led to a 13.6 percent increase in attractive research systems, followed by a sharp 11.8 percent increase in the scale of the firm's investment. Similarly, financial and support performance increased by 7.7 percent and marginally improved sales effect performance by 4.1, while performance remained almost stable across both linkages and intellectual properties dimensions. In principle, innovation leaders perform well in seven dimensions, led by strong innovators, then moderate innovators and modest innovators (EIS, 2018). Table 7 shows the comparison of country groups and their innovation performance by the SII before and after the financial crisis.

Table 7: Innovation performance of the EU countries: before and after the financial crisis

	Summary Innovation Index	
EU Country groups comparison	2005	2017
	EU-25	EU-28
	0.431	0.504
Nordic		
Sweden	0.610	0.710
Finland	0.546	0.649
Denmark	0.572	0.668
Continental		
Germany	0.543	0.603
Netherlands	0.447	0.648
Austria	0.494	0.579
Luxembourg	0.486	0.611
France	0.461	0.551
Belgium	0.477	0.593
Anglo-Saxon		
United Kingdom	0.534	0.613
Ireland	0.504	0.585
Mediterranean		
Spain	0.344	0.400
Portugal	0.317	0.406
Italy	0.320	0.371
Greece	0.279	0.328
Malta	0.280	0.403
Cyprus	0.363	0.386
CEE		
Estonia	0.409	0.397
Latvia	0.204	0.285
Lithuania	0.273	0.359
Poland	0.272	0.270
Czech Republic	0.346	0.415
Slovakia	0.273	0.323
Hungary	0.273	0.332
Slovenia	0.393	0.465
Romania	-	0.157
Bulgaria	-	0.229
Croatia	-	0.258

Source: Author's contribution based on EIS report (2009, p. 58), EIS, (2018, p. 98)

Compared to the pre-financial crisis timeframe (EIS, 2009) of the 27 EU countries, the growth rate of innovation performance has averaged 2.3 percent over the five years. Reflecting changes in innovation performance before the financial crisis, as seen in Table 7, not surprisingly, over time, performance improved comparatively in 2017 (after the financial crisis) compared to 2005 (before the financial crisis). Analysing further the SII of each country, it gives a glance and reveals that almost all EU Member States, except for Lithuania and Poland, have marked a slight increase over the years, whereas these two EU Member States have decreased in terms of innovation performance. It is worth noting that Romania,

Bulgaria, and Croatia were not included in the SII analysis for 2005 since they were not yet EU Member States as Romania and Bulgaria entered the EU in January 2007 and Croatia in 2013. Although the analysis of EU country groups before and after the financial crisis indicates substantial fluctuations in ratings between 2005 and 2017. Indeed, before the financial crisis, the Nordic countries led the SII ranking, followed by the Continental and Anglo-Saxon countries with the highest innovation performance, while the performance of the Mediterranean and CEE countries was lower.

As regards the dimensions of innovation, as outlined in Table 6, these improvements have mostly been made in terms of HR, finance, and support, and throughout, with some advances being made by all EU countries. Besides, some improvements have been made to the linkages and entrepreneurship aspects and the economic impact. There has been a modest increase in firm investments, while the performance of innovators has marginally worsened. Concerning the three top categories to which all dimensions and indicators belong, the EU 27 showed high growth in enablers and firm activities perceived to be the most influential, while overall growth was the lowest in the category of outputs.

In summary, as seen in Table 7, it should be remembered that after the recent financial crisis, the SII indicates that while most countries did not rise dramatically between 2005 and 2017, at least they managed to grow slightly.

It is worth noting that variations in the institutional and legal frameworks between EU countries can make it more challenging to engage in business activities. In this respect, national governments have a crucial role in further improving the innovation performance and capacity of their economies; hence, government procurement is one of the key innovation policies that accelerate technological innovation. Besides, policymakers and statistical agencies and data researchers would need to prepare a good division of labour to pursue this strategy. However, the European Commission (EC) is committed to supporting all EU Member States through the Horizon 2020 Policy Support Facility, especially in the era of deep-tech innovation, which needs the collective efforts of EU, global, regional, and local stakeholders. Finally, to promote innovation in Europe, the EU is calling for closer cooperation between academics, innovators, investors, and policymakers. In conclusion, as seen in Table 7, analysing the possible effect of the financial crisis on innovation, the chapter

reveals that almost every country in the study has increased its ranking, resulting in an improvement in the SII of the 28 EU Member States. Similarly, the EIS analysis indicates a trend for the innovation performance of EU Member States to continue to improve for most indicators leading to an increase in the SII not only in the pre-financial crisis context but also compare to the EIS results in 2017 (EIS, 2009).

2.4. Needs to improve the EIS methodology

The European Commission is using the EIS to support the creation of innovation. As noted earlier, the purpose of the EIS reports for many years now is to provide a comparative assessment of innovation performance for all 28 EU Member States. In doing so, to assess innovation performance, the SII is calculated by EIS using the composition of categories, innovation dimensions, in the total capture of 27 indicators, using the arithmetic average; however, over the years, the number of categories, dimensions, and indicators has marginally changed (EIS, 2009). Nevertheless, EIS methodology has been heavily criticized by (Edquist, et al., 2018) & (Havas, 2016) who offers a critical review of the SII, concentrating on the methodological weakness of the EIS; moreover, they propose an approach on how to strengthen better or develop this instrument. First, the authors tried to evaluate whether the SII of the EIS was an accurate measure of the performance of innovation and realized that the SII did not meet some of the primary factors. In particular, the authors have highly criticized the SII, calculated based on the EIS indicators, by arguing that it does not include adequate data and information to calculate and assess the performance of the innovation framework. For example, the low value of SII will show either a typically low level of performance of innovation activities or a low level of R&D-based innovation, whereas many other forms of innovation are abundant and ignored. According to the EIS, a country with a higher SII is the most successful in innovation relative to others with a lower SII, regardless of whether the indicators measure the input or output innovation. Moreover, the EIS does not have a clear definition of innovation performance, which is somewhat shocking in this case, considering that this is a core purpose in the scoreboard reports, along with the lack of a precise definition of innovation input and innovation output indicators. As for the categories shown in Table 6, the authors criticized how the categories were classified, highlighting the fact that on the one hand, one of the categories was listed as "innovation output", which is nice because it places the importance of output. However, on the other

hand, the "innovation input" is entirely neglected since there is no clear category for innovation input. So, the question here is, how can innovation performance be assessed if there is a shortage of proper innovation inputs?

On the other hand, the EIS confirms that the calculated SII is intended to assess the innovation performance of 28 EU countries, but it is not clear, according to the authors, what exactly is meant by 'innovation performance?' They further explain this by offering a metaphor: they take as an example two countries that are attempting to send a rocket to the moon, and in the end, both countries succeed, but it should be remembered that these two countries differ in terms of funding, e.g., in order to accomplish this aim, the first country requires $1 billion, while the second country needs just $1. In this case, if the key objective is output and if only outputs are considered, both countries will have reached the same level of performance.' However, it feels that the second country might have achieved better performance as the sources of money used in both situations are so different.

According to some innovation studies, it is challenging to introduce any technological innovations without including organizational and managerial innovation, including marketing innovation (Pavitt, 1999). As noted in the first chapter by (Jensen, et al., 2007), which have made fundamental differences among the two modes of innovation, STI&DUI, nevertheless, the combination and implementation of both modes by firms result in excellent innovation performance. Given the differences between the two modes of innovation, the EIS has been further criticised for the way it has designed and classified the indicators for several editions claiming that such a classification is biased and is unlikely to have yet been maintained in relation to the classification of R&D and non-R&D-based innovations. Likewise, the author criticised the EIS indicators, particularly the way they rely on categories, e.g., some indicators are relevant for R&D based innovation, but none of the indicators contributes to non-R&D innovation, which shows a considerable shortcoming. Except that most indicators are not adequately classified into categories, and many of the indicators are not relevant. Finally, the concept of specific indicators for the categories of several EIS publications has shifted since 2002, concentrating only on the assessment of R&D activities but not on non-R&D activities. Activities characterised mainly by the so-called STI mode may be considered more relevant, but unfortunately, there is no activity to pay attention to the DUI mode; therefore, indicators help to characterise neither the low level

of innovation activities nor the low level of innovation based on R&D. A further shortcoming has been identified concerning the role of social innovation given the fact that it relies on R&D - based technological innovation, most likely the EIS indicators, have not caught it (Havas, 2016). However, the authors have also provided the following alternatives regarding their critical concerns about EIS.

As for the SII, whether or not it is a meaningful measure of innovation performance, the authors insist that it is not useful as it does not constitute a significant measure of innovation performance. Instead, they argue that the SII is not helpful in innovation policy design because it combines and calculates the average of input and output innovation indicators. In this regard, they suggest that the performance of innovation should be measured as the ratio between the numerator and the denominator. In addition, performance must rely on a productivity relationship, defined as the ratio of aggregate innovation outputs to aggregate innovation inputs, to assess innovation performance accurately. The right way to do this is to classify the indicators as either inputs or outputs, combine them using the aggregator function through the arithmetic average, and link them to each other using a simple fraction. Data envelopment analysis (DEA) techniques should be used to calculate the productivity index for each country since it addresses the main weaknesses of the deterministic indicators, which claim that the DEA methodology provides complementary results that shed light on the role that returns. The DEA analysis for countries with similar characteristics can therefore be much more useful. The EIS aims to have a real impact on the design of EU countries' innovation policies; however, according to them, the SII had shortcomings in measuring innovation performance and could therefore be misleading not only to researchers and policymakers but also policymakers, politicians, and the general public.

Regarding the definition of innovation performance, (Edquist, et al., 2018) & (Havas, 2016) argue that innovation performance should be understood as a close relationship between innovation inputs and outputs as done in productivity. Furthermore, their second objective was to design and develop an alternative, productivity, or efficiency-based, the measure of innovation system performance. Here they recommend putting more attention to identify the relationships between input and output indicators. Based on the Oslo Manual conducted by (OECD/Eurostat, 2005), Edquist & Havas, offer a concise explanation of the innovation input and output as follows:

- Input indicators for innovation mean resources such as human, material, and financial resources used to produce innovation and get it into the market.
- Innovation output indicators apply to innovative products and processes, new designs, trademarks/brands, and in terms of non-technological innovation, to marketing and organizational developments, which are often market-related and can be either new to the world or new to the industry or new to the company.

Based on the definition of innovation input and output, the authors have classified and combined EIS indicators into eight indicators with a particular emphasis on measuring innovation output and four indicators measuring innovation input. While the remaining indicators, as seen in Tables 5 and 6, are entirely irrelevant, arguing that EIS did not recognize core determinants of demand-driven innovation processes. According to them, the following indicators are the leading innovation input:

- R&D expenditure in the public sector (% of GDP)
- Venture capital (% of GDP)
- R&D expenditure in the business sector (% of GDP)
- Non-R&D innovation expenditures (% of turnover)

In order to measure the performance of innovation by EIS, the authors find in their work that a high score for innovation output indicators means that high innovation output is achieved, so if the input side is significantly higher than output, then the performance of the system as a whole is undoubtedly poor (e.g., the moon project). Therefore, they propose analysing the same data, but in another way, primarily by DEA techniques, in a drastically different ranking of the innovation performance of the EU Member States, which shows different final results. However, performance and rating results conclude that the analysis needs to be improved and developed in future studies.

When it comes to innovation policy, policymakers should be able to identify the main problems of innovation policies in the innovation system and link them to the causes in order to select suitable policy instruments to address the problems. This approach can be helpful and will allow policymakers to develop appropriate innovation policies; however, policymakers and politicians need to be well informed and focus more on using existing inputs rather than increasing the number of new inputs. In doing so, for example, a clear articulation of a hybrid instrument that pays more attention to demand-side innovation policy

instruments can be helpful. Nonetheless, it is crucial first to identify the problems that need to be addressed in innovation policy and then compare existing innovation policies with the innovation policies they aim to achieve. Policymakers should therefore be able to identify and define problems when designing innovation policies and set targets where to go and how to get there and make measurable policies, even though it is sometimes quite challenging to measure. Nevertheless, a possible way to measure innovation policies and performance is to compare existing innovation policies. It may be helpful for policymakers to develop innovation policies by tackling problems that are intended to be addressed through the implementation of new innovation policies.

In conclusion, it is worth remembering that, in principle, EIS indicators can be useful if at least the STI innovation mode is applied, but it would be ideal if EIS were to use both the STI&DUI innovation modes in practice. Thus, not only policymakers but also analysts responsible for innovation issues should place more emphasis on both STI-based R&D and DUI-based non-R&D. Finally, they should be aware of the role of social innovation; therefore, policymakers, in particular decision-makers and analysts, need to pay more attention to the role of social innovation in their nature, objectives, and characteristics (Edquist, et al., 2018) & (Havas, 2016).

Chapter 3 The emerging innovation ecosystem in the Balkan region: The case of Kosovo

The objective of the third chapter is to analyse in detail the development and identify the shortcomings of the emerging innovation ecosystem in the Balkan countries[1] with a particular focus on Kosovo. This chapter uses various sources from the academy and systematic analysis of the so-called grey literature.[2] The first part of this chapter focuses on identifying factors that facilitate and inhibit innovation in the underdeveloped innovation ecosystem in the Balkan countries, with a particular focus on Kosovo. In addition, innovation policy and institutions' role will be closely analysed, and strengths and shortcomings will

[1] Albania, Bosnia & Hercegovina, Macedonia, Montenegro, Serbia, and Kosovo.
[2] According to the University of New England, (2019), the term grey literature indicates the type of research that is either unpublished or has been published in non-commercial form. For example, the type of government reports, policy statements and policy papers, pre-prints/post-prints of articles, conference proceedings, academic theses and dissertations, research reports, newsletters and various bulletins, academics, and private firms are some of the fundamental sources of 'grey literature' https://www.une.edu.au/library/support/eskills-plus/research-skills/grey-literature.

also be identified. The second section will concentrate only on the Kosovo innovation ecosystem with a focus on developments and challenges.

3.1. Brief overview of the development of the Balkan region

Firstly, a brief presentation of the innovation ecosystem will be presented to understand better the role of the innovation ecosystem in the Balkan countries, emphasising Kosovo. The ecosystem in the socio-economic perspective is defined as *"dynamic institutionally embedded interaction between entrepreneurial attitudes, abilities, and aspirations, by individuals, which drives the allocation of resources through the creation and operation of new ventures"* (Ács, et al., 2017, p. 4). Moreover, the innovation ecosystem is understood as a set of interdependent actors and coordinate factors, which enables productive entrepreneurship in a particular country or region. The innovation ecosystem focuses on the culture, institutions, and networks that are built within a region (Stam & Spigel, 2016). In this context, according to the most relevant definition of the innovation ecosystem (Sarkar & Kotler, 2019), it consists of business participants, start-ups, academics, technical and support services, and individuals that drive results. They further claim that an innovation ecosystem approach is nothing less than a structured approach to analysing the innovation system; therefore, the ecosystem aims to identify and collaborate with key innovators such as start-ups, innovators, professional networking, academics, and engage them if required to develop innovation skills through the creation of network learning.

In the last ten years, the Balkan countries have significantly built their institutional infrastructure that enables innovation development; however, compared to the EU Member States, these countries are also a long way behind in catching up on the performance of innovation efforts. The Joint Research Centre (JRC)[3] within the EC is eager to help all countries in the region by shifting their innovation policies and enhancing research and innovation through a range of instruments aimed at tailoring their country's innovation policies to their economy-specific needs. In this respect, innovation, and smart specialization strategies, along with innovation in the firm sector, such as technology transfer measures

[3] JRC is the scientific service and knowledge of European Commission. The JRC employs scientists to conduct research in order to provide independent scientific advice and support for the entire EU policy cycle. The main activities are focused on creating, managing of knowledge and developing innovative tools and making them available to policymakers, and anticipating emerging issues that need to be addressed at the EU level https://ec.europa.eu/knowledge4policy/organisation/jrc-joint-research-centre_en.

and the promotion of horizontal framework conditions, including cooperation and data access, and the combination of all these elements will significantly improve ecosystem performance innovation. Smart specialization is a European method with a key focus on fostering knowledge development as an essential element of the EU 2020 strategy for smart and sustainable growth (Matusiak, 2018).

Moreover, the OECD and Start-up Studies (2018) indicate that countries in the region have gained political and public interest in developing their innovation ecosystems in recent years. While considerable progress has been made in Serbia as a more developed innovation ecosystem, start-ups are increasingly emerging in the non-IT sectors in the most developed innovation ecosystems in the country. Further success in the Balkan countries in 2018 has been the increased participation of companies in the regional innovation ecosystem. In recent years, technology parks, incubators, and accelerators have gained additional public funds as leading institutions to promote small and medium-sized businesses in Macedonia and Serbia. Essential improvements in science and technology park infrastructure are ongoing in Montenegro and Serbia, and these developments are already scheduled and are expected to occur in Macedonia and Kosovo (OECD, 2018).

It should be noted that there are visible gaps between countries in the innovation ecosystems of the region, but no country lacks an innovation ecosystem. In order to sustain the innovation ecosystem, all countries in the region provide grant programmes, e.g., loans and other instruments specially tailored for innovative companies; nonetheless, most grants do not fulfil the current needs of innovative firms. Favourable interest rate loans are issued in the least developed economies in the region; however, they are always associated with collateral, which is often totally inappropriate for innovative enterprises (Startup Report, 2018).

Furthermore, the analysis shows that these economies have strengthened their performance relative to 2016; however, some countries, particularly Kosovo and Albania, have recently made progress on insolvency law. Kosovo has introduced a Credit Guarantee Fund (GCF) to mitigate risk and improve credit in the region, which has been assessed as a beneficial instrument; nevertheless, there is space for more outcomes to be tested or measured. Though North Macedonia, Montenegro, and Serbia are still working to boost venture capital and

business angel network ecosystems, only North Macedonia and Bosnia and Herzegovina remain the two economies in the region that have credit information without non-regulated entities (OECD, 2018). As for the role of universities in the innovation ecosystem, it should be noted that some public universities in the region have their incubators to support innovative companies, but their success is uneven. However, private universities in the region are taking the lead, being "entrepreneurship universities," implementing entrepreneurship in all their programmes and activities. In addition, most countries in the region are now providing compulsory entrepreneurship and start-up related topics in secondary schools (OECD, 2018). Given this, universities and research institutions play an essential role in innovation systems; in emerging economies, participation in research and innovation in these countries is quite an important indicator. In this relation, the EC Horizon 2020 has provided some detailed information on the success rates of project applications and EU funding contributions; moreover, it is worth noting that in addition to R&D, practical knowledge and experiences are an essential source of innovation, and as pointed out in the second chapter, this relates to DUI mode of innovation. Further information on the ranking of countries in the region is shown in Table 8 below.

Table 8: Horizon 2020 success rates of the region

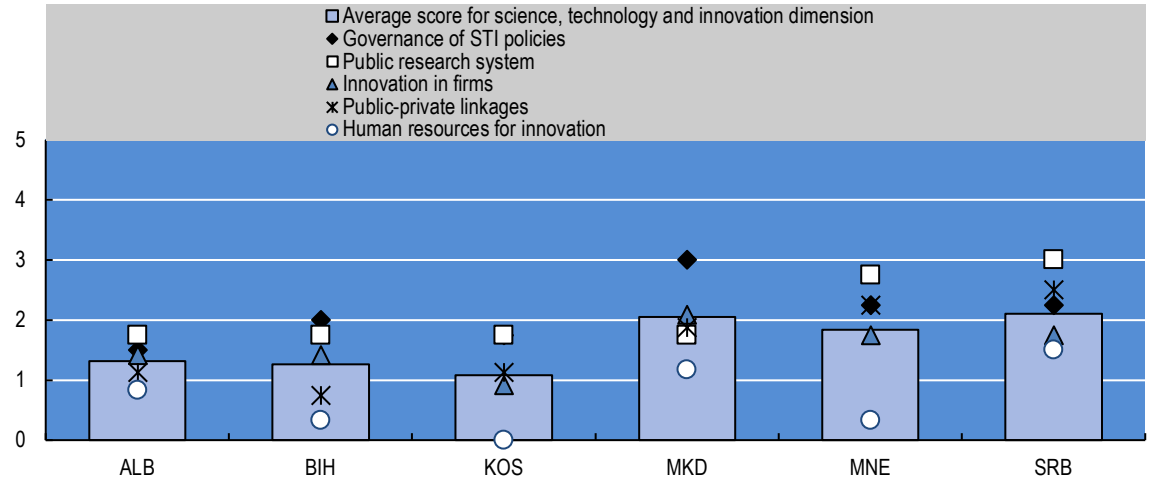
	Eligible applications	Retained applications	Success rate applications
Albania	270	21	7.78%
Bosnia & H	331	46	13.80%
Kosovo	61	11	18.03%
North Macedonia	510	51	10.00%
Montenegro	158	20	12.66%
Serbia	2204	242	10.98%

Source: Author's contribution based on Matusiak, (2018, p. 23).

As shown in Table 8, Kosovo has the highest success rate, more than double that of Albania. While the progress rate of other countries is comparable, it varies from 14 percent in Bosnia and Herzegovina to 11 percent in the case of Serbia (Matusiak, 2018). Foreign donors, such as GIZ, OECD, EU, and USAID, have played a vital role in supporting innovation ecosystems in the regions. These organisations have taken steps to fill gaps in the innovation ecosystem by funding and developing a range of projects and pilots, such as the European Instrument for Pre-Accession Grants (IPA) and the World Bank's STI policy loans led to the development of innovation ecosystems. Although in policy terms, most countries have slightly mentioned innovation within small and medium-sized companies and in their

national strategies, these policies do not shed light on innovation issues. In terms of institutions, relevant ministries and national agencies that support innovation ecosystems, such as small and medium-sized businesses or innovative entrepreneurship, are developed and are in place in all Balkan countries. However, their activities are primarily small to medium-sized businesses, although they also concentrate on innovative companies. Governments also sponsor start-up conferences in Serbia, Montenegro, Kosovo, and Bosnia and Herzegovina. Besides, the sort of ministerial-level coordinating body that works on innovation initiatives is in force in all the economies of the region; however, there is space for better working as such bodies concentrate primarily on international cooperation issues (OECD, 2018) & (Startup Report, 2018). Basically, in all the economies of the region, the results for STI are more modest. Unfortunately, most countries spend very little on their overall R&D expenditure, especially in the business sector, but tax incentives are present in developed ecosystems. As a result, R&D expenditure remains below 0.5 percent of GDP in all countries of the region, except Serbia, where it exceeds 0.9 percent; however, these economies have not introduced any exact fiscal stimulus for R&D in companies, e.g., in the form of tax breaks or credits; hence, the average score is below 1. What is essential for the region's economies is that policymakers have recently tried to move from a linear to a holistic approach to innovation, such as North Macedonia, Montenegro, and Serbia, which have already adopted the holistic approach STI strategy frameworks. While, as seen in Figure 1 below, STI policies have been moderately advanced in the region, and these developments are still at an early stage, requiring more efforts from all economies to develop them further. It is worth noting that these countries are also in the process of adopting appropriate frameworks rather than improving their implementation. Figure 1 indicates some trends and comparisons between the countries concerning STI and its key dimensions.

Figure 1: Science, technology, and innovation: Dimension and sub-dimension average scores



Source: OECD report, (2018, p. 342)

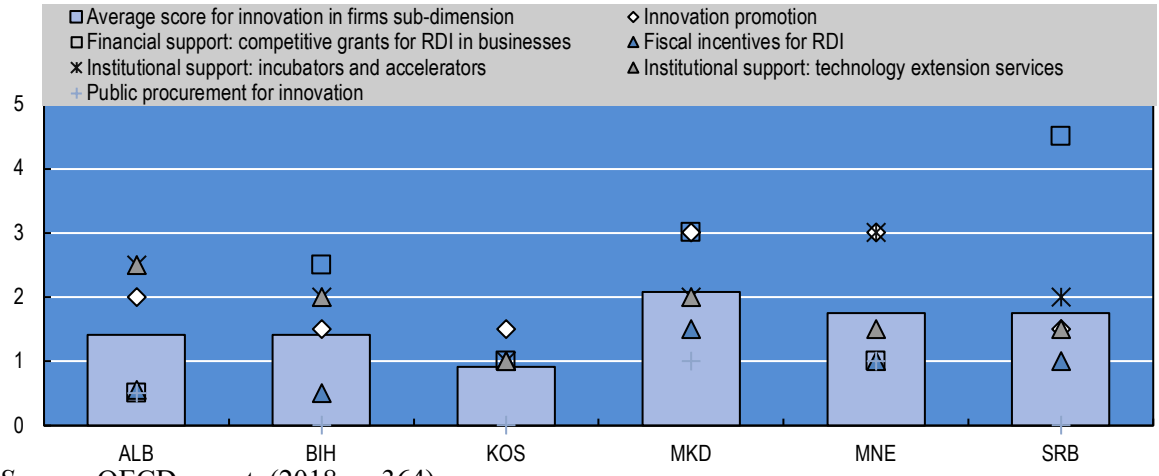
As seen in Figure 1, the human resources pillar for innovation, Kosovo is less advanced than other countries in the region. Nevertheless, all countries face a shortage of innovation policies to facilitate and encourage researchers to innovate and transfer knowledge to firms.

Moreover, the use of public procurement to promote innovation in the region is lagging behind as demand for innovative products and services may be limited. Similarly, in terms of patens filing, all countries in the region lag significantly behind the EU average as they receive less than one-sixth of the EU average for their IP (OECD, 2018); (Startup Report, 2018). However, the number of patent applications indicates significant differences between the economies of the region. Serbia has the highest number of patent applications and is the only economy in the Balkans to have patent applications in all fields that present significant societal challenges. Serbia is closely followed by Bosnia and Herzegovina, while the rest are a long way behind. Governance in science and innovation is developed in the region through international cooperation, mainly through EU-funded programmes as part of the enlargement strategy. The economies are at various stages of the formation of R&D policy governance. As stated earlier, the overall model of innovation governance in the region is rooted in the concept of a linear innovation paradigm (a classic that focuses on R&D) as the sole source of innovation and does not have a proper concentration on non-R&D sources innovation. In general, the R&D&I structure in these economies is primarily public-sector-oriented, line-based activities of public institutions and agencies. The EC suggests that these countries should broaden their governance in two ways. First, countries need to develop a

comprehensive governance framework for R&D&I policy and engage and communicate directly with the private sector. Second, they should involve industry actors in the policy-making process by making innovation an inter-ministerial task (Matusiak, 2018).

Considering innovation from the firm's point of view by evaluating six qualitative indicators, Figure 2 indicates further developments throughout the region; moreover, frameworks for firm-level innovation in the region are still evolving. The analysis of indicators in Figure 3 indicates that the promotion of innovation from the firm's point of view is widespread in all countries, and the incubator infrastructure is still in the growth process. Although other indicators, such as technology extension services, public procurement for innovation, and fiscal incentives for R&D&I, are mostly absent from government policies. In the case of public procurement, the OECD report (2018) advises that countries should find it possible to encourage innovation in the use of public procurement by allowing precise use of functional criteria instead of technical specifications since they can have a positive effect on the promotion of innovative solutions and increased competitiveness.

Figure 2: Innovation in firms: sub-dimension average scores and indicator scores



Source: OECD report, (2018, p. 364)

To catch up with the latest trends and market needs, governments in the region should enhance cooperation between ecosystem innovation stakeholders. The lack of access to capital is a substantial obstacle to innovation in the ecosystem; thus, the available sources of financing need to be further increased; thereby developing national R&D instruments, encouraging innovative companies by subsidies, and co-investing in national and regional capital funds. In addition, developing a tax-benefit structure explicitly for corporations is

essential, with a focus on reinvesting profits in start-ups, innovation, and R&D, as corporations have recently become prominent actors in support of start-up growth, e.g., Serbia is doing well in this respect relative to other countries in the region (Giz, 2019).

In this regard, a significant difficulty identified in the region is that there is no systematic collection of data on government and business spending on R&D, which causes difficulties in measuring input and output indicators. Despite the lack of strategic or high-value-added collaboration between industries and academia remains a substantial barrier; however, joint projects between industry and academia with output in the form of spin-offs are present in all countries in the region, while initiatives for public and private institutions for the execution of initial assistance programmes have not yet been implemented. As noted by (Martin, 2012), recognizing the importance of linkages between public and private sector actors is vital to clarify why some regional economies are more resilient than others. One of the most critical obstacles for governments in the region to systematically engage in developing the innovation ecosystems is a lack of understanding of what start-ups or innovative companies are and how they can better be supported across the innovation ecosystem. As a result, legislative challenges impacting the innovation ecosystem are not being addressed by governments, and issues are progressing quite slowly due to a lack of success stories, especially a lack of public-private dialogue. Finally, in policy learning, brain drain remains a rather significant problem in all the economies of the country (OECD, 2018); (Startup Report, 2018) and (Matusiak, 2018).

3.1. Innovation ecosystem in Kosovo

This section focuses on the structure and function of the innovation ecosystem in Kosovo, but first, a glance picture of the overall economy is presented. Kosovo is a young country with the youngest population in Europe. Data indicate that Kosovo's economy grew by 4.3 percent in 2018, although it grew marginally by 4.7 percent in 2019. Kosovo's fiscal situation is pretty strong; lately, fiscal policy is sound and stable, including tax policy, improving every year (Wrobel, 2019). Thus, Kosovo is, in principle, at the stage of improving its economic stability. In addition, it is worth mentioning that Kosovo has recently been very active in developing the business environment, and this has directly led to a more significant number of new businesses being opened every year. As a result, according to the World

Bank report (2019) Kosovo proved to be one of the most significant improvements, compared to 2012, when Kosovo was ranked 126th in the world, while in 2018, it increasingly shifted to 40th place. Moreover, in one of the leading indicators, "starting a new business", Kosovo is ranked 10th in the world (Doing business report, 2019). All of this indicates significant success in making Kosovo perform reasonably well in the country's economic environment.

The role of innovation in economic development is not yet fully recognized in Kosovo, and the government and business structures are gradually reflecting the importance of innovation as one of the key pillars of economic growth. In this regard, Kosovo is increasingly developing favourable conditions and policies for innovation, e.g., significant policies and laws to support economic development are in place, but the insufficient institutional capacity of the state has hindered implementation. The agenda of the STI has recently gained political attention in the Kosovo economy. The Ministry of Education Science and Technology (MEST) and the Ministry of Trade and Industry (MTI) are the key institutions responsible for establishing a policy framework and environment for innovation, while the Ministry of Economic Development (MED) is steadily increasing its role in the innovation mechanism. The Ministry of Innovation and Entrepreneurship (MIE) was formed in 2017. EUR 1.1 million has been allocated to laboratories and specific facilities to support the innovation ecosystem; however, little progress has been made towards integration into the European Research Area (ERA). Kosovo needs to submit reliable statistics to track progress in this area, while Kosovo participates as a third party in the EU's Horizon 2020 research and innovation programme (OECD, 2018).

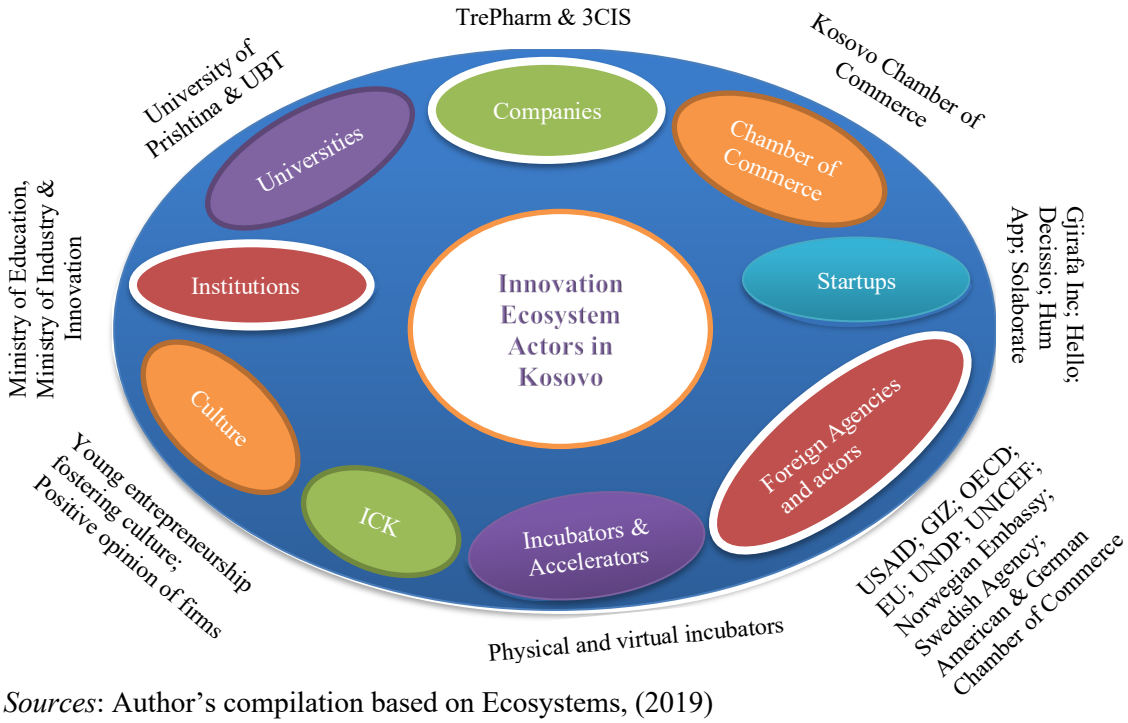
With the creation of the MIE, Kosovo has been able to start introducing a programme that directly affects the progress of innovation and the economic growth of the country; as a result, the Innovation and Entrepreneurship Fund has been set up to help innovative companies, NGOs, and SMEs in Kosovo (Wrobel, 2019). Kosovo's private sector relies heavily on small and medium-sized enterprises generating employment and contributing to economic development, consisting of traditional non-innovative enterprises that tend to be minimal in the use of existing models but have done well in job creation, where SMEs account for around 80 percent of the working population (Hauser, et al., 2016). According to a survey conducted by the Business Support Centre Kosovo (BSCK), which surveyed 500

SMEs in Kosovo, shows that SMEs in Kosovo are mainly focused on improving existing products on incremental innovation with a low number of innovations accompanied by poor quality. The findings showed that the number of innovations that were considered new to the market was only 36.3 percent of all SMEs interviewed, while 56.7 percent were perceived to be of new innovations for firms (Rexhepi, 2014).

Not surprisingly enough, the necessary ingredients and all relevant actors of the innovation ecosystem in Kosovo are present. However, a systematic approach towards linking such components between them to make the innovation ecosystem function properly as an ecosystem that directly supports innovation has been somewhat lacking. Though both types of physical and virtual incubators that provide training and professional support services to innovative firms are available (Stikk, 2014), e.g., Innovation Centre Kosovo (ICK), Chambers of Commerce, startups, companies, universities, and public institutions are the main innovation actors in Kosovo's innovation ecosystem.

Collaboration between the relevant Civil Society Organization (CSO), the universities, and government bodies are increasing; however, it is essential to say that the innovation ecosystem must follow the models of developed countries (preferably in the EU) to grow in the coming years, significantly more attention should be paid to the R&D sector. The leading players involved in Kosovo's innovation ecosystem are presented in Figure 3, including the foreign agencies and actors contributing to innovation ecosystem development, as these are powerful organisations bringing not only financial capital, greenfield investments but also crucial know-how on a variety of fields from policymaking to concrete business development.

Figure 3: Key innovation ecosystem actors in Kosovo



Sources: Author's compilation based on Ecosystems, (2019)

In terms of infrastructure, Kosovo is developing very well daily, particularly with a rising number of start-ups, entrepreneurs, and other players who somehow contribute to building this path (Stikk, 2014). Some progress made by the contributions of innovation ecosystem actors in Kosovo cannot be neglected. For example, ICK contributes significantly to the innovation ecosystem by providing incubator services, mentoring, consulting, and training for innovative enterprises and young entrepreneurs and managers in business planning, accounting, finance, product and service development, marketing and sales, HR, technology development and transfer and matchmaking with local, regional, and international businesses. ICK was established to support entrepreneurship and innovation, focusing on the Information and Communication Technology (ICT) sector in Kosovo ((ICK, 2012); more specifically, ICK has systematically contributed to the innovation ecosystem through different projects, training, and events. In terms of projects and facilities through incubators, ICK has already supported 200 start-ups, 1000 job creation, 100 innovative firms already doing business in the country, 400 developed products, 30 global awards and ten direct investments in start-ups. Furthermore, ICK has organized 210 training courses, 2587 trainees, around 3000 activities attendees, 357 events organized directly by ICK, and 354 co-working clients through training and events (ICK; GIZ, 2019).

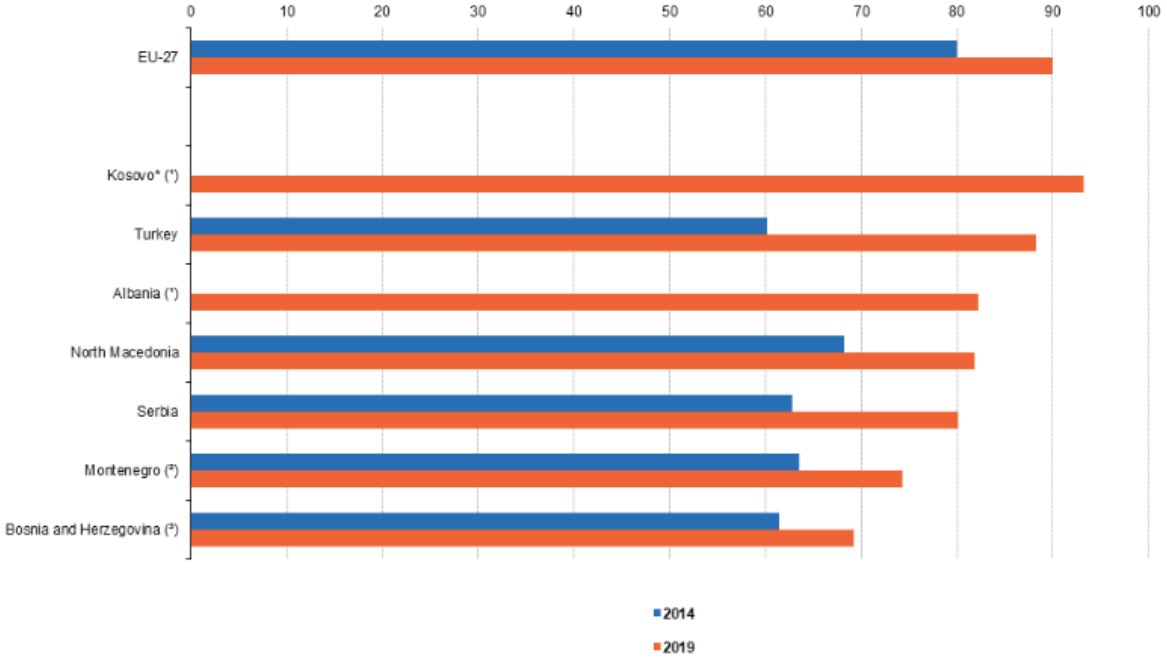
In addition, the Government of Kosovo has recently launched several projects in collaboration with Chambers of Commerce (as key players in the innovation ecosystem) to identify the nature of the skills needed. Following this, other initiatives are taking place, such as the inventions lab and the UNICEF program, which offers mentoring and social impact seminars to promote critical thinking for young people and aspiring future entrepreneurs. Such labs as UNICEF units in Kosovo include project managers, software developers, programmers, social entrepreneurs, advocacy practitioners, communications and marketing consultants, designers, graphic designers, and webmasters (Culkin & Simmons, 2018). However, there is a need for closer partnership between the above-listed stakeholders and more involved government participation, as it would further enhance community cooperation in the development of the innovation ecosystem, along with new innovative products and services (Startupeurope, 2019).

3.2. Enablers and inhibitors of innovation in Kosovo: macro and micro perspectives

Kosovo is still at an early point in the growth of scientific research and innovation infrastructure, and there has been limited progress in the field of innovation. Moreover, there is a lack of systematic data collection and dissemination of research, development, and innovation, making evidence-based evaluation almost difficult. In 2019, the Kosovo Statistics Agency (KAS) reported the findings of an ICT survey for households but had not yet examined the use of ICT by companies. The education system in Kosovo is still insufficient to satisfy the needs of the labour market; however, Kosovo's public expenditure on education of 4.7 percent of GDP in 2018 is broadly aligned with middle-income countries with similar age profiles (European Commission, 2019). A promising sign is that recently innovation and entrepreneurship are focused on the education system, particularly in the level of technical professional high schools, which can have a significant impact on raising awareness about the innovation ecosystem. It is worth noting that the digitalization of paperwork increases within start-ups or institutions with different software applications. In addition, the culture of start-ups and the whole ecosystem is contributing to Kosovo’s economy, especially by the young population and their energetic ideas and ventures (Startupeurope, 2019). In this relation, Kosovo has the youngest population in Europe, with 53 percent under the age of 25 years. Moreover, an interesting statistic is presented below in Figure 4, which shows that according to the publication conducted by (Eurostat, 2020)

recently in a small number of key economic and social indicators in the enlargement countries, Kosovo has the highest percentage of households internet access in the region like 93 percent or 7.0 compared to EU countries of 3.8.

Figure 4: Proportion of households having access to the internet 2014-2019



Source: based on (Eurostat, 2020)

An OECD study report interviewing 150 companies on innovation activities in firms in Kosovo shows that very few firms are involved in R&D activities. The concept of innovation is widely understood and refers mainly to incremental innovation that responds to market adaptation or the introduction of a new product or service. For example, about 80 percent of the firms polled revealed that they do not engage in formal R&D activities, and 77 percent invested less than EUR 1,000 in R&D. In comparison, 62 percent of the firms surveyed who see themselves as innovative did not commit any financial resources to R&D. However, the sector with the most significant proportion of R&D performers was 47 percent in the manufacturing sector (OECD, 2013); (Correa, et al., 2013). While key components and actors exist as part of the innovation ecosystem in Kosovo, there are still some micro and macro-obstacles that hinder the innovation ecosystem. Several international and national studies have identified significant barriers to ecosystem innovation challenges in Kosovo. A detailed classification of macro and micro-level inhibitors, along with some apparent advances in innovation in Kosovo, is presented below:

Access to finance

Financing is considered to be ranked first, with many innovative firms dependent on donors, especially international donors; thus, leading to a reduction in the sustainability of the ecosystem. International banks dominate the bakery sector, and bank loans were not perceived as the most suitable source for companies in Kosovo. The high demand for collateral remains a significant concern for access to financing for SMEs, making the innovation ecosystem slowly rely on international donor support. Besides, there is no clear incentive to ease the tax burden to stimulate innovative businesses in Kosovo. A major obstacle to firms getting access to financing is the risk-averse of banks, as banks need collateral amounting to 300 percent of the loan value, which is prohibitive for small or innovative firms. Therefore, it is vital to set up an innovation fund with an emphasis on helping innovative companies in Kosovo, thus beginning to shift away from donor funding towards sustainability. However, the Kosovo Credit Guarantee Fund (KCGF) was set up by USAID, which offers partial credit guarantees to banks and other financial institutions to encourage increased lending to eligible borrowers. In only one year, KCGF issued 1,677 loans over EUR 26 million, while KCGF continued to obtain financial assistance from the Swedish Government, the German Development Bank.

Lack of collaboration

The lack of linkages and coordination between actors tends to impede the proper functioning of the ecosystem. In addition, the lack of funding, given that there are no commercial or public channels by which they can have access to financing to invest in their business ideas, presents a challenge for the development of research activities that can be used as a driver of new product innovation or service development.

Lack of consistent institution

First, a separate ministry devoted directly to innovation and entrepreneurship was identified as a significant shortcoming in the functioning of the ecosystem. However, as noted above, the MIE has been set up but needed to develop its institutional capacity and follow an innovation plan related to the Smart Specialization Strategy in close collaboration with other ministries. Unfortunately, in 2020 this Ministry has merged with the Ministry of Education. Frequent political transition and change of institutions remain crucial barriers. Similarly,

inadequate institutional capacity and support systems, particularly in the field of R&D, are identified as a barrier.

Lack of innovation skills at the firm level

To enhance innovation performance, companies should have access to a workforce pool with new skills and competencies that will allow them to increase productivity through innovative technologies and work practices. However, according to the OECD survey, about 25 percent of companies in Kosovo have claimed that the labour force has inadequate skills to satisfy the needs of the companies on the market, as there is a gap between skills available to the workers and the skills required by the industry. On the other hand, 50 percent of the firm's interviews indicated that the shortage of HR was not essential or had little significance. At the same time, 50 percent of the businesses polled by the ICT industry indicated that the lack of a qualified workforce is a significant obstacle to innovation. All this has been identified as a crucial obstacle to employment and economic development in Kosovo. Therefore, there is also an immediate need to strengthen ties and cooperation between Kosovo's education and labour market institutions. Unfortunately, however, this issue of estimating skills needs in the labour market in Kosovo is not supposed to be discussed in the National Growth Strategy.

Visa restriction

Another big challenge that has continually been an obstacle for companies is the restriction of visas. Young people in Kosovo are very inspired, competent, multilingual, and eager to learn. Kosovo has one of the youngest populations in Europe, 53 percent of which are under the age of 25, and the lack of freedom of travel due to visa limitations is viewed as a significant obstacle to Kosovo's economy, young people, and companies in particular. This makes it impossible for companies to attend international trade fairs, seminars, and many other workshops where many opportunities and networking are available.

Investing in innovation and access to new technology

Interestingly enough, difficulties of accessing new technology and investing in innovation often remain problematic for certain companies, primarily due to the limited capacity of HR to absorb new knowledge and the difficulties of accessing finance, though, are not very high ranked. In this relation, as the internal non-financial obstacles, such as shortage of trained personnel and lack of adequate knowledge on technology, have not been notably ranked, the OECD study mentions only 25 percent of businesses, respectively. This is because Kosovo is still in the early stages of building an innovation structure, e.g., the strategy and adequate programmes launched at the national level that will promote the innovation at the company level are still in the early stages. As noted earlier, Kosovo companies see financial restrictions and the role of government as the key obstacles to innovation. At the same time, non-financial internal barriers are the lack of qualified employees to some degree or underdeveloped ICT infrastructure, though not highly rated. Finally, the scientific capacity of universities and research institutions in Kosovo remains weak, and the innovation infrastructure in Kosovo lacks R&D equipment and HR (Reçica, 2016); (Stikk, 2014); (European Commission, 2019); (OECD, 2013); (Startupeurope, 2019); (Zogaj, et al., 2016) and (Culkin & Simmons, 2018).

3.2.1. National innovation policy analysis: the dominance of the narrow view of innovation

Kosovo has undertaken several concrete steps towards developing an innovation law that facilitates Kosovo's shift towards a holistic STI approach; however, primary horizontal policy alignment remains an area for further improvement. In addition, the innovation strategy was deliberately designed with the support of international associations and donors, such as the OECD and the SEE programme. The adaptation of the IT strategy with a critical pillar directly linked to innovation was another critical accomplishment (OECD, 2018). Unfortunately, innovation among SMEs in Kosovo is not satisfactory, with most emerging enterprises evolving through the use of existing models that pay more attention to some basic science. Although progress has been made with data on entrepreneurial activities, there is still a shortage of innovation statistics in Kosovo to determine the potential and commitment of SMEs to innovation (MIE, 2019).

In order to encourage growth and support innovation in Kosovo, the Government of Kosovo has drawn up a National Development Strategy (NDS) (2016-2021) in which concrete steps and targeted actions are envisaged to strengthen ties between education and the labour market, to cultivate a favourable climate for innovation and competitiveness, as well as to improve the 'added value' of SMEs. These are all reflected as the core goals of the government strategy (Culkin & Simmons, 2018). More precisely, the NDS has foreseen a range of topics related to innovation issues, such as supporting the enterprise network in Kosovo in similar industrial clusters, helping to improve inter-industry partnerships, developing new businesses supported by existing firms and progress in research activities. The NDS has identified particular weaknesses along with specific messages to fix innovation issues in Kosovo. For example, the Development of a National Competitiveness Strategy (DNCS) aims to identify strategic interventions and improve the competitiveness of SMEs in Kosovo, which will be funded by specific ways such as grants and technical assistance. Such support will be offered through the investment and employment fund, directly through the SMEs competitiveness scheme to increase innovation in the IT sector (NDS, 2016). Likewise, the IT sector occupies an important place under the NDS because currently, most of the innovative firms in Kosovo fall under this sector. This sector has recently played an essential role in increasing the innovation capacity of Kosovo's economy; moreover, the sector is also promoting entrepreneurship, serving the development of a vibrant start-up scene (Startupeurope, 2019).

There is an ambitious hope that NDS will enable better interconnection and collaboration between firms to build synergies, foster innovation, and encouraging the growth of new industries supported by the activities of firms in the implementation of the measures; this would encourage larger firms to concentrate on innovation and transition to higher value-added activities. A major challenge of most firms in Kosovo, particularly those in the manufacturing sector, is quality standards, where most SMEs face many challenges and difficulties to meet them, whether due to investment costs or certification costs. Likewise, a deficient level of public spending on R&D activities (occupies only 0.1 percent of GDP) and the lack of a coherent innovation infrastructure are detrimental to SME development. Therefore, the NDS will directly support SMEs in Kosovo in improving quality standards, creating an innovation support scheme and advisory services, mainly providing specific

support to agriculture and IT sectors. In addition, other innovative companies from other sectors will be supported.

Furthermore, the NDS has foreseen the creation of a special fund for subsidizing innovation projects in the field of IT, which will be part of the employment and development fund. The implementation of such measures is expected to increase the competitiveness of SMEs in Kosovo, leading to sustainable economic growth, and such interventions must be available to increase the use of IT in business operations in Kosovo, including schools and public institutions. Doing so will reduce operating costs and increase investment and innovation in the private sector operational process, which in turn will produce a higher rate of economic growth (NDS, 2016).

It should be noted that in terms of national innovation strategies that pay more attention to innovation in Kosovo, this is the last and promising indication of progress, i.e., MIE has drawn up the National Innovation and Entrepreneurship Strategy (NSIE) 2019-2023, which forces multiple innovation activities to take place over the next five years. The strategy aims to "increase the competitiveness of enterprises in Kosovo and increase social welfare by investing in knowledge, creativity and innovation." At the macro stage, the critical goals of the NSIE will be to strengthen innovation policies to facilitate innovation in Kosovo and increase the competitiveness of companies by developing a more robust framework for cooperation with the innovation and entrepreneurship industry in Kosovo. At the micro stage, the objective of the strategy is to enhance and strengthen the active participation and collaboration of industry and academia in R&D activities and increase human capacity and capabilities for innovation and entrepreneurship in Kosovo (MIE, 2019). As noted earlier, the Government of Kosovo has recognized the importance of the ITC sector for economic development and structural transition into a knowledge-based economy; accordingly, it has formally declared the IT industry a high priority sector for the economy. With the assistance of related players in Kosovo, such as the German Agency for International Organization (GIZ), the Norwegian Embassy in Kosovo and the Kosovo ICT Association, the MED has developed an IT strategy in Kosovo. Economic development, innovation and entrepreneurship, competitiveness, investment in job creation and export promotion are core priorities within the strategy. Hence, the main strategic objective of the strategy is to become

the main driver of economic growth, employment, and innovation by increasing the international competitiveness of the digital excellence IT industry (IT strategy, 2015).

3.2.2 Improving innovation governance: Lack of separation of R&D&I

Good governance for research and innovation policies is important; this means establishing an integrated and consistent policy-making mechanism with appropriate sustainable institutions and deploying policy agencies that perform on well-defined policy objectives and implementation procedures. The law on scientific research activities in Kosovo provides a legal basis for R&D and recognizes the vital role of scientific research as a national interest. Other laws about innovation and research activities are in place, such as the Academy of Sciences and Arts law in Kosovo and the Law on Higher Education in Kosovo. As far as the research institution is concerned, "University of Prishtina" is the largest research institution, while private organizations play a limited role in research; nevertheless, the University of Business and Technology (UBT) is one of the higher educational institutions in Kosovo, with a heavy focus on research, innovation, and entrepreneurship in Kosovo. The strengths of UBT are in the fields of computer software and information technology development and architecture; while the American University in Kosovo (AUK), a private university, has recently begun to prioritize R&D and innovation (Correa, et al., 2013).

Progress report conducted by the (European Commission, 2019) argues that Kosovo has recently made some efforts to develop research and innovation policy; however, the science research legislation is not fully implemented due to lack of funding. Government expenditure on research records amounts to only 0.1 percent of GDP, and this limited amount has been spent moderately and efficiently (e.g., building lecture rooms and laboratories and addressing plagiarism. For example, in 2018, EUR 1.1 million was allocated to specific laboratories and equipment in two regional innovation centres. The lack of funding is seen as a significant barrier to the country, and policymakers have recognized the level of budget available to science in Kosovo as the main barrier to developing research excellence. Only 0.1 percent of GDP is the lowest in the region and is not fully dispersed (Kovacevic, et al., 2017). Nevertheless, governance in research and innovation has been developed in Kosovo with funding from international cooperation and EU-funded programmes as part of the enlargement agenda. However, Kosovo's overall governance model of research is rooted in

a linear innovation model, one that focuses more on R&D as the sole source of innovation and underestimates the so-called non-R&D sources of innovation. In general, Kosovo's R&D structure is largely public-sector, with activities focusing on institutions and public-sector agencies (Matusiak, 2018).

As far as the education sector is concerned, Kosovo faces fundamental problems, such as the lack of appropriate national regulations on research activities. The MESTI is the main body responsible for the legislative infrastructure related to research activities, as well as for the development of a strategy for the development of science, education, and technology in Kosovo and, consequently, for the development of scientific research and higher education systems and the promotion of innovation. Kosovo currently lacks a National Research Council (NRC) and a lack of implementation and a revised National Research Program (NRP). Nonetheless, Kosovo's law on scientific research activities provides the institutional framework and strategic direction for research and innovation. The NRC was established in 2007 and has been active until 2011; since then, the NRC has ceased to operate as the Kosovo Parliament has not voted on its mandate. According to the NRP developed by the NRC, few goals that were projected to be accomplished are ongoing, such as creating an innovation programme to address the needs of the private sector for economic and social innovation. Supporting students to fund post-doctoral studies from the Kosovo budget is essential, and growing involvement in international research networks and strengthening collaboration with Kosovo scholars working abroad are underway. However, the main obstacle to this until 2018 remained the low budget set for scientific research, which amounts to only 0.1 percent of GDP or EUR 520,000 per year in terms of value. Another serious obstacle is the lack of interaction between academia and industry in Kosovo. This poses multiple hurdles, such as limited absorption capacity and lack of technology transfer to industry, general lack of resources, including financial resources, HR and infrastructure from all parties, academia and industry, as well as a lack of innovative ventures that need 'state of the art' scientific support (Kaçaniku, et al., 2018); (OECD, 2013).

Although, the United Nations Development Program (UNDP) in Kosovo, together with the UBT and the Resilience and Sustainable Development Program (RSDP) at the Center for industrial sustainability at the University of Cambridge, took the first steps to build the first innovation laboratory for governance in Kosovo. The key aim of the governance innovation

lab is to improve new approaches for performance auditing, with the primary objective of training and up-skilling auditors in compliance with international standards. In addition, such an innovation laboratory will allow new collaborations between academia, UNDP, and the public sector (UNDP, 2018). Following the governance of innovation, as outlined in the first chapter of the case of NIC in Sweden, it is worth noting that the Government of Kosovo took action to set up the National Council for Innovation and Entrepreneurship (NCIE) at the initiative of MIE. The Council had an advisory role, headed by the Minister of MIE, and consists of 17 leading players from the line ministries, non-governmental organizations, the business community, government, and foreign non-governmental organizations (Government of Kosovo, 2017).

At its first meeting, the Council approved, in principle, the rules of procedure of the NCIE and the calendar of meetings. The meetings have been held roughly three times to date, but they needed to be more involved and improved (MIE, 2019). Unfortunately, with the formation of a new government in 2020, the role of the MIE has been abolished, while the innovation aspect has been integrated with the Ministry of Education, Science, Technology, and Innovation, which means that the NCIE is no longer functional.

Chapter 4 Methodology and data collection

This chapter represents the most critical part of the dissertation. The first part focuses on explaining the role of methodology, particularly the importance of the qualitative method of applying research through the multi-case study method versus the quantitative method. The second part focuses on the fieldwork designing, the reasoning for choosing case studies, and the methods for selecting indicators and collecting data are elaborated in-depth.

4.1. Qualitative multi-case study approach: qualitative research method

This section focuses on the design of the methodology guideline and methods to be applied in the empirical work of innovation activities in Kosovo, but first, the role of the qualitative method will be explained. Qualitative research focuses on the depth and complexity of new phenomena, and it highlights the objective understanding of reality by proposing to understand why and how phenomena occur (Arino, et al., 2016). Basically, most definitions of qualitative methods reflect the complexity of the methods used. In this respect, the

qualitative analysis uses a naturalistic approach that attempts to explain a particular context, such as a "real-world setting where study does not attempt to manipulate the phenomena of interest." (Patton, 2002). Furthermore, qualitative research is, in principle, characterized by the idea that any research that eventually yields any results and findings does not come from a statistical point of view or other forms of quantification, but rather from the form of research that findings from the real world or when the phenomena spontaneously unfold (Strauss & Corbin, 1990). Of the many definitions provided by many scholars on the significance of qualitative research, the most important definition is given by Van Maanen, who describes qualitative research as follows: an umbrella term that encompasses a variety of knowledge techniques that aim to explain, decode, translate and otherwise understand, not the frequency, of certain phenomena that are more or less naturally occurring in the social world (Maanen, 1979). The chosen method is of particular importance since it helps the research be more critical because of the option it provides for the analysis of data in the broader dimension. This dissertation, therefore, relies on qualitative analysis and applies a multi-case study method, which seeks to understand how people view their experience through case studies and to gain a more nuanced understanding of a specific aspect of technological and non-technological innovation development, particularly from mixed industries and universities as actors and contributors to the innovation ecosystem of Kosovo.

The approach of the case study is an important qualitative technique. It is a commonly used study tool, along with narrative analysis of phenomenology, ethnography, and grounded theory, and conducts an in-depth analysis that can be defined as a particularistic, heuristic, or descriptive (Merriam, 2009). In this connection, as elaborated in Schumpeter's early writings, the work focused on "Schumpeter Mark I" who, sadly failed in this approach, although in his later work (Schumpeter 1943), the so-called "Schumpeter Mark II" was more directed towards qualitative analysis, primarily through case studies, which was seen as a valuable and useful method of research (cited in Fagerberg, 2003). This would then be a great inspiration and justification for pursuing a similar methodology by applying the multi-case study method in Kosovo, as this approach has been validated by Schumpeter, a pioneering scholar in the field of innovation.

A core objective of the research is to pick up key players in the innovation ecosystem in Kosovo and to use a multi-case study approach to identify their policies, drivers, and

networks on how to enhance the company's innovation performance. Various essential steps are to be taken to design an interview guide for this study with in-depth interviews. For instance, (Malhotra, 2010) explains some of the required steps that need to be taken to implement the case study process, e.g., in-depth interviews are perceived to be an unstructured and straightforward method of collecting information and are mainly conducted on a 'one-on-one' basis where respondents should be examined by a skilled professional. In order to analyse innovation issues in-depth, our research aims at designing and conducting a multi-case study method. Then a question arises: what is a case study? Case study plays a critical role in academic work in dealing with empirical work on organization and public policy and is applied to various proposals by people from different disciplinary perspectives. It is important to remember that answering specific research questions typically involves qualitative research approaches, mainly by the case-stay method, whether in companies, employee workplaces or policy initiatives. Case studies analyse certain aspects of the phenomena that are not readily determined by quantitative analysis. Likewise, case study methods have been adopted in many fields, and European research projects have made effective use of them in recent years, although there is still a shortage of them in terms of literature, and some attempts to classify these types of case study methods are in progress (Huws & Dahlmann, 2007).

Among several academics, Robert Yin is one of the most influential authors of the case study method. According to Yin, the case study approach is viewed as an empirical method focusing on an in-depth investigation of a contemporary phenomenon within the scope of the real world, particularly when the boundaries between context and phenomenon are not readily visible (Yin & Davis, 2007). Besides, he argues that, in essence, any subject may be examined using a case study, but it should include specific empirical methods that can be seen in either qualitative or quantitative evidence (Yin, 2018). Multi-case studies indicate that after data has been collected and analysed in various cases, and the more cases involved in the study, the greater the variation is between them. In this respect, in order to evaluate a phenomenon, population or general condition, Stake describes as follows: in multi-case studies, a single case is of interest because it belongs to an especially compelling set of cases; rather, individual cases share a similar trait or condition. Whereas the cases in the collection are somehow categorically linked together and may be members of a group or examples of

a phenomenon (Stake, 2006). It is vital for the researcher that before beginning with the selection of cases, it should be explained whether a single or multiple-case design is planned; hence, three separate case studies have been conducted in our multi-case study method. In carrying out multiple case studies emphasising the comparison, the so-called case study protocol is vital as it helps to direct a systematic analysis when the case study report can be evaluated on a case-by-case basis. In this sense, it should be noted that it is impossible to design a perfect 'one size fits all' model of the case study method, such that some standards and methods can be flexible and easily adapted to fit a variety of different case studies. The basic aim of the research questions addressed and the specific needs of research funders in the scientific work and the more cases included in the study results, the higher variation across the board (Huws & Dahlmann, 2007). In this relation may be distinguished the following types of case studies:

- Explanatory case studies
- Descriptive case studies
- Exploratory case studies

Explanatory case studies

This form is a classical sociologically focused model and begins very concretely either with clear hypotheses or with specific research questions, based primarily on previous research and results; thus, it attempts to examine, systematically and scientifically, in particular by defining types of a causal relationship. As important as the number of case studies, more advanced preparation is needed for explanatory case studies to ensure that a sufficient number of cases are comparable and that all research questions are adequately addressed. In this case study, it is essential for the views of a variable number of different respondents to be sought and for the type of respondent to be as consistent as possible over the range of cases to be conducted. Finally, it is crucial to report in-depth explanatory case studies in order to open them up for peer review within the scientific community (Huws & Dahlmann, 2007).

Descriptive case studies

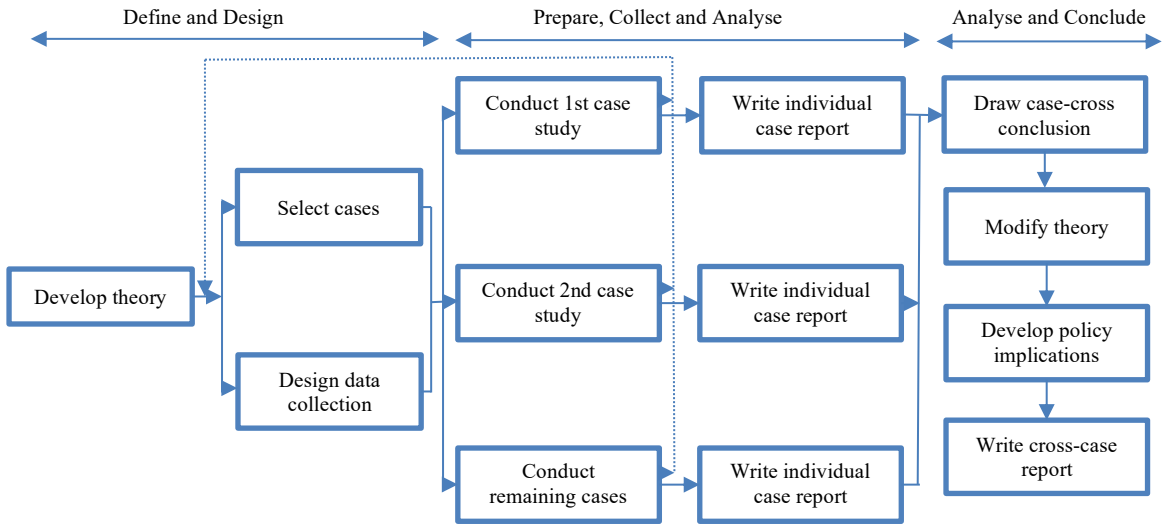
Typically, this type includes polls and more suitable stories for the descriptive process, and in essence, descriptive cases are found in significant disciplines such as sociology and political science. There is a link, for example, with many descriptive case studies dealing with the "how" of a situation, while the explanatory case studies deal with the "why" of situations (Yin, 2018).

Exploratory case studies

Compared to others, this form of the case study has been undertaken to investigate a new phenomenon that is new to the subject or has relatively little knowledge of the issue. It usually begins with open-ended questions, intensely concentrating on a single phenomenon or group of phenomena. The fundamental goal of the exploratory case study approach is to understand whether further studies on this topic will be worthwhile in order to design and develop new indicators for future research; however, this aim to find certain extreme cases rather than typical cases (Huws & Dahlmann, 2007); (Yin, 2018). The research questions most commonly developed to be used in the design of a case study are intended to understand and explain the "how" and why" sort of questions that reflect the explanatory orientation.

Therefore, the most important step in formulating the approach is to classify and define the fundamental research questions to be addressed while using the case study method. As a result, questions starting with "how and why" catch what the research, in particular, is interested in addressing, leading to an accurate case study method. The key feature of the case study is its ability to understand the profound socio-cultural and economic mechanism, enablers, and inhibitors of firm innovation, using it as a document, interviews, and observation of participants (Yin, 2018). Given this, our dissertation follows all Yin requirements for multiple case studies in the field of the innovation ecosystem in Kosovo and the following model has been adapted and applied. Figure 5 illustrates the processes of conducting case studies and data collection.

Figure 5: Multiple case study procedures



Sources: Adapted from Yin, (2018, p. 95).

Following the multiple case study model described above and in order to make the study more convincing in our research, a multi-case study method has been applied, and the following three different case studies have been examined:

1. The Carriers Class Consulting & Integration Services Joint Stock Company (3CIS J.S.C), or shortly 3CIS, business service firm integrated into the global networks of knowledge intensive business service sector.
2. The state University of Prishtina as a key knowledge creation and transferring institution in the country.
3. Pharmaceutical manufacturing as a knowledge intensive sector: the case of Tre Pharm Company.

The reasoning behind the three case studies is to map the factors that shape innovation in the institution of knowledge creation or knowledge developing and transferring institution, such as the university, the business service firm, and the manufacturing company, within the innovation ecosystem in Kosovo. In addition, the relationship between the university and the industry has been thoroughly studied in the context of the three case studies, along with technological and non-technological organizational innovation, joint projects, interdisciplinary and multidisciplinary project work, on the job training (OJT), and outside off-job training (Off-JT), type of managerial techniques, e.g. just-in-time, project-firm, flat organization, quality control cycles (QCC), ICT, and external or national knowledge sources

with a focus on R&D as knowledge creation. Hence the main objective of this study is to answer the following research questions:

3. How has the business service firm undertaken innovation efforts to implement open innovation and enhance its market participation in the global value chain (GVC)?
4. How does the university contribute to the process of knowledge creation through R&D and transferring knowledge to the innovation ecosystem actors in Kosovo?
5. How manufacturing company establishes relationships with knowledge transfer institutions such as the university, consulting firms like 3CIS or other research institutes and how it evaluates the role of the knowledge suppliers?

4.2. Designing fieldwork: why selecting case studies?

Kosovo has made some efforts to grow in implementing innovation. As Kosovo is increasingly developing favourable conditions and policies for innovation, e.g., significant policies and laws to support economic development are in place, but the insufficient institutional capacity of the state has hindered the implementation. Though ingredients and all relevant actors of the innovation ecosystem in Kosovo are present; however, a systematic approach towards linking such components together is not satisfactory. Unfortunately, there is a lack of official statistics on research and innovation activities, and data are not readily available. As a result, there is a scarcity of information about the innovation system and its constituent institutions of Kosovo, thus resulting in limited progress in innovation. The EU report on Kosovo (2019) reveals that R&D activities and innovation statistics are not produced regularly, so systematic, and chronological analysis is nearly impossible. KAS has recently released some findings in household ICT surveys but has not yet published a report on the use of ICT usage by firms. Kosovo also faces a shortage of data on research and technology. Moreover, as noted earlier, Kosovo continues to face many obstacles such as limited absorption capacity in the private sector, general lack of resources, including financial resources, human resources, and infrastructure on both sides of industry and academia, lack of innovative ventures that need 'state of the art' scientific support (Kaçaniku, et al., 2018). In addition, the lack of finance, funding, technical resources, R&D cooperation, the lack of adequate equipment and a reliable database of accurate data remains a challenge. Similarly, existing data on R&D expenditure are not readily accessible, making it impossible

to assess the current level of research spending; additionally, STI statistics are not collected in Kosovo (Correa, et al., 2013). Evidence of the lack of data on innovation is also admitted by the national strategy for innovation and entrepreneurship (MIE, 2019), which underlines that while some progress has been made in gathering data on entrepreneurial activities, there is still a shortage of innovation statistics in Kosovo to assess the capacity and engagement of firms to innovate. Besides the lack of systematic quantitative data collected and evaluated, the lack of adequate resources for the design and research of key players in the innovation ecosystem in Kosovo should be highlighted.

The topic of innovation performance by Kosovo firms is a significant research challenge, as the institutional infrastructure is somewhat fluid and in ongoing restructuring (following any new government they restructure the institutions), e.g., the government between 2017 and 2019 while leading the institutions they had a total of 21 ministries. However, despite this large number of ministries, the creation of MIE was perceived as a good step towards putting on the agenda the importance of innovation for the country. Nevertheless, the other government that began in February 2020 drastically decreased the number of ministries in Kosovo, and the MIE struggled to build up its administrative capacity; therefore, it merged with two other ministries. While the innovation part was combined with the Ministry of Education, Science, Technology, and Innovation, entrepreneurship went to the Ministry of Economy, meaning that the government consolidated several other ministries and has managed to get 15 ministries in total instead of 21. Though due to the political crisis created in Kosovo as a result of the pandemic situation with COVID-19, the new government is in place, and the number of ministries has risen by 16; in other words, such continuing consolidation of the institutions causes uncertainty and the inability or difficulty of designing a long-term innovation governance. While the new government created in 2021 has designed the innovation and entrepreneurship pillars under the Ministry of Industry, Entrepreneurship and Trade with a focus to develop new policy instruments. As explained in the third chapter on institutional infrastructure, Kosovo lacks the data needed to cover innovation activities in firms because there is no data collection on the innovation performance in Kosovo. All of this makes the issue of innovation fundamental to the government's agenda recently.

Finally, the development of open innovation among economic actors is a challenge facing the innovation ecosystem in Kosovo, and firms are unaware of how to implement the

mechanism and its benefits. Therefore, the present study was conducted to provide a clear picture of the processes, requirements, and benefits of implementing open innovation, or in other words, membership in the innovation ecosystem in Kosovo. Given these shortfalls, the design of the empirical part of the dissertation forced us to rely on the qualitative research method rather than quantitative methodology, and the main research tool is the multi-case study method.

4.2.1. Preliminary lessons from the embracing international innovation review for Kosovo

As indicated above, among other international innovation assessment studies, the OECD report carried out in 2013 identified the main technological and non-technological constraints to innovation in Kosovo, and most of these constraints are unfortunately still present, while another OECD report carried out in 2018 identified some of the STI accomplishments for the countries in the region, including Kosovo. Most notably, the evaluation framework conditions used in the OECD report (2018) to assess the performance of innovation in the region are of special significance, in particular qualitative indicators that are considered as relevant to be evaluated in the case of Kosovo through the case study approach due to limitations and lack of statistics on innovation activities. Kosovo needs to improve its innovation potential and prepare a new direction of growth based on the sustainable ability of firms since the "shortage of knowledge" or "knowledge deficiency" needs more systematic data collection. Consequently, considering the apparent hurdles and using the assessment framework conditions, the OECD (2018) has demonstrated benefits for the case study process. Table 9 displays the five major sub-dimensions and 19 indicators under the STI evaluation framework, where each of these sub-dimensions is measured and evaluated using relevant qualitative indicators.

Table 9: Science, technology and innovation assessment framework based on qualitative indicators

Sub dimension 1	Sub dimension 2	Sub dimension 3	Sub dimension 4	Sub dimension 5
Governance of STI policies	**Policy research system**	**Innovation in firms**	**Public-private knowledge transfer and linkages**	**HR for innovation**
• National STI plan or strategy • Horizontal policy coordination • Implementation of STI policies • International STI policy strategy and framework	• Funding of public research, institutions, and universities • Public research institutional arrangements	• Innovation promotion • Financial supports: competitive grants for research and innovation in businesses • Fiscal incentives for R&D&I • Institutional support: incubators and accelerators • Institutional support: technology extension services • Public procurement for innovation	• Innovation voucher schemes • Competitive co-operative grands • Innovative clusters • Technology institutes, competence centres, and science and technology parks (STPs)	• Mobility between academia and industry • Research evaluation in favour of business – academia co-operation • Intellectual property rights for business – academia co-operation

Source: Adapted form OECD, (2018, p. 347).

The framework conditions for qualitative variables helped us design a guiding concept for the multi-case study method, where out of 19, we found almost all the indicators compelling variables. However, few variables are critical for Kosovo but more challenging to measure due to lack of knowledge of the in-depth method and processes or factors that shape innovation at the firm or institutional level. The role of validation and trustworthiness or reliability of the research is always required. The validation process focuses on the following three aspects:

- Content validity: the extent to which the measure covers the essential part of the concept in the context of a specific application.
- Construct validity: the degree to which the scores on the measure related to other measures are consistent.
- Validity of the criterion: the extent to which the scores of a measure reflect the gold in a satisfactory manner (Batura, et al., 2016).

This dissertation tested and validated the chosen variables for content validity through a formal interview with key participants in the organizational case studies. As a result, they were agreed and considered very important to the actors in the innovation ecosystem in Kosovo. Therefore, the process of validity and reliability of indicators has made it easier for us to design particular case study questions that drive each case study differently and carry out the data collection and analysis.

4.3 Data collection

This is the core section of the dissertation, and it describes how the data collection process worked, and the steps are taken. Then, following the identification of the research questions and the selection of case studies, it has proceeded with the collection of data of the key players in the innovation ecosystem through semi-structured interviews, which are, in this case, two firms and a state university. The role of the interview for data collection in conducting case studies is essential; in this respect (Malhotra & Dash, 2016) suggests some general steps for the conduct of in-depth interviews. First, they stated that interviews are an unstructured and transparent method of collecting data and is carried out on a "one-on-one" basis where the competent person performs the investigation to a single respondent necessary for the data collection interview. As knowledge creation and transfer, representatives of three organisations, in specific sectors in the goods and services industry and the university, played an important role in the innovation ecosystem. There were 24 representatives interviewed and analysed in the sense of innovation for all three case studies. The 24 interviewees consisted of people from the two companies and the university and interviews with public bodies and agencies, thus analysing a classic triple helix model or cluster system. Interviews from the public bodies and agencies included people from the Innovation Department, Science and Technology Department and the Intellectual Property Agency under the Ministry of Education and Industry and Trade. More specifically, out of 24 respondents, five were interviewed for the business service firm 3CIS; 14 interviewees from the university staff, including the government institutions, private sector industries, I.C.T., and the incubation centre in the university case study, and five relevant employees were interviewed in the manufacturing case study firm.

The collection of primary data for case studies is carried out in three phases. As stated earlier, the first stage of the interviews was conducted with only one participant from each case study; hence to validate the content, a simplified version of the framework conditions was discussed with them in terms of how they think about it and whether those frameworks conditions are applicable to their organizations to set up case studies. In order to get accurate responses, the second phase of the interviews was conducted with managerial and non-managerial people who were most important to the subject. While the third phase was repeated with selected interviews in case, additional data were required to complete the case study.

Targeted people were informed on time by email, and one-on-one interviews were held as recommended by (Malhotra & Dash, 2016) and in many cases, conversations for each interview were recorded with the approval of the respondent. Innovation issues are a sensitive topic. In many situations, compared to the university's case, businesses are unwilling to provide detailed information, principally through a quantitative questionnaire, so data collection through interviews for this dissertation is considered very useful. Furthermore, it is worth noting that most of the interviews were done in English. It is worth noting that the 3CIS business service firm and the bulk of interviews for the State University of Prishtina were conducted before the COVID-19 situation. Whereas the few university interviews and the entire third case study of pharmaceutical manufacturing as knowledge-intensive sector-related interviews were conducted during the pandemic in most cases using the CATI method.

Finally, besides the primary data collocation, reports related to innovation activity were also analysed in the context of innovation in the analysis of three case studies. Furthermore, in the way of data collection to improve the trustworthiness or reliability of the innovation study, we have assessed reliability through the application of several factors such as "credibility, dependability, confirmability, integrity transferability, fit standards, understating, generality and control" (Flint, et al., 2002). The following Table 10 offers more detailed information on the reliability analysis of the case study data collection methodology.

Table 10: Trustworthiness of the case studies method

	The criteria for trustworthiness	Methods applied in the case studies of innovation research
1	Credibility	Due to the pandemic situation with the COVID-19, it took us 12 months to conduct interviews with the three case studies. In addition to the collection of primary data, a previous analysis similar to this innovation research was considered. The innovation activity reports were also analysed in the context of innovation in the analysis of three case studies. Following the completion of the preliminary work of each case study in order to obtain final results of the reliability, the case studies were distributed to the interviewed respondents as to obtain some new knowledge from them.
2	Transferability	The transferability was supported by manufacturing and service firms and the university.
3	Dependability	Due to the sensitive issue, the bulk of the respondents who engaged in the interview were senior management while the rest were non-management level positions; thus, to gain the correct findings from them. The reason to target the specific group of the senior management level is to acquire an in-depth knowledge and professional information.
4	Confirmability	The final dissertation work, in particular the fieldwork of case studies, is circulated for further analysis to a range of professional experts who have already carried out such research.
5	Integrity	As noted above, innovation is a sensitive issue; hence, participants have been assured of confidentiality, thus ensuring them that the data and information are only used for research purposes.
6	Fit criteria	Having respect to the procedures and steps referred to above, which have been carefully applied, then; as a result, we have a final acceptable 'fit criterion.'
7	Understanding	For the sake of transparency, the final output is sent to them to show if their inputs are correctly and accurately reflected in the research.
8	Generality	What is considered in terms of generality is the environment or atmosphere, the time of the interview and the way of discussion with the participants.
9	Control	The inputs provided during the interviews by the participants have a controlling function, as the findings will possibly affect them either positively or negatively.

Source: Author's compilation based on criteria suggested by (Flint, et al., 2002).

Following all the presentation of the theoretical framework, the key research questions addressed in this research are as following:

1. How has the business service firm undertaken innovation efforts to implement open innovation and enhance its market participation in the global value chain (GVC)?
2. How does the university contribute to the process of knowledge creation through R&D and transferring knowledge to the innovation ecosystem actors in Kosovo?

3. How manufacturing company establishes relationships with knowledge transfer institutions such as the university, consulting firms like 3CIS or other research institutes and how it evaluates the role of the knowledge-suppliers?

The next chapter focuses on using the technic of the semi-structured interviews with some of the key players of the Kosovo innovation ecosystem, i.e., knowledge-intensive business service (KIBS) firm, the most important state university, and a "leading-edge" pharmaceutical manufacturing firm. Moreover, it intends to outline varieties of attitudes of the social-economic actors to map the main contours of the country's fluid innovation ecosystem.

Chapter 5 Analysis: Case studies on key players in the emerging Kosovo innovation ecosystem

This chapter analyses the empirical work of the three case studies conducted as key players in the emerging innovation ecosystem in Kosovo, such as knowledge-intensive business service (KIBS) firm in the field of services, the most important state university in Kosovo, and a "leading-edge" pharmaceutical manufacturing firm. The logic behind the three case studies in this research is to map the factors shaping innovation in the institution of knowledge creation (university) and knowledge developing and transferring institutions (business service firms and manufacturing companies). Thus, first, the two case studies of companies in the services and manufacturing field are analysed, and then the state university reflects on knowledge creation and transfers to the industry

5.1. Leading Edge Knowledge Intensive Business Service (KIBS) firm in Kosovo: The case of 3CIS service company

Introductory remarks

This case study aims to analyse the role of Carriers Class Consulting & Integration Services company, the so-called 3CIS, in the Kosovo innovation ecosystem. It analyses a company in one of the sectors at the frontier of the current technological revolution period; therefore, it provides important insights into how a firm in Kosovo has undertaken innovation efforts to enhance its market participation. Data were collected based on a qualitative guide interview, combining and analysing five semi-structured interviews from the 3CIS staff and analysed in the sense of innovation in the service sector; moreover, findings indicate that

this company plays a unique role in the current innovation ecosystem. The case study structure consists of the following: the first section gives a snapshot of the company, including the past and recent trends over the years. The second section reflects on the identification and classification of the share of turnover by types of service. The third part sheds light on the role of R&D and investment in this field, resulting in better functioning of service automation. The case study then elaborates on the increasing role of organisational innovation, concentrating on interdisciplinary and multidisciplinary project work instead of functional 'silos.' The analysis shows the high priority of continuous learning: combining practices of vocational training or on-the-job training and off-the-job training. Finally, concluding remarks, challenges, and lessons learned are drawn.

History and development of the company in a nutshell

This section provides details on the company's history and analyses the continuing development of 3CIS since its founding. 3CIS is a predominantly American owned and operated Joint Stock Company (J.S.C.) with operations in the United States (U.S.), Ireland and Kosovo. In Kosovo, 3CIS is headquartered in Prishtina, the capital city of Kosovo, established in 2008, first as a limited liability company with just five employees, then transformed as a J.S.C. in 2010. In terms of organisational and management structure, 3CIS is made up of three shareholders. Since the formation, some minor changes to the owners have happened, but the core management partners have not changed. After 2010, the number of workers in 3CIS has increased, reflecting the number of new projects. This can be seen in Table 12, where the number of workers hit 176 in 2019. Although concerning the composition of workers in 3CIS, it is worth noting that out of 176 employees, only 2.2 percent of the total employees in the blue-collar category were hired by the company. On the other hand, 172, or 97.7 percent of the overall workforce, belongs to the white-collar category. This group, composed of 172 workers, holds a university degree, while 100 percent of staff have digital skills, primarily familiar with the intranet. For clarification, it is important to clarify the definition of the categories white-collar and blue-collar. White-collar involves skilled employees, while blue-collar workers are semi-professional workers in a company (Hammer & Ferrari, 2002). Table 11 presents in detail the composition of the company's employees and changes for the period 2017-2019, including trends in turnover, educational composition, gender composition and age.

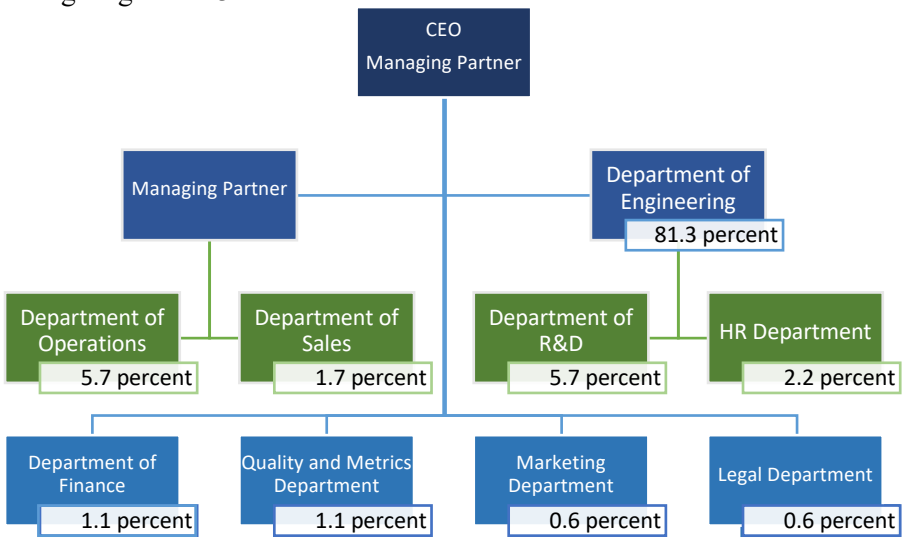
Table 11: Recent development of 3CIS for 2017-2019

Year	Employees	Turnover	Workforce composition		Educational composition		Gender composition		Average age
			White collar	Blue collar	Engineers	Other	Man	Women	
2017	112	€3.75	108	4	87%	13	79%	21%	25
2018	150	€4.94	146	4	90%	10	79%	21%	25
2019	176	€5.87	172	4	91.5%	8.5	79%	26%	26

Source: Author's compilation based on 3CIS data and interviews

The 3CIS organogram consists of a very complex structure and works across nine departments. The current organisational structure, with a percentage indication of the distribution of personnel between departments, has been formed. Figure 6 shows the organisational chart of 3CIS and illustrates the importance of departments in terms of the distribution of employers within them.

Figure 6: The organogram of 3CIS and workforce structure



Source: Author's compilation based on 3CIS interview

Figure 6 identifies the engineering department as the most important department with the most significant number of workers in 3CIS, hitting 81.3 percent, and this is argued by the fact that 91.5 percent of employees are graduated in engineering. Besides, the R&D and operational departments hold an essential role in employment, followed by the HR and sales departments. The rest of the departments remain at about the same level. The dominant ownership of 3CIS is private, and services are the only and leading activities. As regards the ownership structure, according to the Kosovo Business Registration Agency (KBRA), the composition of the ownership structure in 3CIS shows three different shareholders (KBRA, 2008). Table 12 presents the percentage of the shareholders accurately in 3CIS.

Table 12: The composition of ownership structure in 3CIS

Composition and shares of the ownership	Shareholder 1	Shareholder 2	Shareholder 3
	47%	43%	10%

Source: Author's compilation based on (KBRA, 2008) data

Services offer

The company serves its clients worldwide and, in particular, focuses on the international market. More precisely, it offers primary technology services in North America, Europe, the Middle East, and the African markets in support of the network deployment of its customers. The core company services are design, integration, migration, testing provision, operations. More accurately, 3CIS offers the following service pillars:

Networking and mobility concentrate in planning and executing worldwide its customer's network activities including, but not limited to integration, migrations, expansion or reduction, planning, and management, by providing to the large telecom operators with cost-effective network architecture solutions, supporting their transition into more advanced and efficient networks. **Automation and virtualization**, in line with current technology developments, 3CIS relies on Software-Defined Networking (SDN), which is a critical factor in leveraging 5G and the Internet of Things (IoT) as it improves and is capable of accommodating and controlling the growing number of IoT and 5G mobile handsets to make them more efficient and scalable. **Operation support**, 3CIS has a global network operating centre running 24 x 7 x 365 operations from Pristina, Kosovo; this is due to time differences in the various zones of the world. **Software development,** 3CIS provides its customers with custom software solutions to simplify the work process and reduce operating costs, increase productivity, maximise profitability and meet operational key performance indicators (KPI). In addition, the company works closely with global carriers to help them plan and design network capacity management programmes (NCMPs) tailored to specific network needs. **Project management** offers services to its operators internationally, with a particular emphasis on North America. 3CIS has therefore developed a sustainable, tried-and-tested system to attract, recruit and build project management resources. **R&D** aims to increase customer satisfaction by researching and developing solutions that can further improve telecommunications products and systems as it helps the company to identify customer requirements (3CIS, 2010). Table 13 describes, in more depth, the current classification of

the main types of services indicating or representing the predominance from the highest to the lowest share of services in the 3CIS turnover. Although the percentage of service provision across categories fluctuates due to market needs, and the overall percentage of services has an increasing pattern or trend over time, which has a positive impact on the turnover of the company.

Table 13: Share of the turnover by types of services of 3CIS in 2019

Types of the services	Service activities	Share in turnover
Local Exchange Carrier (LEC), Multiple System Operators (MSO), cable operators	High-level designs and low-level designs to facilitate the operators' market expansion to support wholesale transport services to large enterprise and mobile operators. Management and optimization of video delivery by applying the Quality of Service (QoS) scheme	18%
Internet Protocol (IP) Radio Access Network (RAN), metro ethernet, mobile backhaul	Design, integration, migration, Technical Assistance Center (TAC), R&D, Pre-sales testing, IoT and monitoring	15%
Network Operations Center (NOC) services	24/7/365 NOC support, network monitoring, change management, issue escalation, resolution management, crisis management, team communication, and software update coordination	14%
Policy and Charging Rules Function (PCRF), video, media optimization and congestion control	24/7/365 NOC support, network monitoring, change management, issue escalation, resolution management, crisis management, team communication, and software update coordination, design, implementation, migration, IoT, and monitoring	10%
Packet core	Design, implementation, migration, IoT, monitoring, combining 3G, 4G and 5G	9%
Program / project management for technical solutions	Program management for design, install & commissioning, integration, migration, monitoring, and quality assurance	9%
IP- Next Generation Network (NGN)	Design, integration, migration, TAC, R&D, pre-sales testing, IoT, and monitoring	8%
Operations Support Systems (OSS), granite/canopy, transport design and integration	Time Division Multiplexing (TDM) and Ethernet/IP circuit design, provisioning, ordering, LEC delivery management and program management	7%
Software development	Custom made tools and software solutions tailored to its customers specific needs	6%
Network services orchestrator (NSO)	Service provisioning in both physical and virtual multivendor networks by using network automation	3%
Program / project management for physical install and construction projects	Program management of physical auditing and site surveys in preparation for ethernet site migrations. Turf vendor management overseeing site technician deployment and quality control of site survey/site completion reports	1%

Source: Author's compilation based on 3CIS data and interviews

In analysing further service activities, it should be mentioned that the structure of the activities will remain almost the same for years, with any minor changes that might arise as a result of the advancement in networking technologies that affect the business process automation system, in particular, the SDN and the Network Function Virtualization (NFV). Activities with the largest share of turnover can also have minor differences as the trend shifts due to the reduction of operating costs. As seen in Table 11, the company's turnover for 2018 amounted to EUR 4.94 million, which is 24.11 percent higher than in 2017, which was EUR 3.75 million (Auditor's report, 2018). The analysis shows that the turnover of EUR 5.87 million for 2019 was 19 percent higher than in 2018, making the company the leader in the services sector in Kosovo. Table 11 indicates a significant rise in the company's turnover from 2017 to 2019. What makes 3CIS different from other companies in Kosovo is that, in terms of the dominant sector, the company relies solely on the international market, and analysis shows that all sales have been exported over the years. Most of this volume has been exported primarily to the US, while the remaining quantity has been exported to the United Kingdom, Middle East Europe, and the African markets. According to the Central Bank of Kosovo (CBK), Information and Communication Technology (ICT) in Kosovo, in particular exports of telecommunications, computer and information services amounted to EUR 55.8 million in 2018 or EUR 9.2 million more than in 2017 (CBK, 2018). Given this export, EUR 55.8 million and the turnover of 3CIS for 2018 of EUR 4.94 million indicate that the 3CIS share represents 8.84 percent of the country's overall export. Though the company is currently not involved in offering services in the national market due to small market demand and low turnover; however, if there is any interest from any national operator in Kosovo, 3CIS is ready for cooperation.

Key role of R&D strategy: the case of service automation

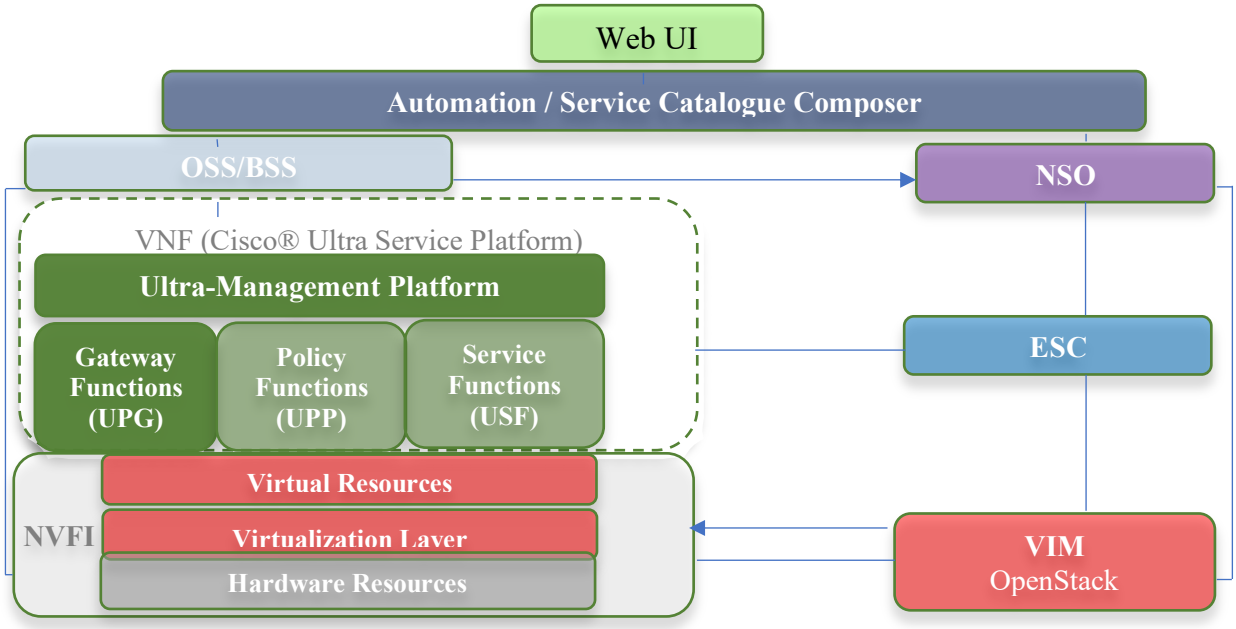
This section begins with the definition of the automation system and proceeds to analyse the main characteristics and how it works in 3CIS. The classic concept of the role of automation is understood as replacing human manual control, including planning and problem-solving by automated devices and computers. Nevertheless, as (Bibby and his colleagues, 1975) pointed out, *"even highly automated systems need human beings to be guided, adjusted, maintained and developed further."* As a result, it can be concluded in the role of automation that both technological and human factors are essential for the automation system

(Bainbridget, 1983). In this sense, since 2008, 3CIS has been characterised by continuous development, and the role of innovation has been in focus as it is considered valuable in the field of business services. Since then, the organisation has created the R&D department as a specialised section dealing with innovation, and automation is the critical task of the R&D department. Moreover, automation in 3CIS focuses on improving common device configuration models, the standard NSO, administration and alarm management, and compliance reporting tests. Some of the main characteristics of the application of the automation system are as follows:

- It enables the use of the Network Configuration Protocol (NETCONF) and allows it to read and write Yet Another Next Generation (YANG), models
- It uses logs to troubleshoot the CISCO NSO deployment and check NSO communication with network devices
- It facilitates the complex validation and feature implementation of using Java and Python within the service model (see Annex 1)

Besides, automation enables hardware resources used to populate Unix, opens stack, and build various types of Virtual Memories (VMs), as well as the use of standard management and orchestration of gateway functions, policy functions, and service functions. As a result, the automation function in 3CIS is higher than before, as senior engineers are thoroughly trained and skilled in their use. It should be noted that the automation function is often designed in collaboration with the projects, based on the needs of both 3CIS as project implementation and the client as project beneficiary; thus, the application of the automation system varies from project to project. Figure 7 illustrates the virtualization of the automation system and how it operates in 3CIS.

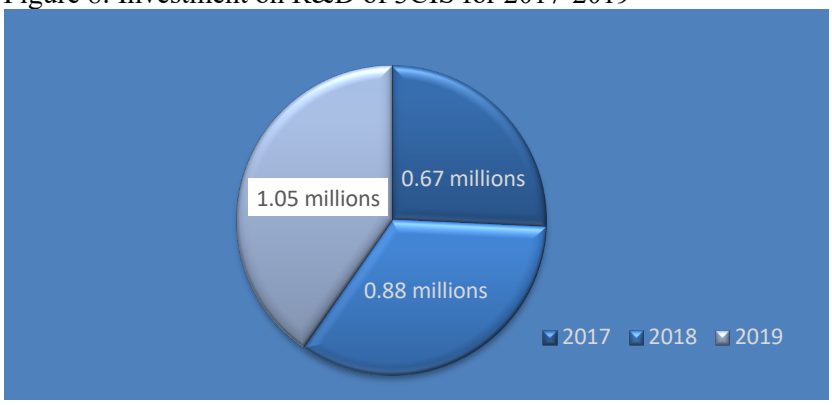
Figure 7: Automation support and implementation in 3CIS



Source: Author's compilation based on 3CIS data and interviews

As far as R&D is concerned, the analysis shows that the company has consistently spent 18 percent of the income generated over the years as it is considered very necessary and profitable for the company's growth. Figure 8 indicates an increase in R&D spending, hitting EUR 1.05 million in 2019 compared to previous years, and as shown in Table 11, this is attributed to an increase in annual turnover in 2019.

Figure 8: Investment on R&D of 3CIS for 2017-2019



Source: Author's calculation based on 3CIS data

To further argue this, our study reveals that the investment in laboratories for 3G, 4G, and 5G integration, which cost the company EUR 268,406, resulted in a return on investment of EUR 984,090. More significantly, as a result, 3CIS has hired 25 new engineers in the company as new employees, and the laboratories will continue to work and produce income

for the company. The analysis shows that a 1-euro investment in R&D generates EUR 3.6 of income for the firm. Although this profit is not always immediate, in the long run, it is worth the investment. In addition to this investment, 3CIS also invests in training, equipment, and education, including participation in ICT conferences, as part of R&D.[4] Following the labs, the testing team continues to deploy 4G cups and 5G network functions. Up to this point, virtualized 4G cups and 5G Single-Mode Fibres (SMFs) and User Plane Functions (UPFs) are currently operating as cloud-based applications. The company is now building the knowledge base needs, focused on customer requirements and new technologies. With technology evolving, the consumer needs are adapted based on new technologies, e.g., until a few years ago, telecom earnings were the product of voice traffic, with the introduction of a new voice IP call application such as Viber and WhatsApp, the entire vision of telecommunications technology has shifted; therefore, now the telecoms have to base the revenues on data plans compare to voice plans.[5]

Concerning the fiscal incentives for R&D, the company agrees that there are no fiscal incentives in place and complains that, even from the government side, such incentives are lacking. Nevertheless, tax breaks and other fiscal incentives are highly needed to invest in the necessary R&D funds. Given the low interest and willingness on the part of the government to support private companies in R&D, 3CIS was not inspired to design or propose a new incentive scheme that would push its current investment in R&D. Otherwise, if 3CIS had any incentives, it would build more space for them to accommodate more business opportunities. Whether there is adequate government support for innovation activities, 3CIS is not happy with the current incentives to support the ICT sector in Kosovo. The company suggests that the government should be more closely engaged with businesses in Kosovo, which contribute to innovative activities for both products and services. In order to strengthen relations between the public and private sectors, the government should be more involved in listening to the voice of businesses and considering the interests of companies. By doing so, the government will provide businesses in Kosovo with improved conditions in terms of innovation policies. According to the company, the types of grants given by the government do not satisfy the needs of 3CIS; hence, they have never obtained

[4] According to an interview with the managing partner in charge of operating issues in 3CIS.
[5] According to the interview with the CEO of 3CIS.

any grants from the government to fund innovation activities. The company insists that the grant structure is not appropriate and well-tailored to address the needs of the private sector, including 3CIS. For example, considering the specific global engineering knowledge needs of 3CIS and the laboratory testing of 5G architecture that the grant structure cannot provide, 3CIS has never applied for any government funding, keeping in mind that 3CIS needs are specific and grants are not tailored to 3CIS or the ICT sector requirements in Kosovo. In terms of program incubators or other facilitators in Kosovo, 3CIS highlights the role of ICK and 'BONEVET'[6] as incubators and facilitation providers as this should be useful for entrepreneurs given the fact, the incubators always bring new ideas, and the entrepreneurs should listen to those ideas.

Another critical part of 3CIS is technology, whether or not the company has any technology challenges, and whom it looks for help. In general, the company acknowledges that there are instances in which it faces technological difficulties, most of which occur in administration, but it is worth noting that, when dealing with those problems, 3CIS uses two channels of solution. First, it looks for a solution within the company, using the leading technology group to address the technical issues, and there have been situations where this group is very useful in solving those technical problems. For example, concerning design and implementation, there are instances where the design group within 3CIS contacts or collaborates with the integration group within 3CIS to work on particular problems such as the multi-vendor Computer Information System Company (CISCO), Ericson and Juniper as inter-operational issues. Second, the company used to face situations when it had to cooperate with external technology partners like CISCO[7], Juniper Networks[8], and Ericson[9] in order to solve any complex technology problems. The external help 3CIS usually needs from partners is to

[6] Bonevet aims to build the spirit of curiosity, innovation and creativity through active play and technology. A wide range of Science, Technology, Engineering and Mathematics (STEM) classes and training support children in coping with challenges of the 21st century https://www.bonevet.org

[7] Cisco Systems, Inc. is an American multinational technology conglomerate headquartered in San Jose, California, in the centre of Silicon Valley. Cisco develops, manufactures, and sells networking hardware, telecommunications equipment and other high-technology services and products https://www.cisco.com

[8] Juniper networks, Inc. is an American multinational corporation headquartered in Sunnyvale, California. The company develops and markets networking products, including routers, switches, network management software, network security products, and software-defined networking technology https://www.juniper.net/us/en/

[9] Ericsson is a Swedish multinational networking and telecommunications company headquartered in Stockholm and have several subsidiaries all over the world https://www.ericsson.com/en

work around known software or hardware bugs. In this connection, 3CIS used to face hardware bugs and, in order to address them, 3CIS requested external assistance from collaborators such as CISCO, Juniper and Ericson.

Collaboration with the university

As far as a partnership with the university is concerned, even though such collaboration between academia and industry is fragile and passive, the company admits few cases when the university and 3CIS invited each other to engage in specific cooperation programmes. For example, 3CIS was invited to be a member of the University of Prishtina (UP) board to make suggestions on new technology to adapt it to the curricula of studies as the new semester or academic year begins. Some of the technological topics proposed for the university are described in the syllabus (see Annex 2). Related subjects are also used on the job training (OJT) for employees of the company. 3CIS claims, however, that such interaction should be further strengthened as collaborating with academia on R&D will be very helpful and profitable, as the university should have advice on invention and innovation that should benefit firms in Kosovo. In the case of 3CIS, there are no particular needs towards the university on entrepreneurship and innovation; nevertheless, to bear in mind that the root of the invention come from institutes and universities as part of R&D, in doing so, there should be active collaboration between academia and or the university with companies in order to produce more R&D which would be helpful not only for students but also for the companies. In the case of Kosovo, the university should be able to offer R&D to companies that can then be managed by firms or commercialised by firms dealing with products and services. Nonetheless, the partnership between 3CIS and the university addressed only specific general needs and comments. In this respect, 3CIS insists that the university should provide graduates with capabilities and a skilled workforce for the labour market.

Moreover, as mentioned before, in order to fast-changing knowledge sector such as ICT by supporting technology, graduates, for example, the university should increase the number of students in higher education in Science, Technology, Engineering and Mathematics (STEM). Though, it is essential to note that, in cooperation with the university in engineering, 3CIS has consistently organised and assisted students who have the basis of skills. For example, in 2019, 3CIS welcomed 40 interns who completed a total of 200 hours of internships and

were positioned in numerous mobile networking projects. As a result, out of 40 students, 12 were recruited from 3CIS due to the excellent results demonstrated during the internship. Besides, over the years, the company has welcomed many U.S. students to do internships in 3CIS.[10]

The bulk of students employed with 3CIS are graduates from the UP and UBT, the latter being a private university. Such good cooperation with universities will also allow them to adjust the syllabus to support companies like 3CIS to provide graduate students. However, despite this minor progress between the university and 3CIS, the collaboration among them remains weak. In other words, the concept and effort of creating greater cooperation with companies is absent from the university as it tends to change very slowly. It may also be seen as a significant barrier due to the lack of adequate expertise of university staff and the lack of incentives on the part of university staff, as well as the lack of adequate mechanisms, such as regulations on work ethics and effective curriculum programme of studies, competitiveness, quality and results, and the considerable influence of politics.

Increasing role of organizational innovation: interdisciplinary and multidisciplinary project work instead of functional 'silos'

Given the importance of marketing as part of non-technological innovation, the company appears to be very involved in using various social platforms. The company uses the following social media for advertising offerings in different forms: 3CIS website, Twitter, Facebook, and LinkedIn. While 3CIS is well placed on the international market to provide services to its customers as the fundamental challenge of the company's programmes, applying rigorous marketing to the company is not seen as a strong requirement. "*The CEO of the company believes that the high quality of service delivery is the best marketing for 3CIS*"[11] and the analysis explains that the company exported about EUR 5.87 million in 2019; however, the use of social media remains vital to them, but is mainly used when the recruitment process is required. The company uses and incorporates numerous interdisciplinary working groups such as the engineering group, the radio access network, the design engineering group, the automation engineering group, and various management techniques. For the sake of illustration, inter-collaborative group work used an automated

[10] According to the interview with the head of HR and Quality and Matrix Department.
[11] According to the interview with the CEO of the company.

tool for one engineering group and then adapted it to be used in other engineering groups within the company. Another critical factor is that 3CIS involves employees in the preparation of decisions and keeps them updated daily. For example, inside the company, there is a technology-leading influence, coping with decisions in current and future projects. Besides, in every kind of business decision, such as durability and profitability decisions, the employers of technology and sales are actively involved and informed.

Furthermore, 3CIS organizes and engages in the form of a joint work organization, e.g., within the company; there is a development group that works closely with the implementation group as it aims to enable the latter to speed up the delivery of the company's task. The company demonstrates this in a real scenario; for example, during the implementation of one of the company's projects, the project team has built a tool to track the work from the outset of the service delivery, and this automated process builder is updated periodically, based on the customer's requirements. Databases have been created to measure each process separately during the work performed; thus, the team's automated process has increased work efficiency and customer satisfaction. While the job application, created by the R&D team, identifies the responsibilities of persons involved and any possible errors, this, in addition to the job description, has made it easier to communicate and has accelerated the completion and the quality of work on time.

The company's basic rule is the measurement method and the organization of systematic collection and evaluation for consumers and other stakeholders. As a result, the quality and metrics department translate the needs of clients explicitly into acceptable performance measurements in facilities by processes as well as serving as a coordinator between the company departments and tracking the performance of staff in order to assess the efficiency of work performance in collaboration with the HR department. Efficiency and performance of projects and metrics are the way to allow project management to do this in order to assess progress. However, it is crucial to remember that the metrics must be established to enhance the product or processes engaged in the project and must be attributable to the specified objective, threshold, or consumer requirement; or otherwise, it has no value. Our case study reveals that customer satisfaction and duality function have the company's highest priority and work under strict KPIs predetermining between 3CIS and its customers. In this respect, the company follows the "five nines" or 99.999 percent maxim, which corresponds to the

desired percentage of availability of the given computer system; therefore, 99.999 availability operates out of 5.39 minutes of total downtime scheduled or unplanned for a given year. The higher availability of services happens when the downtime is less than 5.26 minutes a year.

High priority of continuous learning: mixing practice of on-the-job training (OJT) and off-the-job training (Off-JT)

The company is actively organizing various training for its workers, such as OJT and Off-JT; however, the proportion of these two training forms is very significant. For instance, out of 176 employees, 90 percent benefit from OJT inside the company, while 10 percent are provided Off-JT depending on the issue. Outside training in Off-JT is typically organized on particular subjects relating to technologies and projects. The company had such cases where it had to train staff in the United States, the United Kingdom, and Europe, mainly two or three workers or partners attending the Off-JT, so those workers would come and transfer knowledge to a larger group within the company, while as noted above the majority of the employees would be trained locally in the field of technology. More precisely, there are two forms or phases of the OJT arranged by 3CIS for its staff:

The first type of OJT is linked to R&D, which focuses on emerging technologies. One part of this training includes testing and developing new ideas in 3CIS laboratories. Other topics are given to senior engineers who are primarily engaged in current projects. The phenomenon here is that such an OJT is organised for existing senior engineers who can work on new projects in 3CIS; hence, OJT focuses directly on senior engineers' training for future new projects under contract. In so doing, 3CIS aims to involve in the new projects the staff who have enough experience and skills with the existing projects, and once the new projects start implementing with these trained staff, the new senior engineers are to be recruited in order to replace the senior engineers who were involved in the existing projects.

The second form of OJT is linked to the recruitment process. In this scenario, the first stage of the recruitment process begins with the candidates' interview within 3CIS, so the successful candidates in the first stage are invited to take part in the writing test; therefore, the company recruits the best candidates. This process takes about three weeks to complete. The hired engineers would then be engaged in the existing projects, and many OJT's would

be provided for them, starting with the development of the current technologies in 3CIS. Some of the key current projects for which the employed engineers are responsible for implementation are presented in Table 14 below:

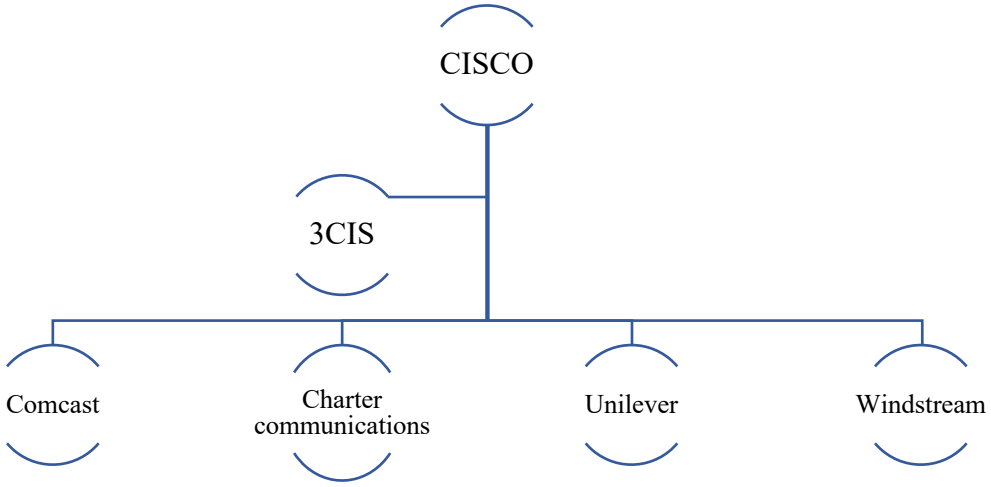
Table 14: Classification of the current projects of 3CIS in 2020

Type of projects	Project's implementation company	Beneficiaries of the project	Aim of the project
Voice Network Operation Centre (VNOC)	3CIS	Windstream, headquartered in the USA	The project is focused on monitoring of the legacy telecom network of 24 hours per week.
The Service Provider Technology (SPT)	3CIS	Comcast, headquartered in the USA	The project deals with designing and migration of the Comcast commercial customers to the new equipment and technology.
The Service Provider Technology (SPT)	3CIS	Charter communications, headquartered in the USA	The project is focused on designing and provisioning of the new commercial customers in the network.
Customer enterprise technology base	3CIS	Unilever, headquartered worldwide	The project aims to provide professional services regarding the migration of all old Unilever devices to the new devices.

Source: Author's compilation based on 3CIS interview

In the context of the syllabus designed by 3CIS, most senior engineers participating in the above-listed projects benefit from OJT and Off-JT. As far as OJT is concerned, a range of topics is provided to train them for new technologies and new projects to be primarily based on R&D (see Annex 2). In addition, to conform to the curricula of studies, as noted before, certain topics on new technology are introduced at the university. In contrast, Off-JT is primarily structured on working procedures unique to customers and are usually not industry standard. As mentioned earlier, there have been cases in which senior engineers from 3CIS have been sent to clients such as Comcast, Charter Communications, Unilever, and Windstream for Off-JT's benefit. The key issues discussed are the work procedures and communication processes, scheduling job execution, coordination with other execution evaluation teams, the ticketing system, and other related customer-specific procedures. Based on the needs and specifications of 3CIS, Off-JT is coordinated in collaboration with 3CIS project clients. Figure 9 illustrates how the relationship between 3CIS and its contracted partner CISCO works; in this situation, the vendor, and the contracted project clients to whom 3CIS provides professional services.

Figure 9: Collaboration of 3CIS with its partner and project clients



Source: Author's compilation based on the interview with 3CIS

For the sake of clarification, the following box 1 gives a brief explanation of the scope and key characteristics of all actors presented in Figure 9:

Box 1: Brief explanation of the scope of 3CIS clients

CISCO also defined innovation as re-imagined ties and pushed the limits of what is possible. CISCO Networking Academy (CNA) was founded in 1997 as the world's most extensive and longest-running Corporate Social Responsibility (CSR) education programme, and in 2006 it set the first time Greenhouse Gas (GHG) emission reduction goal. CISCO has pioneered the technology that integrates all and helps communities educate the generation of tech professionals in three areas: a) CNA, in particular, equips students with real-world knowledge and career connections in fast-growing IT fields; b) Innovation Centers Spaces (ICS) where urban innovation hubs can innovate and share ideas (CSR Report, 2019). Charter communication is an American company, focuses on growing TV, internet, and voice businesses. It also deals with the integration of the best quality service with outstanding entertainment and communications products. Charter communications are at the crossroads of technology and entertainment, especially by facilitating the necessary communications that link more than 28 million business and residential customers in 41 countries worldwide and represents its clients and exceeds expectations because it is the cornerstone of its business strategy that drives its 98,000 employees (Rutledge, 2019) president & CEO of the company. Comcast is an international media and technology corporation that works across the three main business sectors: Comcast Cable, NBC Universal and Sky. Comcast cable is headquartered in the USA with the most extensive high-speed Internet, video, and mobile coverage to residential and business users. It also offers wireless and automation services, but mainly to residential consumers in this situation. NBC Universal is global and operates news, entertainment and sports cable networks, television production operations and television stations. The last one in the sky is a leading media and entertainment business that links users in Europe to a wide variety of video content and communication networks, including high-speed internet, wireless and mobile services for its customers (Roberts, 2020). Unilever is a global company that is active around the world. It has over 400 different brands, focusing on health and well-being, and these items are distributed in 190 countries, e.g., Lipton, Knorr, Dove, Rexona, Hellmann's, and Omo are just some of its leading products. The company's standards are dictated by three main factors: laws and regulations, internal safety assessments and shifting customer preferences. The importance of the company is that about 2.5 billion consumers today use their goods regularly (Jope, 2019). Windstream technology was eventually developed in 2008, emphasising low-cost design and manufacturing, along with a highly efficient renewable energy solution for both urban and rural areas. The company's main product is 'SolarMill,' which is 100 percent owned and controlled by Windstream and has proprietary rights in the U.S. and globally. In this connection, Windstream is an American company that supplies its goods to several different countries in Europe, Africa, Latin America, South Asia, India, and the Caribbean (Windstream, 2018).

As seen in Figure 9, 3CIS acts as a third party contracted to work under CISCO. It should be stated that the needs of the Off-JT in the relevant fields of technologies and working procedures are defined at the outset of the projects; thus, 3CIS agrees with projects concerning the technology and methods of implementation and delivery of services. Subsequently, during the implementation process, CISCO continuously supports 3CIS, based on the needs agreed in collaboration with project clients, either with Comcast, Charter Communications or Unilever and Windstream, to coordinate Off-JT 3CIS workers. Senior engineers who benefited from Off-JT will then come back to share and transfer knowledge with other senior engineers working on the same project. Projects run from 6 months to 3, 4 and 5 years, depending on the project's goals.

Concluding remarks

It has become a decade since 3CIS began operating; indeed, this is not a long tradition in the particular service field. The company has proven that it has played a vital role in Kosovo's innovation ecosystem; thus, it can be considered a success story. Continuous technological innovation, in particular increasing automation services, has strengthened the front-runner position of 3CIS in the global market for business services. The main lessons learned from the 3CIS experience can be summarised as follows: First, the company has a unique role in the innovation ecosystem in Kosovo. It has also succeeded in being integrated into GVC of the knowledge-intensive business service sector. Maintaining, in particular, improving the position in the GVC has forced 3CIS to invest heavily in knowledge: thus, the company invests 18 percent of its turnover annually in R&D; however, research activities are somewhat lacking compared to development components is quite advanced. Investment in knowledge creation has now been an increasingly cost-effective approach. The analysis shows that a 1-euro investment in R&D resulted in a financial benefit of EUR 3.6. Second, the company has successfully combined in house and external knowledge sources (e.g., mixing OJT and Off-JT). In this connection, it is worth noting the increasing role of organizational innovation in enhancing knowledge creation and transfer within the firm (e.g., the regular use of the project type interdisciplinary work organization). It is worth mentioning that the maintenance or improvement of the 3CIS position in the GVC in the KIBS sector requires continuous monitoring, learning and renewal of the techno-organizational and knowledge infrastructure.

However, as indicated above, despite outstanding achievements (e.g., R&D input and output ratio) and an excellent location in the GVC, the company has to cope with future challenges. Due to limited cooperation with the government, the company needs to develop "high-value-added" or "strategic" cooperation with innovation policymakers and help articulate the business community's voice in elaborating and executing the Kosovo government's innovation strategy. For example, the government's grant structure needs to be more tailored and well-designed to address the actual needs and trends of innovative companies in Kosovo. Finally, the collaboration between academia and industry is weak and lacks dynamics. The university should be able to provide graduates with up-to-date skills and learning capabilities (e.g., increase the number of STEM students) to exploit the significant R&D investment of the innovative firms efficiently. In addition, there are no successful motivational mechanisms in the main universities (both public and private) in Kosovo to support mobility and closer cooperation (e.g., business, and academic community jointly develop course curriculum, inviting practitioners to teach at the university).

5.2. Pharmaceutical manufacturing as a knowledge-intensive sector: The case of Tre Pharm company

Introductory remark

This case study aims to analyse the role of a pharmaceutical manufacturing company as a knowledge-intensive sector in relation to innovation activities in one of the sensitive industries in Kosovo that is at the frontier of a high competition of the current technological innovation and market share. Therefore, the study provides important insights into how the pharmaceutical manufacturing company has undertaken innovation efforts to enhance its participation in national and international markets. Data were collected based on a qualitative guide interview, combining, and analysing five semi-structured interviews from the different representing areas of work in Tre Pharm and are analysed in the context of innovation in the pharmaceutical manufacturing sector. Besides interviews, recent research and reporting activities related to Tre Pharm have been complemented and used as secondary data sources in the case study analysis.

The findings indicate that as a young company still less than a decade on the market, it has a unique role in the current innovation ecosystem. The company is gradually increasing the

integration into the GVC, representing about 87.80 percent of the country's total exports; however, the annual consumption is dominated by imports, comprising only 2.55 percent of the participation. In addition, continued investments in automation systems, technology and machinery result in a wide-scale and a variety of manufacturing products, thus managing to produce 115 pharmaceutical products. The case study structure consists of the following: the first part offers a snapshot of the company, including the history and recent developments since its establishment. It continues with the second part on the classification of manufacturing products by turnover and participation in the market share. The third part is concentrated on developments in production and automation systems and highlights the use of various managerial technicians, including the role of marketing as a driver of innovation. The fourth part analyses the role of collaboration between the university and Tre Pharm, focusing on STI and DUI collaboration, along with the practice of OJT and Off-JT. Finally, conclusions are drawn.

History and continuous development of the company in a nutshell

This section offers details on the history of Tre Pharm and lists continued developments and challenges of the manufacturing company since its inception. Tre Pharm is a pharmaceutical manufacturer in Kosovo, registered in 2008, as a limited liability company starting to operate in 2010 and entering the market in 2011, initially with a small number of employees, but gradually increasing its capacity; meanwhile, the company hit its peak of hiring a total of 85 workers in 2020. The company applies rigorous recruiting requirements for hiring new employees and tends to hire people who live in separate towns or villages not even close to the factory because the company manages and provides transport facilities. The pharmaceutical manufacturer of generic products and medical brands is located in Kosovo, especially in the outskirts of Prishtina. According to Tre Pharm's CEO, *"the overall investment in the whole development amounted to EUR 20 million; it began with EUR 8 million but continued investment, reaching a total of EUR 20 million by 2020."*[12] The company's main activity is the manufacturing of pharmaceutical products and, since its founding, the primary goal of Tre Pharm has been to establish a factory certified by the EU authorities. In this regard, the certification process for the factory started in 2017, when the application was submitted to EU Pharmaceuticals, Good Manufacturing Practices (GMP)

[12] According to the interview with the CEO of the company.

Professional Certification (CPGP).[13] Since the application was submitted, several partnerships and improvements have taken place, and, in compliance with EU regulations, the inspection team visited and inspected the factory. Recently, Tre Pharm received a report confirming that the factory is on track to be certified by CPGP during 2021, which will give the company a high rating. This will be very important for Tre Pharm because the EU will recognize the quality system of the factory; it will also allow the company not only to apply for GMP and marketing authorization certificates in EU countries for goods that meet export requirements but also to bring in European products and to be manufactured in the Tre Pharm factory. Quality assurance, in this case, is crucial; it is a failure management mechanism that accounts for almost everything related to product protection, quality standards, and regulations, and it is this mechanism that takes steps to prevent the defective product from reaching the advanced stage of the distribution chain and in the case of Tre Pharm, the quality management system is a combination of directives, laws, and regulations regulating the manufacture of pharmaceutical products by the World Health Organization (WHO)[14] (Quality Assurance, 2020). In terms of activities, Tre Pharm also specialises in providing types of services through its accredited labs that measure or test water and types of drinks for some domestic producers using specific monitoring controls for the export of such goods. However, in the long term, this is not seen as beneficial to Tre Pharm and is not expected to grow it further; instead, they are considering quitting this activity.

The company's sales turnover increased marginally from year to year, even though it decreased in 2019 due to an investment in the certification process; though, the company remains the leader in the market in Kosovo as the country's largest pharmaceutical manufacturer and continues to grow its sales turnover over the years. Table 15 describes the trends, including the composition of the company's employees, in the period 2016-2020.

[13] The certified pharmaceutical professional considers the good manufacturing practices (GMP) as regulated and guided by both national and international agencies for the pharmaceutical industry. This includes finished human and veterinary drugs and biologics, ectoparasiticides, and dietary supplements controlled as drug goods, as well as their, component of raw materials that include active pharmaceutical ingredients, packaging, and labelling operations: https://asq.org/cert/pharmaceutical-gmp.

[14] The WHO is a specialised United Nations agency responsible for international public health. The WHO Constitution sets out the governing structure and principles of the agency that highlights its main objective as "the attainment by all peoples of the highest attainable level of health": https://www.who.int.

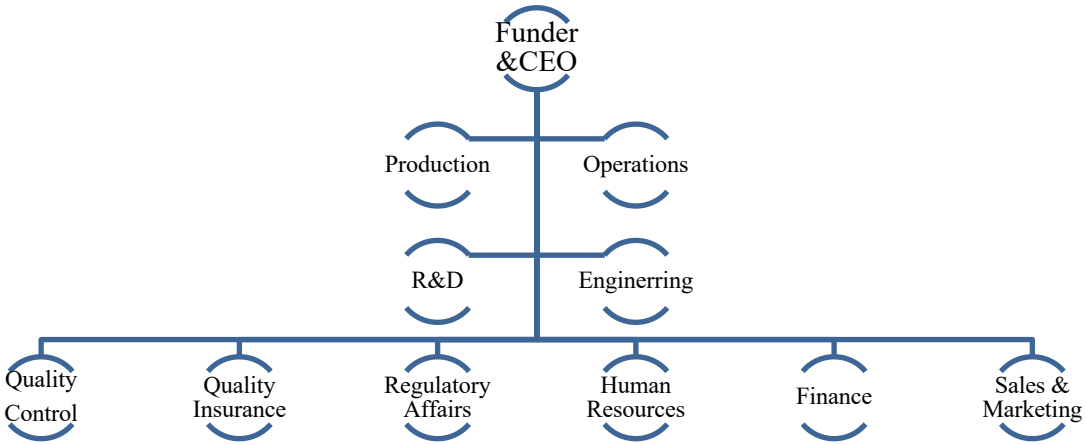
Table 15: The recent developments of Tre Pharm between 2016-2020

Year	No. of employees	Sales turnover	Educational composition		Gender composition	
			Qualified	Less qualified	Men	Women
2016	33	€1.46	17	16		
2017	33	€1.99	17	16		
2018	70	€2.57	40	30		
2019	83	€0.95	42	41	35	48
2020	85	-	45	40	36	49

Source: Author's compilation based on interview and financial statement[15]

The company consists of ten departments, and the number of staff determines the importance of the departments. The company manages with 85 workers in 2020, and the distribution of the number of employees varies from one department to another. For example, the manufacturing department represents the most significant number of employers, with 35 employees, followed by the HR department with 16 employees, engineering and quality control with seven employees each. The remaining number of workers is split among other departments, from three to five workers. Figure 10 shows the organizational chart of the manufacturing company, which consists of a very complex structure.

Figure 10: Organogram of Tre Pharm



Source: Author's compilation based on the interview

It is worth noting that the R&D is organized as a department in 2020 and has only three employees; however, R&D has collaborated with other departments from the outset because

[15] https://mf.rks-gov.net/desk/inc/media/FCFA4230-3B38-4E1A-8C5C-1B9FFE47FC86.pdf.

developing products required some kind of R&D. In order to produce a product, e.g., paracetamol, an in-depth study of the formula and ingredients must be carried out, both of which require R&D, in a particular development, and which has resulted in the development of 140 pharmaceutical products in total. However, to equip the R&D department since it is formally organized in the department, the company should have more equipment and increase the number of employees. This will enable the company to start with research activities that have been completely lacking so far, continue developing new products, and not stay focused solely on the development of existing and new products within the company. In this regard, since 2020, the company aims to spend up to 13 percent of its annual sales turnover on R&D in the form of investment; likewise, over the last ten years, the ability of the manufacturing company to invest continuously in the technology and machinery phase has not decreased.

In addition to its investments, in 2015, Tre Pharm received some funding from the European Bank for Reconstruction and Development (EBRD)[16] of €57,000, which helped the company broaden its product range and comply with EU quality standards and helped it to prepare for the certification process (EBRD, 2015). However, the company has never obtained any funding or subsidies from the government bodies in Kosovo, even during the pandemic situation with the COVID-19; the company has not even been contacted regarding any collaboration or challenges the company is faced with. Finally, concerning the ownership structure, according to the data for 2017 obtained from the Kosovo Business Registration Agency (KBRA), the composition of the ownership structure in Tre Pharm, depending on the status of the registered company, indicates the situation regarding the shareholder and the total capital of the company. Table 16 presents the composition of the ownership in the company.

[16] In Kosovo, EBRD focus on supporting competitive development of the private sector, enhancing energy security, sustainability and supporting connectivity and regional integration: https://www.ebrd.com/kosovo.html.

Table 16: Composition of ownership at Tre Pharm

Capital of the company	shareholder & authorized person
	€8,151,567.85

Source: Author's compilation based on (KBRA, 2017)

Product activities by turnover

This part briefly focuses on identifying products that most contribute to the overall sales turnover of the company. In this regard, out of 145 products developed, the company can produce 115 products, and between 2014 and 2020, all of these 115 products were registered and obtained marketing authorization certificates from the Kosovo Medicines Agency. This ensures that all these goods have the right to function and be sold on the domestic market; however, the study reveals that not all of these 115 goods are consistently manufactured and marketed since the company produces based on orders, and the demand is not necessarily for all goods. In this relation, between 2017 and 2019, out of 115 manufacturing products, the study identified 71 pharmaceutical goods that played a crucial role in the company's sales turnover. Table 17 displays, in more detail, the present classification of the key categories of goods representing the predominance from the highest to the lowest proportion of products in the sales turnover of Tre Pharm

Table 17: Share of sales turnover by types of product activities between 2017 and 2019

Product activities	Share in turnover	Product activities	Share in turnover
Secumet 50mg+850mg x 30 filmtablets	15.80%	Erytre 500mg x 16 capsules	1.63%
Albadol 100mg/5ml-shurup (100ml)	0.09%	Expergo 100mg x 10 tablets	1.57%
Albadol 400mg x 30 filmtablets	2.38%	Glimur 3mg x 30 tablets	4.38%
Aminophylline 350 mg x20 tablets	0.77%	Lisocard H 10mg+12.5mg x 30 tablets	0.60%
Amipen caps 500 mg x 16 capsules	0.45%	Locard H 50+12,5mg x 30 tablets	1.57%
Amlodipine 10mg x 30 tablets	0.07%	Locard 50mg x30 tablets	0.74%
Amlodipine 5mg x 30 tablets	0.00%	Loratadine 10mg x10 tablets	0.32%
Aspiridol Protect 100mg x 30 tablets	1.23%	Loratadine 5mg/5ml shurupe (100ml)	0.21%
Aspiridol Protect 75mg x 30 tablets	0.59%	Moxtid 1 g x 10 filmtablets	1.43%
Azitre 200mg/5ml oral suspension (15ml)	0.63%	Moxtid 125mg/5ml oral suspension (100ml)	0.27%
Azitre 500mg x 3 capsules	1.40%	Moxtid 250mg/5ml oral suspension (100ml)	2.68%
Bactre 240mg/5ml-shurup (100ml)	1.38%	Nifurex 200mg x 8 capsules	0.32%
Bactre 480mg x 20 tablets	2.03%	Nifurex 200mg/5ml Oral Suspension (90ml)	0.80%
Bactre 960mg x 20 tablets	1.70%	Phenocillin 1 mil IU (625mg) x 30 filmtablets	2.39%
BedoKS 25mg x 20 tablets	0.00%	Phenocillin 1.5mil IU (937.5mg) x 30 filmtabl	2.12%
Bisacodyl 5mg x 20 tablets	0.77%	Primet 850 mg x 30 tablets	2.72%
Cef 250mg/5ml oral suspension (100ml)	1.57%	PRO gel 25mg/g-50g	1.83%
Cef 500mg x 16 capsules	3.73%	Procard 6.25mg x 30 tablets	0.71%
Cefexel 100mg/5ml Susp.oral 60ml	2.17%	Protopen 20mg x 20 tablets	1.30%
Cefexel 400mg x 10 capsules	4.14%	Protopen 40mg x 20 tablets	4.38%
Ciprot 500mg x 10 filmtablets	1.16%	lbadol 100mg/5ml x 12 qese	0.38%
Ciprot 750mg x 10 filmtablets	0.47%	Secuvia 50mg x 30 tbl	3.87%
Dolofix 500mg x 30 tablets	0.25%	Tre Tal 400mg x20 filmtablets	0.18%
Dolofix 500mg x 500 tablets	0.13%	Treagra 100mg oral gel x 7 sachets	0.11%
Dolofix Forte 750mg x 20 tablets	0.00%	Treclor 500mg x 16 capsules	2.30%
Dolofix Forte 750mg x 200 tablets	2.24%	Treclor 125mg/5ml oral suspension (60ml)	1.53%
Dolofix Menstrual x 10 filmtablets	1.07%	Treclor 250mg/5ml oral suspension (60ml)	2.92%
Dolofix Muscular x 10 film tablets	1.25%	Treklin 300mg x 16 capsules	0.82%
Dolohot (Cold & Flu) x 12 sachets	0.37%	Triocard 160mg+5mg+12.5mg x 30 filmtablets	2.64%
Dolohot C x 12 sachets	0.74%	Triocard 320mg+10mg+25mg x 30 filmtablets	1.37%
DoloKids 120mg/5ml x 12 qese	0.36%	Valsacard H 160mg+12.5mg x 30 filmtablets	0.13%
Dolokids 120mg/5ml-shurup (100ml)	0.40%	Valsacard H 320mg +25mg x 30 filmtablets	0.30%
DoloKids 200mg/5ml x 12 qese	0.47%	Vitamin C 500mg x 250 tablets	0.21%
Enalapril 10mg x 30 tablets	0.04%	Xalam 0.25mg x 30 tablets	0.48%
Erytre 250mg/5ml oral suspension (100ml)	3.48%	Xalam 0.50mg x 30 tablets	0.40%

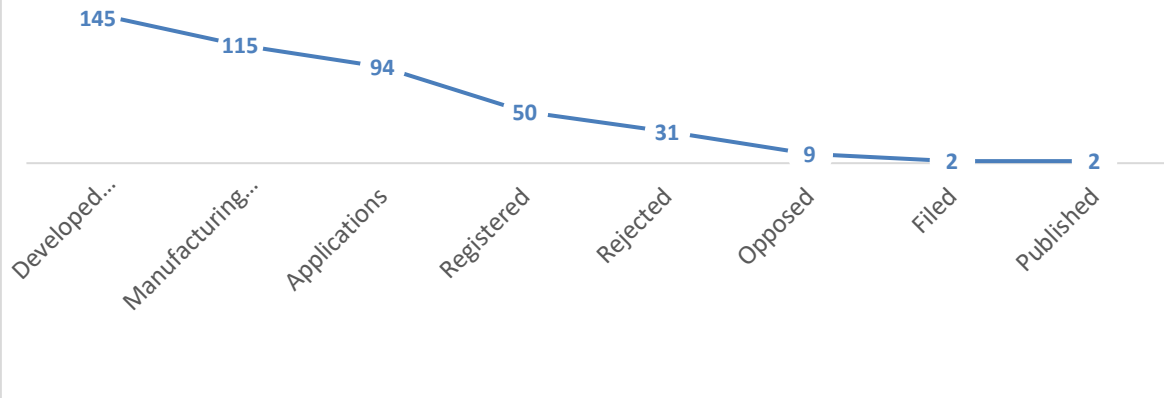
Source: Author's compilation Tre Pharm data

Although the percentage of supply of pharmaceutical goods in various categories fluctuates due to market needs and the total percentage of products has a growing pattern or trend over time, which positively impacts the company's turnover between 2017 and 2019. Furthermore, it should be noted that mainly products belonging to the paracetamol and antibiotic family represent the largest share in production and sales, which significantly contributes to the sales turnover over the years. This means the structure of the product activities will remain the same for the coming years, or it could increase, e.g., due to the pandemic situation with COVID-19, the demand for such products is increased.

Classification of manufacturing products and market share

In the first years of foundation, the company started with e small number of products. However, due to continuous investments, developments, and organizational changes, the production currently includes a large scale and range of products with the most modern machinery and cutting-edge technology in Kosovo. In this way, the number of production lines increased significantly; meanwhile, in 2020, it manages to produce 115 pharmaceutical items and create an efficient production structure. The company has developed 145 products, but in practice, it produces 115 pharmaceutical products. Tre Pharm has adapted the ingredients of the pharmaceutical products from the British Pharmacopoeia[17] operating in the United Kingdom (UK). Out of 115 manufactured products, Tre Pharm has applied for the trademark protection of 94 products to the Industrial Property Agency (IPA), the central administrative body operating under the MTI. IPA is responsible for the legal protection of an invention/patents, trademark, industrial design, designation of origin, geographical indications, and topographies of integrated regions, as well as other issues arising from international agreements to which the Republic of Kosovo is a signatory.[18] Figure 11 presents the development of the enterprise about the total number of products developed, the number of manufacturing products, the number of the application process and the achievements in terms of trademark registration.

Figure 11: A snapshot of pharmaceutical products



Source: Author's compilation based on interview and IPA data

[17] The British Pharmacopoeia covers a broad international market. It reaches more than 100 countries around the world with a focus on protecting public health by ensuring accurate quality standards for pharmaceutical and medicinal products since 1864 and playing an essential role in the process of setting standards in Europe. The British Pharmacopoeia is a fundamental reference tool for all individuals and organisations involved in pharmaceutical, including R&D, production, and quality control analysis: https://www.pharmacopoeia.com/what-is-the-bp.

[18] https://kipa.rks-gov.net/page.aspx?id=2,17.

As shown in figure 11, out of these 94 applications, the company has managed to register 50 of them in terms of trademarks. In comparison, 31 applications have been rejected for not meeting the criteria for trademark registration, while nine applications were against trademark registration, and four other applications filed and published were in the process of examining the trademark. As for patents and industrial designs, Tre Pharm has not yet addressed any application. More information regarding the classification of products and types of trademark applications for Tre Pharm are presented in Annex 3. What is crucial to analyse here is that out of 33281 applications in Kosovo, for any type of product not focused only on the pharmaceutical field, a total of 26603 trademark applications are registered in the IPA office, of which 9.90 percent or in value terms 2635 registered trademark applications are locally owned.[19] In this relation, it is worth noting that of the 2635 registered trademarks, the analysis shows that Tre Pharm represents 1.89 percent of the total participation. The manufacturing company ranks third in the market share of cardiovascular products in Kosovo, while imports cover most of the market share; however, Tre Pharm remains the leader of drug manufacturers in Kosovo. Table 18 shows the trade exchanges of pharmaceutical goods between 2015 and 2019 in value.

Table 18: Trade exchanges of pharmaceutical products over the years

Year	2015	2016	2017	2018	2019
Export	€57,926		€695,643	€1,864,781	€931,977
Import	€64,035,959	€65,971,020	€63,380,714	€66,175,335	€66,607,855

Source: Author's calculation based on Kosovo Statistical Agency[20] and Kosovo Customs

As illustrated in table 18, there was an increasing trend in exports and imports between 2015 and 2019; however, the analysis shows that imports dominate medicines over the years. As a result, the level of exports remains weak, resulting in a high trade deficit of EUR-65.6 million for 2019, which means that the domestic demand for the consumption of pharmaceutical goods is met mainly by imports, with a domestic demand-oriented entirely by the external market. According to the tariff code of Kosovo, the category with the highest share of exports and imports pharmaceutical products is the category represented by the following products:

[19] The report of trademark applications for Kosovo is available by contacting IPR office.
[20] https://askdata.rks-gov.net/PXWeb/pxweb/en/askdata/.

- herbal medicinal preparations based on the following functional substances like minerals
- consisting of penicillin's or derivatives thereof, with a penicillanic
- containing insulin, other
- containing alkaloids or derivatives thereof essential amino-acids or fatty acids, in packings for retail sale.[21]

Table 19 below shows the total domestic exports of medicines and Tre Pharm's share over the years in both value and net weight. In terms of export, the company is concentrated in two directions, on the markets of neighbouring countries such as Albania and Macedonia; while, of the foreign target markets, the most significant share of exports is destined to Libya. Thus, out of 115 products, the company exports 50 percent of them, and Libya remains the largest export market.

Table 19: Total export of medicines and participation of Tre Pharm between 2017 and 2019

Year	Total export of the country	Tre Pharm export	Share in total export	Total net weight exports	Tre Pharm export net weight	Share in total export
2017	€695,643	€94,903	13.60%	27,471	3,512	12.90%
2018	€1,864,781	€1,638,205	87.80%	52,643	47,548	90.30%
2019	€931,977	€13,650	1.50%	6,121	523	8.50%

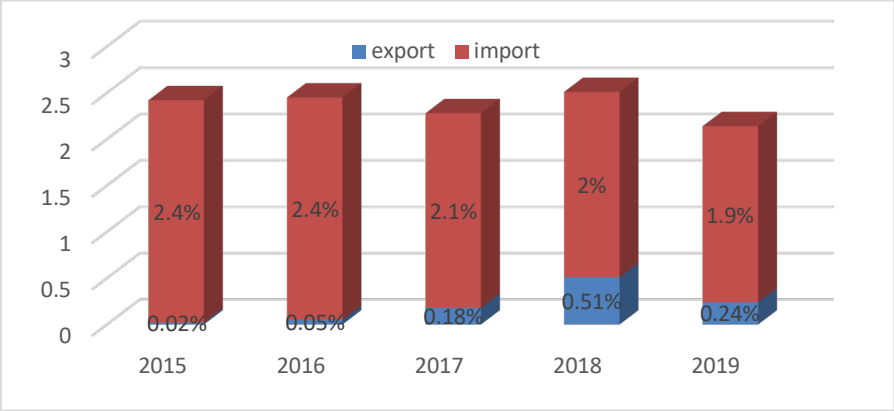
Source: Author's calculation based on Kosovo Costumes

As seen in Table 19, Tre Pharm's share of total exports in the country fluctuates considerably from year to year. The analysis shows that Tre Pharm exports declined significantly in 2019 compared to 2017 and 2018, but it is worth assessing the year 2018, where the export value hit more than EUR 1.6 million, which shows a far better export performance compared to 2019, and if we compare 2018 with 2017, the analysis shows that there has been a massive increase of 168 percent. It is also worth noting that in 2018, Tre Pharm extended the export geography of pharmaceutical drugs beyond the area where the leading destination was the Libyan market, accounting for 75 percent of the company's total exports, while 10.7 percent in Albania and 7.2 percent in the Turkish market and main exported goods are medications, dosed for retail sale, containing antibiotics, vitamins, or other goods. These products exported to those countries needed to be registered with a marketing authorization certificate by the importing countries because it is not sufficient to have a marketing authorization certificate only by the Kosovo authority. Products that do not have a marketing authorization

[21] https://dogana.rks-gov.net/tarik/TARIK_VERSION01012020_PDF%20ENG/CHAPTER%2030.pdf.

certificate from an importing country may only be sold on the Kosovo market. Therefore, Tre Pharm has not yet reached the EU market, and the chances of entering the European market are more complex, although there are many applications in the evaluation process in Croatia, Poland, England, and Hungary. Such a process takes two years to register a product or obtain a marketing authorization certificate for goods that comply with export criteria. As stated above, it would be simpler for Tre Pharm to approach the EU market after the certification process is completed and the EU recognizes the quality. The year 2019 marked a dramatic decline in the export of Tre Pharm, although imports remained almost at the same level between 2015 and 2019, and the significant drop of Tre Pharm was evidenced by a strong commitment and investment dedicated to the certification process; furthermore, most of the production was oriented to the national market. Figure 12 shows the involvement of pharmaceutical products in the overall imports and exports of the country over the years, including the involvement of Tre Pharm.

Figure 12: Participation of medicaments in total imports and exports



Source: Author's calculation based on Kosovo Statistical Agency

In the case study, we further examined the sales capacity-based production of Tre Pham with a specific emphasis on the national market share of sales. From Table 20, we understand that in 2018 the manufacturing company performed exceptionally well in the domestic market and export. The analysis shows that the most significant quantity of goods sold in 2018 was destined for the domestic market, accounting for 67.38 percent of national sales, while 32.62 percent of sales were destined for the international market.

Table 20: National sales and market share between 2018 and 2019

Sales from production	Quantity per unit in 2018	Share in percentage	Quantity per unit in 2019	Share in percentage	Changes in 2018/2019
Exports	839,150	32.62%	6,000	0.63%	-99.20%
National sales	1,733,558	67.38%	948,590	99.37%	-45.30%
Total sales	2,572,708	100.00%	954,590	100.00%	-63%

Source: Author's calculation based on company data

By comparison, the year 2019 is characterized by a sales volume of 99.37 percent of the domestic market share, although just 0.63 percent went to export. However, if we compare the overall sales of the goods produced by Tre Pharm in 2019, we understand from our study that there is a dramatic decrease in sales of about 63 percent compared to 2018. Finally, it should be noted that our study indicates that the total annual consumption of medicines in Kosovo is around EUR 67.90 million, so that imports amounted to around EUR 66 million over the years, making up the largest proportion of import-dependent consumption. In this respect, when evaluating the company's national sales of EUR 1.7 million, the findings in 2018 indicate that Tre Pharm represented only 2.55 percent of the overall consumption share; nevertheless, its participation decreased to 1.40 percent in 2019; however, it fluctuated marginally between 2016 and 2019.

Production line with the focus on automation system

This section focuses on company productivity, including the role of automation and IT systems in the production process, but first, a short definition of productivity is provided. Productivity is a measure of value-added in the production process of goods and services, and the ability to apply new knowledge and innovate in product and process innovation is an important driver of productivity growth (Nielsen, 2019). Tre Pharm has the highest level of productivity in the country and is a significant competitor in the region, and it works under two units:

- the first unit with a surface area of 2200 m², of which 800 m² are production areas for pills, capsules, dry syrups, and oral suspension powders, and
- the second unit with a surface area of 5650 m², of which 2700 m² are used for the manufacturing of solid and liquid, sterile and non-sterile formulations.[22]

[22] http://sustainicum.at/files/projects/296/en/additional/SMTrepharm_Company_%20Profile_handout.pdf.

The pharmaceutical product manufacturer is the market leader of Kosovo and one of the most significant factories in the region, and a very competitive company. It controls all the processes ranging from raw material production to selling the finished products in national and international markets with a relatively cost-efficient working system of raw materials imported from UE countries and China. In order to produce a product, there should be around 25 ingredients in the form of raw material. Investment in technology and improvements in organizational structure seem to be the main factors shaping innovation in Tre Pharm. The organizational and managerial structure developed in parallel with technological development have resulted in increased production capacity. As a result, production lines increased significantly; meanwhile, in 2020, it manages to produce 115 pharmaceutical items and create an efficient production structure. As for the automation system, in the past at Tre Pharm, most activities were done manually, especially when experimenting, they had to do it manually, e.g., write down the values and download, but during the last two years, they have an IT system in place, which is linked to all the equipment in the labs and manufacturing system, and the IT system is taking care of everything. This has created an efficient production structure that led to better performance by streamlining the processes and eliminating inefficiencies, and reducing costs related to the production system. However, not everything is automatically perfect as it requires constant investment in the automation system, which costs the company. As part of the automation system, Tre Pharm has set up a device in the house that helps them solve any technology problems. Operations in the company are performed in specially designed areas and with the right size with separate areas, and control systems are implemented for processing in order to prevent contamination or mixing during operations.[23]

The use of managerial technicians

This section focuses on identifying and reviewing the capabilities of the company in the use of any managerial technician in the production process or in any way that supports the production method, such as any form of the International Organization for Standardization (ISO), Just-in-Time manufacturing (JIT) and the Quality Circle. In addition, the case study shows that the organization uses different interdisciplinary working groups and appears to be well advanced in implementing different forms of managerial techniques.

[23] http://trepharm.com/technology/.

The use of ISO forms

ISO is an independent, non-governmental international organization made up of 165 national standards bodies. It brings experts together through its members to exchange expertise and create voluntary, consensus-based, market-related international standards that promote innovation and address global challenges. [24] In the context of ISO, as a young company still less than a decade on the market, Tre Pharm has steadily built up its reputation and increased its quality requirements by applying a range of different international standards in the form of ISO. In table 21, is shown the usage and scope of each standard applicable to Tre Pharm.

Table 21: The use of ISO forms

Forms of ISO	The purpose of standards
ISO 17025:2017	This version of the standard extends to all entities engaged in laboratory activities and defines the general criteria for the competence, impartiality, and sustainable operation of laboratories.
ISO 7887:2011	This standard defines four different methods for analysing watercolour in water treatment plants.
ISO 9297:1989	This standard specifies the consistency of the water, the determination of chloride and the titration of silver nitrate with a chromate indicator.
ISO 6878:2004	This form of the standard defines methods for the assessment of all forms of water quality, including seawater and phosphorus.
ISO 9308-1:2014	Apart from water quality, this form of the standard defines a system for counting Escherichia coli bacteria.
ISO 5667-1:2006	This type of standard sets the basic principles and directs the design and sampling of water programmes, including wastewater.
ISO 5667-3:2012	This standard sets the general criteria for the treatment and sampling of samples of water.
ISO 14644-2:2015	This standard sets minimum requirements for an air purity cleanroom monitoring plan or clean-area efficiency, depending on criteria that measure or affect the concentration of particles in the air.[25]

Source: Author's compilation based on the interview

JIT practices

This small section focuses on determining whether the organization is aware of the application of any form of JIT manufacturing tools, given that the production operation of Tre Pharm is producing based on orders. Though, first, we present an elaboration of the role of JIT in the production system. Among the numerous discussions and definitions, the JIT development or manufacturing mechanism was perceived as "only the necessary products,

[24] https://www.iso.org/about-us.html.
[25] The description of the purposes of the standards is based on the official ISO website: https://www.iso.org/about-us.html.

at the necessary time and in necessary quantity" for example, Toyota is famous for introducing the JIT system, which focuses on retaining the active participation of employees, preventing unnecessary movement of staff, and ensuring the safety of employees and the ability to entrust them with a high degree of accountability and authority (Sakakibara, et al., 1997). Certainly, Tre Pharm cannot produce if there is no order. In fact, Tre Pham does not formally recognize the application of JIT, but to some point, how the production process is directed includes some characteristics of the JIT tools or consists of some instruments. For instance, as explained above, the company in practice produce 115 products. However, between 115 manufacturing product capacity, the company manufactured 70 pharmaceutical products between 2017 and 2019 based on orders obtained or demand for products and analysis shows that these products occupy the most influential role in the annual sales turnover. In this regard, even though stocks play an important role in a manufacturing company, but in the case of Tre Pharm, stocks are not heavily practised as the factory manufacture based on orders; thus, production based on orders is a characteristic of JIT.

In addition, due to the wide range of goods, the finished goods are loaded on automated transfer carriages to be transported either for export abroad or to a company in Kosovo responsible for distributing the Tre Pharm pharmaceutical products on the national market. Besides, the use of the IT system in Tre Pharm, which is connected to all equipment in the labs and manufacturing systems, has created an effective production structure that led to improved performance and elimination of waste and inefficiencies and minimized costs associated with the production system. Finally, the company shall complete each year's plan by 30 October, which means that the company accepts orders for the next year by that date. At the moment Tre Pharm takes the order, 50 percent of the payment is made, while the remaining 50 percent is made after the product has been delivered. The entire production order process, either for the Kosovo market or for export, takes a maximum of 60 days because the company does not hold stocks.

Interdisciplinary and multidisciplinary project work instead of functional 'silos': special focus on quality circle

The objective of the problem-based learning (PBL) method is to use a mixture of theoretical and practical knowledge-based experience as a learning process that can be characterized as a complex analytic problem-based solution that may result in incremental organizational or market and product innovation (Krogh & Jensen, 2013). In this relation, while Tre Pharm has ten different departments, they often organize in the form of a quality circle and work together to produce a quality work product more often on manufacturing and quality issues. In this context, the role of the quality department in Tre Pharm is crucial because, without it, they cannot manufacture and, in doing so, the quality department cooperates with other departments in the form of a quality circle in order to solve any problem or facilitate the production of processes. In particular, when the company receives any order that needs to mobilize the company, that team meet regularly and share knowledge and work based on PBL. In addition, they had a specific case in which, when analysing a certain imported product, they suspected that the product was being sold cheaper than in the country of origin, which means dumping, the team in the form of a quality circle worked together to address the issue. This type of work refers to DUI learning characterized by relationships that are open to collaboration, problem orientation and cross-disciplinarity, which is consistent with the PBL approach (Nielsen, 2019). Given this, it means that the innovation model of the DUI is to some extent applicable in Tre Pharm.

The role of marketing as a driver of innovation

This part focuses on the role and form of marketing innovation applied by Tre Pharm, but first, a short definition of marketing innovation is presented. There are many concepts of marketing, but the newest, according to the American Marketing Association, "*is the activity, set of organizations and processes for developing, connecting, distributing, and sharing services of value to consumers, customers, associates, and society at large"* (Philip & Kevin, 2012, p. 5). Moreover, according to some innovation studies, it is challenging to implement some technological innovations without the presence of organizational and managerial innovation, like marketing innovation (Pavitt, 1999). In this connection, considering the importance of marketing as part of non-technological innovation, it should be mentioned that marketing plays an important role and that there are two types of

marketing innovation in Tre Pharm. The first method of marketing innovation focuses on promoting the image, quality, and values of the company that are mainly realized through international trade fairs, e.g., every two years, the company takes part in an international trade fair in Frankfurt, followed by one in Aba Dubai and other international fairs. This form of marketing does not involve the promotion of pharmaceutical products directly because the company does not intend to encourage consumers to use drugs without a doctor's prescription but intends to promote the name and brand of the company. This form of marketing has enabled the company to establish contacts and penetrate new export markets such as Libya and Turkey.

While the second method of marketing innovation of Tre Pharm concentrates on promoting selected, manufactured products that can be sold without a doctor's prescription or over the counter, the so-called "OTC" or non-prescription products,[26] whereas the "Rx Products" are given with a prescription.[27] As regards to non-prescription products, as seen in table 24, many pharmaceutical products such as all forms of albadol, aspiridol, bedox, and the whole range of dolofix and dolohot belonging to the paracetamol family, luna and vitamin C are marketed without a doctor's prescription. In the case of such goods, the company is very active in introducing creative marketing, especially in the local market through social networks and, in particular, through television advertisements. As shown in Table 24, all of these products have resulted in a significant contribution to the sales turnover of Tre Pharm.

Collaboration with the university: the high need to strengthen STI and DUI collaboration

This section deals with the relationship between university and industry. For Tre Pharm, collaboration with the university is critical, but unfortunately, presently is not satisfactory. However, in order to ensure long-term labour supply, the company tries to organise joint programmes in the form of vocational training with the university, especially with the faculty

[26] OTC Product shall mean a medicinal product for human consumption licensed by the Food and Drug Administration for sale to non-prescription consumers and/or patients in the Territory: https://www.sec.gov/Archives/edgar/data/1593034/000159303416000051/ex1028novartisagsandozincs.htm#s21EA50034B8E707DB4AC1A4BA9865810.

[27] Shall mean a medicinal substance for human consumption that has been licensed by the FDA for sale to consumers and/or patients in the Territory with a prescription signed by the Practitioner: https://www.sec.gov/Archives/edgar/data/1593034/000159303416000051/ex1028novartisagsandozincs.htm#s21EA50034B8E707DB4AC1A4BA9865810.

of medicine and regional institutions. Unfortunately, the university continues to produce students who do not have practical knowledge and practical experience because the university does not offer the necessary labs to enable students to gain practical knowledge. There are cases in Tre Pharm when they have employed some graduate students at the University of Prishtina, but from the beginning, they have had to invest a lot in providing basic training, which costs the company. Therefore, the government can make it mandatory for the university that before giving a degree to students, they should send students to work three to six months may be in the form of an internship in the pharmaceutical industry to take the pharmaceutical degree. For instance, the UK applies such a method to students aiming to obtain a degree in the field of medicine they must spend up to six months in the pharmaceutical industry environment.[28] Likewise, the Aalborg University in Denmark enables students to work on development projects or assessments before the graduate dissertation project is drawn up, which can provide companies with experience on future job opportunities because graduates can transfer new knowledge and ideas from a university to enterprises and contribute to the improvement of absorption and innovation capacity (Nielsen, 2019).

In this relation, Tre Pharm performs quite well in implementing a program of internships with students in medicine and pharmacy, the so-called 3+3 program. In the first three months, interns are given full access to the use of instruments in the company, and students get to know technology. The working system and environment and all this is an investment, and those students who show exemplary performance undergo two tests, and if accepted, they have another three months of probationary experience, and if the student continues to perform well over these three months, the student is officially hired. For example, in 2020, from this internship program, two interns were hired due to the incredible skills and competencies they showed during the internship period. With these two faculties, in addition to an internship program, there is a memorandum of understanding in which, as part of the curriculum programme, students frequently visit the factory to track developments within the company. Moreover, Tre Pharm annually receives certain visits from the University of Tirana and the Faculty of Pharmacy of UBT. In terms of STI, it is important to understand

[28] According to an interview with the head of operations at Tre Pharm, from the United Kingdom, who shares the perspective of the medical education system. The sound file of the interview is available.

that a conscious division of learning between university and industry partners is needed to ensure that STI collaboration is successful as technological developments are so rapid that knowledge transfer from university to the industry is a permanent necessity, but knowledge transfer from business to university is also necessary (Nielsen, 2019). Unfortunately, apart from these developments, there is not enough cooperation with the university and, there is a complete lack of dual training between Tre Pharm and the university that would perform STI collaboration. However, the internship program and the way Tre Pharm engages new graduates to consist of DUI mode, but not at a satisfactory stage, and this is an urgent issue that needs to be addressed, especially by the university because the company is willing to cooperate and strengthen STI&DUI innovation modes with the university.

High priority of continuous learning: combining practice of OJT and Off-JT training

The company is very involved in arranging various training for its workers, such as OJT and Off-JT, and despite the disparities between qualified and less qualified employees, almost all of the company's staff benefit from these types of training. In this way, management aims to create a healthy and innovative workplace environment, a cooperative leadership style, and equal salaries. Furthermore, through in-house training courses, experienced colleagues are training new once, inexperienced staff; this is the practice of OJT (e.g., learning by experiencing, learning through communication, and learning by interacting). In the last five years, the role of OJT and Off-JT training has been dramatically increased in Tre Pharm, i.e., professional training is unavoidable in a regularly structured manner. However, the topics of training offered by the Off-JT curriculum are substantially different from those given for the OJT. What is crucial here is that Tre Pharm maintains an updated annual training schedule to offer it to all employees of the company that the HR Department coordinates.

HR department claims that a range of cases have been reported and arranged for staff training in the form of OJT by bringing local experts or Off-JT by bringing specific international experts from different European countries to provide training for staff of selected departments. Concerning OJT, the company organizes training with national experts on topics related to the manufacturing system, innovation topics with an emphasis on the development of new products and existing products and markets, as well as quality policies and procedures; furthermore, depending on the position of employees in the company, HR

determine the form of training. While regarding Off-JT, the company collaborates with international experts and is usually organized for specific topics, e.g., experts from the Czech Republic responsible for GMP and quality are invited to train a certain number of staff basically from engineering, operation, and manufacturing departments in the company. In addition, some other experts from Poland come and provide training on product certification, as well as some experts from Slovenia often visit Tre Pham to train the company staff in the field of marketing innovation. It is important to note that those who benefit from Off-JT, as noted earlier when a company applies a quality circle, share and transfer knowledge from different departments that join together to solve any issue in the form of DUI. The list of topics addressed by the annual training plan for OJT and OFF-JT is set out in Annex 4. Finally, it should be noted that the organization has brought foreign experts and provided Off-JT in the company's premises, but in 2020, it intended to send workers abroad for training, but the pandemic situation of COVID-19 has made it unlikely.

Concluding remarks

The case study reveals that as a young company still less than a decade on the market, many developments are present at Tre Pharm, but few challenges remain. Tre Pharm is approaching the completion of the process to be certified by CPGP, which will enable the company to have the quality system recognized by the EU authority and to apply for GMP and marketing authorization certificates in EU countries for goods that meet export requirements as well as to bring European products and manufacture in Tre Pharm. As a result, sales in turnover grew slightly from year to year, resulting in an increase in export participation, from 13.60 percent in 2017, hitting a peak of 87.80 percent of the country's total exports in 2018; however, with a decrease in export participation of 1.50 percent in 2019, which comes as a result of investments and commitments in the certification process. Tre Pharm concentrates its exports to Albania and Macedonia from neighbouring countries, while Libya has the largest export market share in foreign markets, followed recently by Turkey. This means that the company has a unique role in the Kosovo innovation ecosystem, and it is gradually increasing its integration into the GVC. As far as R&D is concerned, since Tre Pharm was founded, the part of the research activities has been completely non-existent, although Tre Pharm has performed very well in terms of development activities since it has developed 140 pharmaceutical products and is capable of producing 115 products. However,

in 2020 R&D is organized as a new department but, in order to equip the R&D department, the organization should concentrate on raising equipment along with the number of employees (currently it has only three employees), and these people with 13 percent of the sales turnover budget allocated to R&D must be able to conduct research activities. Currently, this remains a challenge for the company.

Nevertheless, the fact that Tre Pharm plans to divide up to 13 percent of its sales turnover to the R&D department is a clear indication of the strengthening the role of STI. While in terms of trademarks, it should be noted that out of 94 applications, the company managed to register 50 products, and out of 2635 registered trademarks in Kosovo, Tre Pharm represents 1.89 percent of the total participation. However, due to a lack of research activities, Tre Pharm has not addressed any application for patents and industrial designs in the IPR office, meaning that invention has not occurred yet in the company.

Technological and marketing innovations are seen as drivers of innovation for the company. In terms of the automation system, the company has an IT system in place which is linked to all the equipment in the labs and a manufacturing system that takes care of everything and controls all the processes ranging from raw material production to selling the finished products. Tre Pharm must show capabilities in the use of various managerial technicians in the production process that supports the production method, e.g., several forms of ISO standards are in place that guaranteed the company to build up its reputation and increased its quality requirements as well as it played a crucial role in the path of the certification process. Though Tre Pharm does not formally recognize the role of JIT, the case study reveals that, to some point, the way how the production process is directed includes some characteristics of the JIT. Due to the IT system in place, the manufacturing system has created an effective production structure that led to improved performance and elimination of waste and inefficiencies and minimized costs associated with the production system. Quality circle is also a tool that is applied regularly, and it functions based on PBL. Given the importance of marketing as non-tech innovation, it should be noted that marketing plays a significant role, and two forms of marketing innovation are present. The first method of innovation marketing is aimed at promoting the firm's image, quality, and values mainly through international trade fairs, and this type of marketing helped the company develop contacts and penetrate new markets for exports, such as Libya and Turkey. In contrast, Tre

Pharm's second marketing strategy promotes selected, manufactured products, which can be sold without a prescription or over the counter. In such products, the company is very involved in innovative marketing through social networks and in particular television advertising, particularly in the domestic market, which has continuously resulted in a significant contribution to the company's turnover.

In terms of collaboration between the university and Tre Pharm is weak and lacks dynamics; however, some developments are evident. Unfortunately, the university continues to produce students who do not have practical knowledge and practical experience because the university does not offer labs to enable students to gain practical knowledge. Despite this, Tre Pharm implements a program of internships with students in medicine and pharmacy, the so-called 3+3 program that consists of DUI mode but is not at a satisfactory stage. This is a reasonable practice implemented by Tre Pharm but remains challenging the lack of practical knowledge and practical experience for students, and there is a complete lack of dual training between Tre Pharm and the university that would perform STI collaboration. However, employing university graduates is an important step forward in this process-creating a precondition for STI knowledge clutches. The company successfully combined in house and external knowledge sources (e.g., mixing OJT and Off-JT), e.g., professional training in the form of OJT and Off-JT is unavoidable in a regularly structured manner. However, the biggest challenge currently and for the near future for Tre Pharm remains the market share, e.g., consumption is dominated by imports, comprising only 2.55 percent of the participation in consumption; therefore, the marketing department should focus on business analysis and market analysis in order for the company to increase its participation in the national market. Furthermore, improvements in equipment and facilities are continuously required, along with the need to train people more appropriately; in particular, Off-JT should take place abroad.

5.3. The role of university in knowledge creation and transfer: The Case of the State University of Prishtina in Kosovo

Introductory remarks

This case study aims to analyse the role of the university in the process of knowledge creation and knowledge transfer. While knowledge creation is analysed in terms of R&D, in particular the performance of academic staff in generating scientific publications, producing high-quality degrees, on the other hand, knowledge transfer focuses on the abilities and motivation of university staff in transferring and disseminating the science outcome to Kosovo's innovation ecosystem actors.[29] Data were collected based on a qualitative guide interview, combining and analysing 14 semi-structured interviews, including people from the university staff and other innovation ecosystem actors such as government agencies, ICT, and private industry sectors. University activity-related reports are also analysed in the context of these two pillars. The findings show that part of achievements is evident, while part of them is questionable in many respects, e.g., there is a visible asymmetry between knowledge creation and knowledge transfer. The case study shows an impressive increase in the number of publications in recent years (between 2017 and 2019), although the transfer of knowledge remains relatively weak in the university's performance. In comparison, teaching has also improved significantly over the last decade, but critical thinking is not yet at a satisfactory level.

The case study consists of the following structure: the first part presents a brief history of the university, and it continues with the latest development, including analysis of the university activity-based budgeting and distribution of resources among various faculties. The second part examines the role of investment in R&D aimed to strengthen the knowledge creation function of the university; hence, in this context, we try to understand the characteristics of the knowledge creation process. The third part sheds light on the university's role in developing Kosovo's innovation ecosystem; in particular, it focuses on the role of government institutions in innovation activities with a particular focus on the university-industry collaboration. After analysing the university's role in knowledge creation

[29] The case study reveals that the necessary actors of the innovation ecosystem in Kosovo are present, but a systematic approach of collaboration between them has been lacking. For instance, the Innovation Centre Kosovo, Chambers of Commerce, startups, companies, university and public institutions are the main innovation actors in Kosovo's innovation ecosystem.

and collaboration with the industry, the fourth part concentrates on the university's capabilities, opportunities, and willingness to transfer knowledge to Kosovo innovation ecosystem actors. Finally, results and future challenges of the university are drawn.

The University of Prishtina: A brief history

The UP is a traditional/classical university like many other universities around Europe, which has a leading role in higher education in Kosovo. The university was founded in 1970, based on the law establishing the University of Prishtina.[30] At that time, the university consisted of the Faculty of Law, Economics, Philosophy, Architecture, and the Faculty of Medicine. Since then, the university campus has been located in the centre of Prishtina. The statute of the university came into force very late on 9 July 2004. In 2020, the university marks its 50th anniversary and presently has a total of 42,006 students and consists of 13 accredited faculties or units by Kosovo Accreditation Agency (KAA), along with the 900 academic staff and 300 administrative staff employed (University of Prishtina, 2019).

Recently, the Faculty of Architecture was split from the Faculty of Construction, and in 2020 it began to function as a new Faculty, thereby hitting a total of 14 faculties, while the Faculty of Informatics is expected to open soon. However, due to internal issues in coordination with other faculties, in particular those that could be influenced by this new faculty, such as the Faculty of Mathematics and Natural Sciences, it has not yet been able to start functioning; thus, there are already certain interfaculty conflicts that need to be addressed or solved. The list of current faculties, which included the number of active students in 2016-2017 and the number of enrolled students in 2017-2018, along with the gender composition, is provided in Table 22.

[30] The University of Prishtina was founded by the law on the establishment of the University of Prishtina, which at that time was approved by the Assembly of the Socialist Province of Kosovo on November 18, 1969, but the law is unavailable to find.

Table 22: Number of students by faculties active in 2016-2017 and enrolled in 2017-2018

Name of Faculties	Number of students by faculties					
	2016 2017			2017 2018		
	Male	Female	Total	Male	Female	Total
Philosophy	1167	2325	3492	231	442	673
Mathematics	1028	1823	2851	182	375	557
Philology	600	2159	2759	144	436	580
Law	2360	3380	5740	363	468	831
Economics	4841	4488	9329	702	626	1328
Construction and Architecture	1832	641	2473	243	119	362
Electrical and Computer Engineering	828	598	1426	244	115	359
Mechanical Engineering	1043	226	1269	274	59	333
Medicine	1669	2461	4130	139	211	350
Arts	306	401	707	56	86	142
Agriculture and Veterinary	1114	523	1637	278	193	471
Physical Educations and Sports	579	159	738	110	52	162
Education	373	2936	3309	11	242	253
Total	17740	22120	39860	2977	3424	6401

Source: Author's calculation based on (KAS, 2019) data

As seen in Table 22, the Faculty of Economics, followed by the Faculty of Law and Medicine, are the leading faculty by students' size. Likewise, the Faculty of Construction and Architecture and the Faculty of Engineering have a reasonably high ranking, although the gender composition consists of a significantly higher number of females compared to males in total. However, these inequalities have visible differences in the gender representation in faculties (e.g., electrical and computer engineering, construction and architecture, mechanical engineering, agricultural and veterinary sciences, education, and sports); the share of males is higher than females. On the contrary (philosophy, math, philology, law, medicine, the arts, and education), the proportion of females is significantly higher than that of males.

University budget composition and distribution by faculties

This section analyses the structure of the university's budget and its distribution on activity-based budgeting and the allocation between faculties, but first of all, our presentation starts with a picture of the state budget, then reflects on the financial resources of the university and faculties. Over the years, the Kosovo state budget remained at the same level, but in

2019 it hit a high of EUR 2.32 billion, with a slight increase of EUR 2.35 billion in 2020.[31] Interestingly enough, only 1.49 percent of this state budget goes to university, while it is EUR 34.79 million in terms of value. Nevertheless, the same logic of budget distribution has been applied over the years, with a slight increase for 2020. In this connection, we shall briefly mention the Ministry of Education, Science, Technology, and Innovation (MESTI) budget, which amounted to EUR 73.23 million in 2019. Activity-based budgeting was distributed as follows: EUR 19.81 million for wages and salaries; EUR 17.75 million for goods and services; EUR 1.61 million for utilities; EUR 6.27 million for subsidies and transfers, and the highest amount of money from the overall budget of the MESTI goes for capital expenditure of EUR 27.77 million (Ministry of Finance, 2019). Table 23 illustrates how the form of financing has allocated the university budget for the past three years.

Table 23: Activity based budgeting of the university

Year	Wages and salaries	Goods and services	Utilities expenditures	Subsidies and transfers	Capital expenditure	University budget in total
2018	21,158,067	3,052,645	1,175,000	1,299,000	7,150,000	33,834,712
2019	21,263,857	3,402,645	1,175,000	1,444,000	7,500,000	34,785,502
2020	20,986,212	3,422,513	1,175,000	1,444,000	7,900,001	34,927,726

Source: Author's compilation based on the state budget (see Annex 5)

As seen in Table 23, the university has a limited budget that is not enough and needs to be increased; in comparison, it remains at the same level over the years, which determines the university's low value. According to our analysis of the total university budget of EUR 34.78 million, 88.51 percent is financed from the state budget. By contrast, 11.49 percent is generated from the university as its own source, in value terms of EUR 3.99 million for 2019, while the university participated in its budget in 2018 at 12.26 percent or EUR 4.15 million as revenue from its sources. The money generated by the university as its own source consists of student registration fees or tuition fees and professional services expertise by the institutes and laboratories. Unfortunately, the main budget of the university goes for salaries; likewise, the analysis shows that the university has not spent its budget correctly for many years now, i.e., in 2018, the university has executed 92.94 percent out of the total budget and what is interesting to analyse here is how the university spent activity-based budgeting on the pillars.

[31] According to the Central Bank, Kosovo is in the eurozone and has the unique financial system of the European Union, which means that Kosovo does not have its own monetary policy, therefore, in 2002 Kosovo moved by the German mark to the adoption of the euro.

For example, 70 percent, the largest budget share, is spent on wages and salaries, followed by 10.43 percent on goods and services, 3.15 percent on utilities, 4.02 percent on subsidies and transfers, and just 12.28 percent on capital expenditure. Similarly, in 2019, out of EUR 34.92 million, 61.13 percent or EUR 21.263.857 were spent on wages and salaries.[32] In addition to the small university budget, what can be found in Table 24 is that there is no money allocated for R&D. The university claims that, for the future, the strategic plan envisages reserving 1 percent of the university's total budget for R&D; however, the study reveals that there is nothing concrete yet. Nevertheless, the university budget remains low because to increases the university's quality and presence in a higher ranking; first, the university budget should be better managed than it needs to be increased. However, the budget should not just increase in terms of wages and salaries, but also increase the ratio of the number of employees and the academic staff, in particular, because compared to the number of university students from 42,000 in 2020, the number of academic staff consisting of 900 is minimal, resulting in the smallest ration in the region.

The case study also analyses the budget of some public universities in neighbouring countries, e.g. the budget of the University of Belgrade (UB) in Serbia in 2020 reached EUR 159.15 million, which is significantly higher than the budget of the University of Prishtina; although the University of Belgrade represents the most significant number of faculties in the region with a total of 31, along with a large number of the academic staff of 4,834 and with a large number of enrolled students of 97,700 (University of Belgrade, 2020). Moreover, the Serbian Education Development Strategy stipulates that in 2020 the budgetary allocation for education will hit 6.5 percent of GDP (Ricciardelli, 2020).

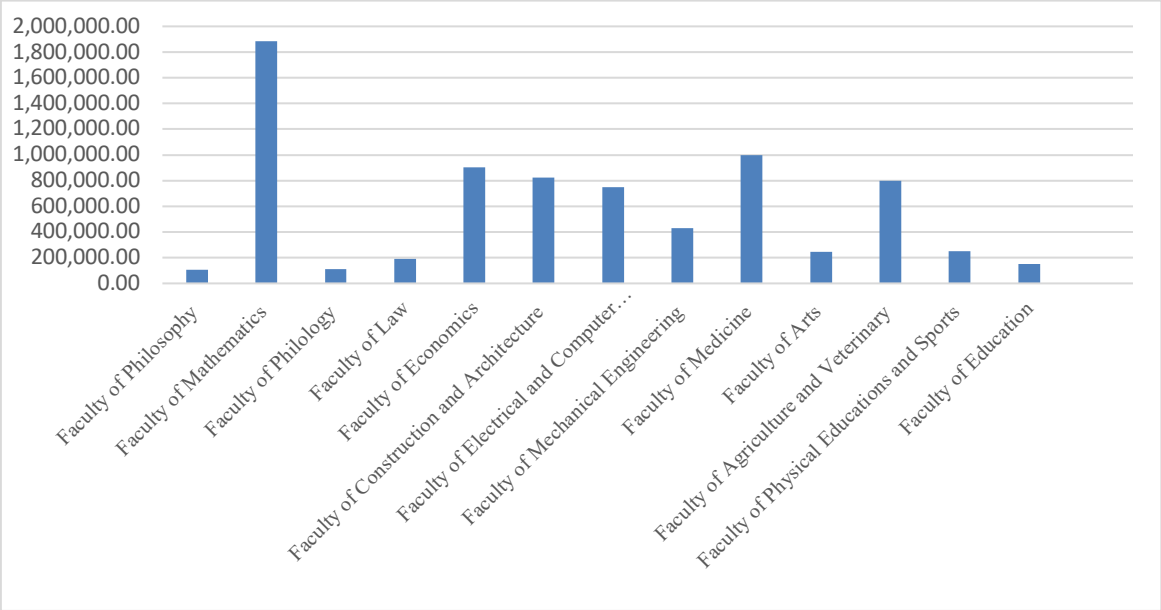
While the University of Tirana does not differ significantly from the University of Prishtina, there are some similarities in some dimensions. For instance, the University of Tirana's budget in 2020 was EUR 36.59 million (Academic senate, 2020), slightly higher than that of the UP; on the contrary, the number of enrolled students is slightly lower than that of the UP. Whereas the number of academic staff is at the same level in both universities of 900. Interestingly enough, the number of faculties at the University of Tirana is only six (University of Tirana, 2020). And finally, the Ss. Cyril and Methodius University in Skopje

[32] The interview with the Vice Rector for budget and finance and the detailed report on the allocation of the budget by the units and the activity for 2019 is available by contacting: rektorati@uni-pr.edu.

differ in all aspects from the UP. The University of Skopje has 23 faculties and more than 3100 academic staff, and 60,000 enrolled students (University in Skopje, 2020).[33] The analysis shows that the University of Belgrade represents the largest share of the budget and the size number of students enrolled. However, these significant budget discrepancies may be justified by the higher number of academic staff and students at the UB.

In preparing the case study, we further analysed the budget allocation from the UP among units/faculties. As a result, the study reveals that 22 percent of the EUR 34.78 million was allocated for each academic unit's goods, services, and capital investment categories in 2019. Figure 13 lists the mathematics, medicine, and economics faculty with the largest share of budgetary activity, while the remaining faculties have a slightly lower share.

Figure 13: Budget distribution by faculties for 2019



Source: Author's calculation based on the interview data

The university executives confirm that the university is a centralized system with a central budget, so decision-making on activity-based budgeting goes to high-level university management. However, as seen in Figure 13, in a tight budget, faculties use the budget to participate in international conferences or workshops and make some official visits, including the payment of utility expenses.

[33] As for the budget of the Ss. Cyril and Methodius University in Skopje, no evidence was found.

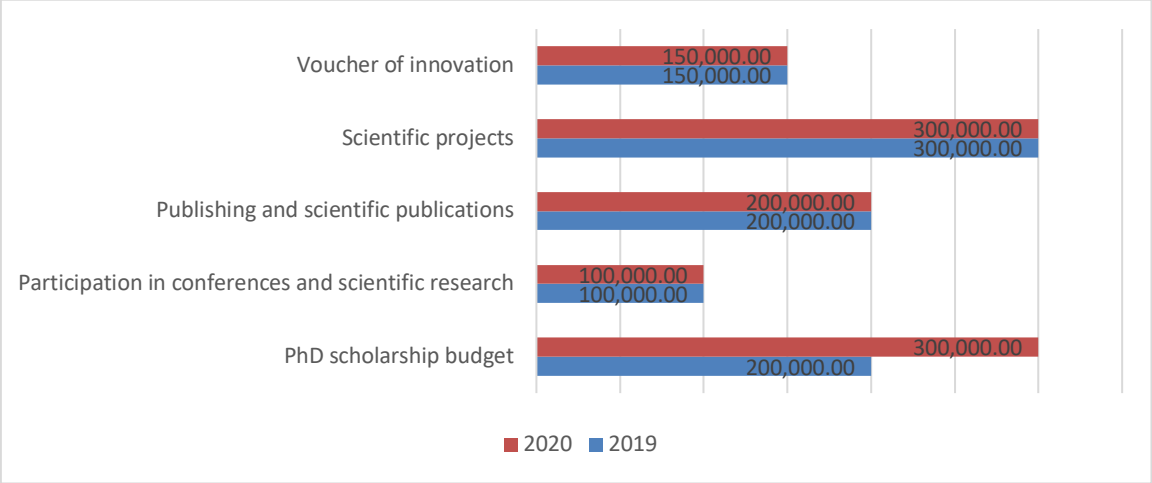
Limited government support to R&D activities

This section briefly reflects on the role of the government, particularly the role of the MESTI, in managing the R&D expenditure fund at the national level. By 2018, Kosovo allocated the lowest budget in the region for R&D, which amounted to 0.1 percent of the state budget, or only EUR 520,000 in value terms, even though the law on science research activities foreseen 0.7 percent of the annual state budget. Over the years, this budget was split as follows: EUR 80,000 for scientific publications; EUR 100,000 for local scientific projects; EUR 50,000 for regional projects; EUR 35,000 for short-term mobility; EUR 50,000 for PhD scholarships and EUR 15,000 for vouchers, while neighbouring countries (e.g., Serbia, Montenegro, Albania, and Macedonia) spent about 0.9 percent (Kaçaniku, et al., 2018).

According to the R&D law, this amount is intended to finance some basic research in Kosovo with a specific emphasis on technological development and innovation; activities in the creation and development of science infrastructure; scientific conferences, exhibitions and publications; research transfer activities; and technological transfer.[34] Unfortunately, in addition to a small R&D budget that is not enough, this limited amount is not spent adequately on "state-of-the-art" research that might produce any knowledge creation that will contribute to knowledge transfer, but instead is spent on publishing books or reprinting old books, and this is not research and not the right way, and this is an urgent issue that needs to be addressed.[35] Furthermore, this amount is not spent in compliance with the legal regulations; thus, the university should start to devote some budget to R&D; otherwise, the university cannot, even legally, justify its name because the university's name besides teaching also contains research. Fortunately, since 2019, the money has risen slightly, attempting to hit EUR 1.2 million (leading to 0.7 percent) as envisaged by the R&D law, but not quite the same sum, i.e., EUR 952.019.00 in 2019 relative to 2020, which amount to EUR 1.052.020.00 million (9.5 percent higher than in 2019) and is allocated as presented in the following Figure 14.

[34] https://masht.rks-gov.net/uploads/2015/06/ligji-per-veprimtari-kerkimore-shkencore-2013-eng.pdf
[35] According to the interview with the professor at Faculty of Electrical and Computer Engineering. The sound file of the interview is available.

Figure 14: Distribution of R&D budget between 2019 and 2020



Source: Author's calculation based on data from the MESTI

As shown in Figure 14, the distribution of the R&D budget (between 2019 and 2020) among the pillars, the allocation budget is balanced, in addition to the PhD scholarship portion, which increased significantly by EUR 100 000 in 2020 compared to 2019. According to the participant interviewed by MESTI, out of EUR 952.019 in 2019, the Ministry executed only EUR 600,000, although, in 2020, the Ministry intends to spend more than it had intended to do in its budget preparation. However, 0.7 percent state budget is spent on some scientific research activities on an ongoing basis. Thus, each year, MESTI provides grants to public and private universities, and academic personnel may apply to benefit from small projects, and to some degree, professors earn grants on a personal or team basis (usually two or three) professors. The project goes through the university, and professors will apply for research that they plan to do, and this is a competition based so that the team whose project is accepted can gain financial assistance of EUR 9000 as a grant. With the money received, professors must produce papers and contribute to research activities based on these research projects and cooperate with colleagues working in other intuitions outside Kosovo. Different teams have earned such financial assistance in several cases and have carried out research projects outside Kosovo at many universities. Several articles were presented at conferences and published in journals (indexed by Scopus), resulting in a slight increase in the number of publications in 2019 relative to 2017. Simultaneously, the university staff perceives this initiative of the Ministry as a good idea to finance research activities, but the same complaint that the financial support of EUR 9000 per project is not enough.

In comparison, the total budget of EUR 80,000, which has risen marginally over the last two years to the pillar of scientific publications and participation in international conferences, as seen in figure 10, remains low. However, most of the interviewed participants (including the fund's beneficiaries) argue that this fund has not been appropriately spent over the years since there are no pre-determined requirements for when and how these funds can be spent. Moreover, the procedures are still by the manual application for allocating funds for research activities and are not favourable and very bureaucratic, and there is a shortage of reporting, tracking, transparency, and evaluation of the funds.

In summary, given that the university currently does not allocate money for R&D, it would be much better if the R&D fund were distributed to faculties, enabling academic staff to be more responsible and spend more money on research activities in a more acceptable manner. Although the university shift from the centralized structure to the decentralized system would facilitate and significantly increase its position in monitoring faculties, reporting the results to the MESTI, and 0.7 percent of the R&D fund be increased then.

The role of the university in knowledge creation

This section aims to analyse in detail the role of the university in the creation of knowledge, particularly its ability, support, and commitment to help national and international research projects, scientific publications, patents, and inventions, which lead to the creation of knowledge. According to Nielsen, R&D is undoubtedly essential for product innovation, but it is not the only kind of knowledge; sometimes, innovation is linked to the kind of knowledge produced in the sense of R&D, which is also one of the critical functions of universities (Nielsen, 2019); therefore, the case study tries to identify and measure the involvement of the academic staff in R&D related activities. First of all, the university is aware that knowledge creation remains its most important mission; secondly, according to its statute, teaching and R&D are two key twin objectives. As far as knowledge creation is concerned, the statute obliges academic staff to continuously contribute to R&D, using two resources: public funding provided by the university or private funds sponsored by individual contractors of third parties, or both. And to achieve international competitive results, the university's teaching staff are also obligated to carry out scientific research and innovative work using their professional skills (Statute, 2005). Although the university's

statute obliges the university to contribute to creating knowledge, the case study reveals that this is not the main priority in practice. The university executives admit that many professors treat the university as a secondary school when students show up in classes and attend lectures, professors teach, and students leave, which urgently needs to be changed. Indeed, teaching is one pillar and is essential, but R&D-based teaching, incorporating the results of collaboration with industry and international partners, should be the most crucial pillar. Presently, this sort of project work is almost entirely missing.

In order to narrow the analysis to the core research activities at the university, the case study first analyses the parameters that many world-ranking universities consider when evaluating university performance. For example, Times Higher Education and Webometrics consider the following leading indicators for measuring the performance of global universities: learning environment, including teaching, R&D and research outcomes, volume, size of university and reputation, citations, perceived international outlook, including students, staff and research, community relations and collaboration with industry sectors with a focus on knowledge transfer (Times higher education, 2017); (Webometrics, 2020). Recently, Webometrics ranked the university at 2829, while in the Continental Raking at 940, and in the Country Ranking at 5 (Webometrics, 2020); this means that the university is lagging behind in many ranking indicators, especially in the field of R&D. However, some analyses of scientific publications undertaken by the Organization for Improving the Quality of Education (ORCA) and recent updates to the Research Gate indicate some developments in scientific publishing (ORCA, 2018); (ResearchGate, 2020). Table 24 indicates an increase in the number of university publications for 2019 compared to 2017 and the quality of the publications.

Table 24: Scientific publications in the university

Year	Total number of scientific publications
2017	1320 papers
2018	1735 papers
2019	2481 papers

Source: Author's compilation based on ResearchGate and (2020)

Table 24 indicates an increase in the number for 2019, but the quality of the university publications is not at a satisfactory level; thus, the university must continue its efforts to enhance the quality rather than the mere number (quantity) of scientific publications in order

to fulfil its mission of knowledge creation. Table 25 presents the composition of academic staff by gender and status, including the category of full-time professors and part-time professors by faculties. Statistics show that the total number of full-time professors at the university is more significant than part-time professors. What is even more interesting to analyze in Table 25 is the gender factor, which indicates that male dominates the number of academic workers, and the gender balance is relatively weak.

Table 25: Number of academic staff by gender & status in 2017 2018

Faculties	Full-time professors					Part time professors				
	Male	%	Female	%	Total	Male	%	Female	%	Total
Philosophy	38	73%	14	27%	52	28	68%	13	32%	41
Mathematics	31	46%	36	54%	67	9	33%	18	67%	27
Philology	79	82%	17	18%	96	18	64%	10	36%	28
Law	38	69%	17	31%	55	10	100%	-	-	10
Economics	37	60%	25	40%	62	14	52%	13	48%	27
Construction	25	61%	16	39%	41	12	50%	12	50%	24
Electrical	22	69%	10	31%	32	33	89%	4	11%	37
Mechanical	35	90%	4	10%	39	22	73%	8	27%	30
Medicine	137	53%	123	47%	260	44	49%	46	51%	90
Arts	48	61%	31	39%	79	60	75%	20	25%	80
Agriculture	36	88%	5	12%	41	24	63%	14	37%	38
Sports	19	90%	2	10%	21	18	90%	2	10%	20
Education	28	51%	27	49%	55	14	64%	8	36%	22
Total	573	64%	327	36%	900	306	65%	168	35%	474

Source: Author's calculation based on (ORCA, 2018) report & (KAS, 2019) data

In addition, Table 25 further analyses the total number of scientific papers and the participation of faculties, along with the number of professors involved in publishing. As shown in Table 26 below, while analysing the total number of academic staff and faculties, the results indicate that, despite the limited number of total scientific publications, the average of the professors publishing papers by faculties is even smaller than the total number of professors by faculties. The analysis ranks the Faculty of Medicine in a good position, with the most significant number of professors participating in research and development activities compared to other faculties. Similarly, the high ranking characterises the Faculty of Mathematics followed by the Faculty of Agriculture and Veterinary Sciences, while the remaining faculties do not perform well in publishing due to the professors' low level of commitment and motivation. However, it should be noted that these three higher-ranking

faculties have almost the highest number of academic staff compared to other faculties. The findings show that the average number of papers published with the participation of professors in the Faculty of Medicine is only 25 percent of the total number of professors, which is 350, which means that only 25 percent justify their academic titles.

In contrast, the rest of the academic staff does not justify their academic title in publishing. At the same time, the Faculty of Mathematics has the highest average of 69 percent published papers justifying the academic title quite well compared to other faculties. Comparing these two faculties means that publishing in the field of medicine would require more resources (e.g., laboratories, experience, and rather heavy investment in infrastructure) compared to mathematics.

Table 26: Number of academic staff involved in scientific publications by faculties in 2018

Faculties	No. of professors	Scientific publications	Number of professors that published	Average
Philosophy	93	35	32	34%
Mathematics	94	524	65	69%
Philology	124	36	39	31%
Law	65	74	42	65%
Economics	89	98	44	49%
Construction and Architecture	65	48	23	35%
Electrical and Computer Engineering	69	57	21	30%
Mechanical Engineering	69	94	29	42%
Medicine	350	528	87	25%
Arts	159	-	-	0%
Agriculture and Veterinary	79	184	33	42%
Physical Educations and Sports	41	14	14	34%
Education	77	94	36	47%
Total	1374	1735	465	34%

Source: Author's calculation based on (ORCA, 2018) report & (KAS, 2019) data

Besides, the substantial difference in publishing performance is worth noting, i.e., 65 percent at the Faculty of Law and 0 percent at the Faculty of Arts. Unfortunately, we have only aggregated statistics on university professors' publication activity, so we do not know the structure of publications according to quality indicators (e.g., the impact factor, Q1, Q2). In order to get a sophisticated picture, it would be essential to know the quality of these

publications. Assessing the role of R&D as a critical factor in knowledge creation, a low-performance R&D university does not help its staff conduct research and publish research-based activities, as the university does not yet allocate money for R&D. Moreover, the money provided by the Ministry of Education as part of the R&D fund until 2018 was not sufficient. On the contrary, it was not used properly; however, as indicated above, in 2019, particularly in 2020, the R&D fund increased to EUR 1.052.020 million, and this may help university staff improve quality and carry out more research activities. To date, the analysis shows that the university is not performing well in the creation of knowledge due to the low average of the scientific papers published by all faculties, which represents the participation of the university with only 34 percent in R&D, which means that the most significant 66 percent of the academic staff does not justify the academic title or ranking of the university.

It should be noted that there is a regulation that drives the academic staff promotion (career advancements); however, this regulation does not explicitly prescribe the contribution of academic staff to R&D, as it does not oblige to deal regularly with research activity (Regulation, 2019).[36] There is a lack of criteria since professors should not retain their full academic title if they have not consistently contributed to research activities or have a scholarly article in a prestigious journal every year. While this Regulation aims to rely on the university statute's fundamental principle, it requires academic personnel to have five scientific publications to receive the academic title of regular professor. For example, suppose a professor has been promoted from an Assistant Professor to an Associate Professor for four years. In that case, after four years, the public competition announces again, and this gives the professor the right to decide, within four years, whether to participate in research activities, either in the first year or in the last year, in order to fulfil the requirements for the next competition. This rather loose incentive system does not drive academic staff to be consistently involved in the combination of teaching and research activities.

Teaching and R&D are the university's primary objectives; thus, the academic staff should make a parallel contribution to these two components. Although the university set up an office for research and sponsored projects in 2017, it aims to facilitate R&D work and make it easier for teachers to submit competitive projects in order to obtain sponsored money. The

[36] https://uni-pr.edu/desk/inc/media/3A4FF762-6D09-4037-A98E-43B53753651D.pdf

office serves as a link between the university's academic staff and the organizations, agencies, and foundations with sponsorship and financing research projects and operates under the direct supervision of the Vice-Rector of Science of the UP. Since its inauguration, the office had supported 17 projects in 2018 and 35 other projects in 2019 focused on capacity building. The Faculty of Electrical and Computer Engineering, Mechanical Engineering, Philosophy, Economics, Education and Agriculture are among the main active units and beneficiaries of these projects. The implementation of such projects was carried out in collaboration and partnership with several European universities, such as Germany, Italy, Spain, Croatia, Slovenia, the United Kingdom and Montenegro, and Albania, as neighbouring countries.[37]

Moreover, in order to support R&D, the university has, since 2015, subscribed to the "Science Direct" database, and staff have full access to it. However, they do not have access to many other international scientific databases that would allow academic staff and university students to access a range of high-ranking journals and peer-reviewed academic papers with an international impact factor. Nevertheless, the university uses "Scopus and Elsevier" only the basic ones, which are not enough. This is a concern but still does not justify the poor performance of the university in R&D. Though, in some professions, access to journals is not sufficient to produce high-quality research, as stated above, investment in infrastructure and laboratories is more critical, enabling academic staff to be involved in national and international research consortiums and to participate in international conferences. The source of high-quality research and publication is very complex; thus, it is not enough for the university to have unlimited access to international journals. Kosovo's innovation ecosystem is built, and the functions of socio-economic actors are working, but this kind of knowledge requires systematic research of the socio-economic and cultural-technological conditions that characterize Kosovo.

Interviewed university participants acknowledge that teaching has advanced significantly over the last decade, while R&D has improved slightly. Academic staff are aware of the role and responsibilities of methodological teaching and scientific research. The positive shift

[37] The data are collected via the interview while the detailed report on the implementation of projects by the academic units is available by contacting: gentrit.berisha@uni-pr.edu

reflects changes in generations of academic staff (e.g., replacing old academic staff with new generation). This is due to retirement, which has contributed to a positive change in mindset, so the university executive official confirms that younger teachers are more active in R&D. According to our analysis, this is seen in Table 24, which indicates an increase in R&D (between 2017 and 2019) and published in better journals indexed in reliable databases such as "Scopus, ScienceDirect, Google Scholar and Elsevier." In reality, this is how the university measures the quality of the publications and the quality of the younger generation. Compared to research activities that are not systematically tracked, teaching is continuously monitored (each semester) by the Academic Development Office of the university through the evaluation of students for professors and courses for bachelor and master academic staff.[38]

Finally, it should not be neglected in the last five years that civil society's role in Kosovo has increased. The university confirms its role in exerting pressure on the university to ensure that teachers compete at the regional and international levels in teaching and research activities. Although the university is trying to strengthen teaching and research-related activities, teaching is performing better as it is easier to develop and track administration. As far as teaching is concerned, the university should concentrate on improving students critical thinking. As specified by the national qualification framework, critical thinking should be one of the programme's core components and curriculum, which means that bachelor's degrees should have a critical mindset. In contrast, in the master's programme, it should be compulsory, but in practice, the university admits that students partially gain some critical thinking as it depends on their skills.

[38] The data are collected via the interview, the results of the student's evaluation for teaching and courses for the academic staff are confidential, but the questions are available.

Enriching innovation ecosystem: an important but not focused government initiative

This section aims to identify collaboration between the university and the Kosovo innovation ecosystem actors; therefore, it is divided into two parts. Firstly, it focuses on analysing cooperation between the university and relevant government institutions in support of innovation activities. Secondly, it continues to analyse in more detail the collaboration between the university and industry. In the sense of collaboration between government institutions, the MIE supported the university in 2019, in particular, the Center for Innovation and Entrepreneurship, which operates under the Faculty of Electrical and Computer Engineering with EUR 473,440.06[39] thereby providing the faculty with the money it earned with a laboratory and hardware infrastructure; moreover, as part of the project, this faculty received a server and is in the stage of building a data centre. These developments within the MIE project framework have been useful because the laboratory and data centre is fundamental; however, there are still no concrete results as some work remains to be done to make it fully operational. Nevertheless, it is worth noting that academic staff and university students will benefit from this investment but interested innovative firms in Kosovo will have access to and benefit from this investment. In this regard, in addition to the funding received from the MIE, the university invested EUR 2.1 million in 2019 to develop institutes and laboratories for the creation of better infrastructure; thus, facilitating academic staff to use R&D institutes and laboratories and to serve students and enabling faculties to provide more professional services to interested stakeholders. Furthermore, this investment can have some advantages, as the return on investment can be accomplished in various ways, e.g., by having better conditions for R&D, it may turn out that the university improves the infrastructure of the knowledge development. In doing so, students are given better-quality teaching and equipped with higher-quality skills, and they will be better able to compete in the job market after graduation.

Moreover, knowledge creation will strengthen the university's role in transferring knowledge to students and the industry, which is currently the weakest pillar of the university mission. In addition to this, the university's budget allocation for 2020 has intended to spend an additional EUR 2.4 million (slightly higher than in 2019) to develop laboratories and

[39] The data are collected based on the interview with the head of the innovation department of the Ministry of Innovation and Entrepreneurship, and the report is available.

infrastructure with a focus on increasing knowledge creation. The university will continue to increase revenue generation as its own source, consisting of professional services and expertise provided by institutes and laboratories.

University and industry collaboration: important but not focused on building STI and DUI relations

This section deals with the weak ties between the university and the business community. First, it should be noted that the level of education of the workforce is important for development and growth (Junge & Skaksen, 2010) Second, the methodological and analytical skills of problem-solving, including absorption capacity and professional knowledge of graduates (STI learning on the university side), are ranked high as the industry's expectations when recruiting graduates (Nielsen, 2019). Business representatives in Kosovo complain about the lack of satisfactory quality of cooperation with the university. Consequently, many complaints towards the university are present. In Table 27, a classification and elaboration of such complaints are illustrated according to the participants interviewed by the following actors:

- Association of Information and Communication Technology of Kosovo (STIK)[40]
- 3CIS & Tre Pharm
- Innovation Centre Kosovo (ICK)[41]
- Kosovo Wood Processing Association[42]
- Metal Industry and Renewable Energy Cluster of Kosovo.[43]

[40] The main objective of STIKK is to promote the interests of the businesses and individuals in the field of ICT. It acts as an incentive for the dynamic technology industry and accelerates growth and progress for the economy at the fast-paced economy. STIKK currently is the voice of 200 members, thus, representing 90% of the whole ICT market in Kosovo https://stikk.org/en/about-stikk/

[41] ICK has systematically contributed to the innovation ecosystem through the application of various projects, training, and events. So far, ICK has supported 200 startups, 1000 jobs created, and 100 innovative firms are already doing business in the country (ICK; GIZ, 2019).

[42] With more than 465,000 hectares of forest area, 33.5 million m3 standing volume and tradition in quality window and door production, wood processing in Kosovo has what it takes to be a dynamic and attractive industrial sector, with around 1,480 private companies operate in the sector. Manufacturing of furniture and kitchens is the largest activity and also the most popular among the new entrants. Another 40% of the companies produce builder's carpentry and joinery https://kosovowood.org/en/Wood-Industry/Brief-History

[43] The cluster founders are representatives of the sectors renewable energy and metal industry operating in the Republic of Kosovo, and headquarters in Prishtina. They aim at strengthening of the business community in the development and promotion of products and services in the sectors of metal industry and renewable energy https://www.linkedin.com/organization-guest/company/mireck-metal-industry-and-renewable-energy-cluster-of-kosovo

Table 27: Classification and elaboration of complaints by industry to the university

• The case study shows that there is currently the lowest level of satisfaction among firms working with the university. The partnership of STI research has not contributed to innovations since there is no evidence of inventions or patents sold to the industry in Kosovo.	• While the industry confirms that, if the university could provide inventions or patents, companies are willing to buy and commercialize them. This means that there is a lack of STI&DUI relations between the university and industry.
• The lack of adequate knowledge of the university and the lack of incentives on the university people are shown as a concern. Kosovo's industry is not satisfied with the student's level of knowledge that comes from the university as a labour force for the industry. Companies claim that students face a lack of soft skills, critical thinking, problem-solving skills, and presentation skills.	• The industry hires students who are not relevant to their professional background, and this forces companies to invest heavily in offering vocational training, in the field of business interest, along with the practical part of how machines work in a company; therefore, to improve the skills of new employees/students, although it is costly for the company.
• University curricula and teaching methods are very old (the curriculum is updated every three years), which does not encourage students to remain up to date with their skills. Furthermore, there is a total lack of co-research activities between the university and the industry and commercialising them (lack of STI&DUI relations).	• Although the industry has continuously tried to adjust and adapt curricula to technological developments, but the university should be able to provide graduates with up-to-date skills and learning capabilities (e.g., increase the number of STEM students) in order to exploit the use of the significant R&D investment of the innovative firms efficiently.
• There is a tendency for public institutions and university to avoid collaborations with industry. Due to non-systematic cooperation, there is a shortage of effort at the university to offer students the industry internship scheme.	• While the industry confirms its willingness to accept students for an internship scheme, as this is of mutual benefit because it will make it easier for the industry to recruit new workers from an internship programme that demonstrates skills and competencies.

Source: Author's compilation based on the business community interview

Such complaints have also been confirmed by the Kosovo Chamber of Commerce (KCC). Therefore, a short explanation about the role of KCC is provided in the following box 2.

Box 2: A short summary on the KCC role

KCC is a professional organisation founded in 1962 by the Assembly of Kosovo, an independent professional organisation, apolitical and non-profitable. The number of members has gradually grown, with 15,000 members coming from different societies. The KCC currently has 35 employees and works based on the Kosovo Chamber of Commerce Law. The KCC has very organised cooperation and contact with its members, mainly the top-down and bottom-up communication functions. Besides, KCC contributes to the growth of businesses and, with its professionalism and commitment, enables Kosovo's industry and community to internalise European values.

Source: Author's compilation based on the interview with the president of the KCC

A necessity for a tight collaboration clutch is mutual trust, which is frequently developed in mutual experiences (usually, DUI learning is characterized by such collaboration). A study conducted by Peter Nielsen, which rates the University of Aalborg in Denmark as the highest in partnership with industry, argues that the segment of innovative firms that have collaborated with universities (building STI and DUI relations) has a much higher probability of product or service innovation (a novelty in product or service innovation) compared to the segment of firms which have not collaborated with the university (Nielsen, 2019). A strong partnership between the UP and industry is necessary to achieve successful STI; however, in university-industry cooperation, regardless of the issues listed above, our case study highlights some developments that have shown some progress in recent years. Nevertheless, the case study tries to figure out how the university contributes to industrial innovation and how this contribution could be improved?

The university approves improved ties with the industry, which is the result of the academic staff, but it still does not have a satisfactory level. In this connection, among other faculties, the Faculty of Electrical and Computer Engineering's role is worth noting, which appears to be the university's most involved faculty in fostering innovation activities. A team within this faculty engages in calls for innovation, and professors continue to participate in many international innovation conferences, and the university supports, partly, covering just some of the costs, in most cases. The university recognizes the importance of industry engagement in a range of issues of mutual interest; thus, it took the first step in 2014 to formalize Regulation's adoption on the establishment of the industrial advisory board. The Regulation on the establishment and principles of the advisory board's functioning has enabled the academic units to set up such an advisory board. With the support of the USAID project (approximately EUR 50,000 million project), the Faculty of Electrical and Computer Engineering has played a pioneering role in the establishment of an industrial advisory board composed of relevant members of associations, institutes, and public-private companies operating in the field of ICT such as STIK and ICK.

Interestingly enough, the new Regulation (2015) [44] on the establishment and functioning of the academic unit advisory boards and the Faculty of Electrical and Computer Engineering

[44] https://fiek.uni-pr.edu/getattachment/Personeli/Trupa-Keshilledhenese/Rregullore-per-themelimin-dhe-parimet-e-funksionimit-te-TK-se_ne_UP.pdf.aspx

initiatives – referred to above – incentivized many faculties to set up similar advisory boards every year. In doing so, the advisory board was set up during 2015 with the help of the Swiss project, enhancing youth employment (EYE) [45] by the Faculty of Education, Architecture, Civil Engineering, Agriculture and Veterinary Sciences, Philology, and the Faculty of Economics. Similarly, in 2016, this initiative was followed by the Faculty of Medicine, Mechanical Engineering, and the Faculty of Physical Education and Sport, while in 2017 was established by the Faculty of Law. The advisory board's main objective is to link the academy with the industry, and, through closer relations ties, the university can prepare graduates with skills better suited to the requirements of the labour market. Unfortunately, no such results are seen in practice; otherwise, some of the complaints mentioned above raised by the business community would have been resolved; however, some positive changes are evident, as outlined in our case study below.

The advisory board's key role is to work together with the faculties' advisory management on updating the curricula; furthermore, the industry's main task is to provide inputs when new curricula are designed. The Faculty of Economics has been very involved in arranging a meeting of the advisory board and addressing problems in economics, entrepreneurship, and strengthening job opportunities for students. The Faculty of Agriculture and Veterinary also held such meetings to update academic curricula, improve teaching and learning methods, and provide practical work and innovative conditions (Career Development Center, 2019).[46] A success story in the field of collaboration between the university and industry can be illustrated by the industry initiative, where the Kosovo Metal Industry and Renewable Energy Cluster was developed for the first time in 2017, with a focus on encouraging industry and universities to work closely together, and the concept of the cluster was designed to bring development and innovation together. This was viewed as a positive start, but unfortunately, this partnership did not last long. The industry confirms that, after

[45] Enhancing youth employment takes a system approach to problem understanding and an adaptive approach to management. EYE goal is a dynamic and socially inclusive labor market that provides more and decent jobs, including self-employment for young people in Kosovo. EYE pursue the long-term goal of a dynamic labor market system while continuously identifying new promising ideas and opportunities and mobilize the resources and partnerships to make change happen. Public-private dialogue for improved skills is enhanced between formal education/training providers and the private sector http://helvetas-ks.org/eye/en/working-approach/

[46] According to the regulation, the advisory board can have at least 11 members and a maximum of 17 members. Faculties should organize advisory board meetings as needed, but not less than two meetings per year.

the formation of the cluster, the university did not systematically help them; instead, the university was no longer active. Nevertheless, even with the university's passive role, the cluster itself has continued to play an active role and has consistently offered vocational training to the staff of its member companies, particularly to young engineers and students and jobseekers. Since its establishment, this cluster has given 20 training sessions with approximately 800 participants. Nowadays, of these 800 trained participants, 70 participants have completed the internship scheme, and around 100 young people are working in cluster firms; this has enabled the cluster to become a valuable reference for young engineers and job seekers to advance their professional skills and competencies.[47]

The case study reveals that the Faculty of Electrical and Computer Engineering has made excellent progress through this advisory board out of 13 faculties. Due to the strong cooperation of this faculty and ICK within the advisory board's framework, several computer science students are sent to participate in ICK events because it offers an excellent infrastructure to support students with future challenges. As a result, the bulk of start-ups originate from ICK affiliates to the Faculty of Electrical and Computer Engineering. Students who attend or present in the event organised by ICK receive a reward of five percent of the grades in the modules related to the events. The Faculty of Electrical and Computer Engineering highlights various examples as successes, e.g., in cooperation with STIK and ICK, suggestions are taken into consideration when preparing the new curricula for the new semester. In addition, business associations usually provide input to the faculty if the new curriculum reflects or does not reflect the market's needs. According to the advisory board members, up to 20 percent of the company's suggestions in technology have been incorporated into the new curriculum as the new academic year begins. At the same time, the rest relies on the rules of accreditation and the relevant policies of university governance. Although the business community is not satisfied with this progress, the curricula are updated every three years, making it difficult for the university to provide graduates with up-to-date skills and learning capabilities and raise STEM students.

[47] According to the interview with the executive director of metal industry and renewable energy cluster of Kosovo. The sound file of the interview and the report on the topics offered during the training sessions is available.

Nevertheless, the advisory board, along with the internship programme, is a type of institutionalised mechanism that addresses and coordinates innovation issues, especially in technology. Besides, the advisory board allows students in the final semester of their studies to have a compulsory course called an internship and are required to spend at least 120 working hours working on a project in international or domestic companies. At the end of this internship, students come together with their mentors from the industry to present the work they have completed. To this end, students earn credit as a regular course; this helps them establish industry connections, demonstrate skills, strengthen their relations with possible future employers, and improve their negotiating position and regular track record. However, businesses require these advisory boards to be organised every three months since it is not enough to meet only in the spring semester when students are expected to do their internships afterwards.

This university recently had an interesting case, a company from Germany called Wiso Tech GmbH[48] which opened a branch and began operating in Kosovo in 2019. The company launched a student scheme and randomly connected to some university students who first started the internship programme, and then, due to their excellent skills and competencies, the company recruited students and continuously increased the demand for university students. A total of 12 university students, responsible for developing software on the German market, engaged in the company between 2019 and 2020. There are cases where students are sent to Germany to participate in the internship programme in companies such as Bosch, Microsoft, and Intel, and some others are working in German companies operating in Kosovo, such as Wiso Tech GmbH. Students also take internships in domestic companies such as 3CIS, ICK, and STIK, developing software for international and domestic market needs. An intended result of the internship programme is that many students could get full jobs, primarily in 3CIS, due to their skills. The analysis shows that 10 percent of students are involved in the internship programme abroad, while 30 percent of students participate in outsourced activities and the rest work in the local market. It is worth noting that professors dealing with innovation and technology are committed to establishing international

[48] WISO-TECH deals with the IT and software development service provider for competent and goal-oriented software and database solutions. The company has specialized in the development of individual applications such as web applications, (micro) services and database applications. As a service provider with a competent team of .NET, Java and PHP developers and have over ten years of experience in this field https://www.google.com/search?client=safari&rls=en&q=Wiso+Tech+GmbH&ie=UTF-8&oe=UTF-8

networking for students. Through the advisory board, the Faculty of Electrical and Computer Engineering meets once a year with local companies where students continue to engage in the internship scheme. These firms present a new offer on technological changes at this meeting, a programming language reflected in the new curriculum of the faculty when the new semester or new academic year starts. First, the university reviews all the suggestions coming from the industry. As mentioned above, up to 20 percent of the most important suggestions are reflected in the curricula, as most of the curriculum relies on accredited programmes. Likewise, companies where students engage in the internship programme are usually invited by the faculty to provide some dual training for students on technology development issues. The idea of bringing businesspeople together to develop students' soft skills in the field of technology came from STIK in Kosovo; however, this association is not yet entirely satisfied with the university's implementation of this activity.

The university acknowledges that the industry is always complaining about the supply of knowledge and that it is a good thing because as long as companies complain, it means that the university produces something, but not the best. Thus, the university provides students who can join various projects and not particular projects on innovation and technology. Despite this considerable collaboration between the Faculty of Electrical and Computer Engineering and the Technology Industry, this collaboration needs to be strengthened. This is in the university's best interest because there is still a lack of research on the technological-social-institutional practice in Kosovo at the university surveyed. Developing high value-added or strategic collaboration between the university and industry will significantly boost the university's knowledge creation function and can also help improve the position of the country's firms in the GVC.

Concerning the performance indicator of university staff, such as the quality of publication and involvement in international conferences and the teaching code, the case study shows that the influence of these factors shaping university–industrial collaboration is mutually beneficial. For example, strengthening international and regional cooperation would also increase collaboration with industry, as the industry is currently at least a step ahead of the university. Thus, if the university interacts more closely with regional and international universities, this will improve the university's role with local partners such as the industry. While both sides should strengthen the relationship, as the advisory board remains only an

advisor and not so involved, e.g., both have failed to build STI&DUI relations. As far as the STI mode is concerned, there is no evidence in Kosovo of the inventions or patents that have been given to the industry, while as far as the DUI mode is concerned, only the internship scheme, along with the formation of clusters, can be seen to have led to some degree of graduate recruitment. However, there is a lack of idea and initiative on the university's part to improve cooperation, as it tends to change very slowly, but that does not mean that the industry should not push ahead with such efforts. Finally, on the one hand, the university and industry's weak cooperation is also indicated by the KCC, which argues that the university should be more proactive and engage the industry more closely. However, on the other hand, the lack of strategies for firms remains a significant challenge, even though KCC claims to have recommended continuously that firms create their strategies with specific goals and activities thus to improve collaboration with the relevant partners such as the university and enhance the integration into the GVC.[49]

Why lack of knowledge transfer?

This part sheds light on the university's role in transferring knowledge to actors in the innovation ecosystem in Kosovo. Knowledge transfer is, in principle, a vital part of the university's role, but offering high-quality lectures requires professors to adapt and develop "state-of-the-art" knowledge. While significant progress has recently been made in creating knowledge, the university is, unfortunately, well behind its possibilities in knowledge transfer. Despite the lack of systematically collected data, the findings indicate that knowledge creation and transfer are not well balanced, and the university has admitted this weakness. The case study reveals that the transfer of knowledge to the ecosystem's innovation stakeholders, explicitly to the industry, is relatively weak or even in some fields entirely lacking. The industry has also confirmed this; thus, the issue of knowledge transfer needs to be addressed urgently.

On the one hand, the legal framework needs to be strengthened along with the willingness to implement it; on the other hand, by improving collaboration with the industry and strengthening the role of advisory boards, logically, the transfer of knowledge would begin to improve. The university acknowledges that, to date, the issue of knowledge transfer has

[49] According to the interview with the president of the KCC. The sound file of the interview is available.

not been adequately addressed; however, knowledge transfer is reasonable only in the teaching pillar, which is a good thing, as knowledge creation could be transferred as knowledge to students. The university should increase cooperation with international organizations and donors as one essential tool, while the research project is another vehicle that should not be neglected. Collaboration with national and regional partners is also important, both of which are unfortunately not at a satisfactory stage. Knowledge transfer needs a time-consuming process of collective learning. In the last decade, technological developments have taken place so rapidly; therefore, the transfer of knowledge from university to industry is a permanent need, nevertheless, for the creation of successful cooperation between the two parties; also, the transfer of knowledge from industry to university is necessary, and in this connection, it is worth making use of the experience of Aalborg University in Denmark as a benchmark (Nielsen, 2019). Considering such factors which need to improve rapidly, it can be concluded that knowledge transfer in direction to the business community at the university is logically lacking. Due to some improvement in teaching, the transfer of knowledge is working well towards students but not yet at a sound stage with the Kosovo innovation ecosystem actors. However, few faculties provide specific professional services expertise to public and private enterprises or individuals, e.g., in telecommunications, construction, architecture, health, and agriculture, to some degree to be considered a form of knowledge transfer. As stated above, an investment of EUR 2.1 million in 2019 in the development of institutes and laboratories to create better infrastructure for scientific research activities and a further EUR 2.4 million expected to be invested in 2020 (all of which concentrate on increasing knowledge creation and transfer) will allow the university to improve revenue generation as its own source consisting of professional services and expertise provided by institutes and laboratories; accordingly, it cannot be neglected as a sort of knowledge transfer.

Concluding remarks

It has been 50 years since the establishment of the UP. Indeed, many progress and challenges could be identified over the half-century. While only 1.49 percent of the state budget is allocated to the university, only 12.26 percent of the budget is the university itself as its resources, resulting in a total university budget of EUR 34.79 million, which is not enough and should increase in the future. Moreover, the university has not yet been able to devote

the necessary financial resources to R&D; hence this remains a challenge; furthermore, the university has not spent budget-based activities adequately. As far as R&D is concerned, the analysis shows that even at the state level, Kosovo spends less percent of the R&D budget, as the government does not spend 0.7 percent of the state budget on scientific research activities as envisaged by law. Apart from not spending even a tiny amount of money, it has not been appropriately spent for several years. Returning to the university and assessing this educational institution's various pillars, we may conclude that there is asymmetric progress in comparing knowledge creation and its transfer to other actors in the Kosovo innovation ecosystem. Our findings indicate that some faculties perform well in related R&D activities, but the majority are underperforming. The analysis shows that the efforts of the university are questionable in the field of knowledge creation: the small average of the scientific papers published by the faculties, which reflect the involvement of the university with only 34 percent in R&D, which means that the most significant percentage of 66 percent of the academic staff does not justify the academic title or the university rank. Unfortunately, given the role of R&D as a determining factor in knowledge creation, the low-performance university does not show any indication of knowledge creation, as there is a lack of monitoring of the professor's performance in R&D. Besides, there is no sign that motivates university staff to publish in a high-ranking international journal, and the present measurement using only aggregated statistics does not provide a realistic picture of the publication performance of the university.

Another challenge for R&D in the coming years is to prepare (train) and motivate academic staff to be more competitive in delivering internationally attractive, multidisciplinary, and practice-oriented projects. Even though the university has recently set up an office for research and sponsored projects, it facilitates research and development work and makes it easier for academic staff to submit competitive project tenders and gain additional financial and intellectual resources. It should be noted that the university is continuously improving its collaboration with international donors (e.g., the European Union remains the main sponsor) and numerous universities. The university has implemented a variety of projects due to the research office and the sponsored projects. Between 2018 and 2019, up to 52 different projects were funded; a few focused on research activities and most of them on capacity building. In the framework of these projects, electrical and computer engineering,

mechanical engineering, philosophy, economics, education, and agriculture are among the most active faculties and beneficiaries of these projects in cooperation with various European universities and a small number of universities in neighbouring countries; therefore, the university should continue to cooperate and be more dedicated.

Over the last five years, the quality of R&D has improved to some degree, as demonstrated by the indexing of scientific journals on reliable databases such as "Scopus, Elsevier and Google scholars" in particular, the analysis shows an increase in the number of university publications in 2019 compared to 2017, along with the quality of publications. As seen above, from 1,320 papers in 2017 to 2,481 papers in 2019, the number has increased significantly. The most outstanding work has recently been done on creating a system for the quality management of scientific research, which is determined by the journal's credibility in which academic staff publish scientific papers. There is a positive sign that in 2019 the university invested EUR 2.1 million in the development of institutions, laboratories and infrastructure and a further EUR 2.4 million in the allocation of the university budget to be invested in 2020 with a focus on increasing knowledge creation and transfer. Such investments are expected to increase the creation knowledge of the university and strengthen the role of the university in the transfer of knowledge to Kosovo's innovation ecosystem actors in providing professional expert services, which, in turn, will not only bring more revenue to the university budget but will also help the influx of leading business and technology knowledge into the university knowledge pool.

The case study found that teaching has improved significantly over the last decade; however, the university should improve critical thinking for students. The university assumes that if students gain some critical thinking, they will get it from the university (some professors have a high degree of critical thinking reflected in high-quality publications and international projects). Nevertheless, the university does not have tools to measure students' critical thinking but acknowledges that it needs improvement. On the one side, industry, the ICT sector, and 3CIS complain that students are faced with a lack of critical thinking (due to old curricula being updated every three years). Furthermore, the level of knowledge emanating from the university is not satisfactory (which makes it almost impossible for students to transfer new knowledge and ideas from the university to the industry), which often forces companies to employ students who are not related to their professional background.

However, firms need to invest heavily in providing vocational training. Therefore, the university should produce students who can join various projects and not particular projects on innovation and technology and compete in the job market after graduation. In doing so, the university should further develop its teaching method function to train high-quality students with critical thinking. In university-industry partnerships, the case study highlights several developments in collaboration with industry which has improved in recent years but not at a satisfactory level. It is a positive sign that the university recognizes the importance of industry engagement in many issues of mutual interest to the parties concerned; thus, it took the first step in 2014 to formalize the Regulation's adoption and the establishment of the advisory board. It is worth noting that among the faculties, the Faculty of Electrical and Computer Engineering has played a leading role in creating an industrial advisory board made up of appropriate members of public-private organizations, institutes, and companies. As a result, many students have been able to participate in the internship scheme, create network industry connections and become fully employed in domestic and foreign technology companies, particularly developing software for international and domestic market needs. As shown above, this incentive has been followed, and most faculties have already formed the advisory board, but need to be more proactive and fully functional and deliver mutually beneficial results. The finding shows that the industry continuously provides feedback when new curricula are delivered; thus, the industry is at least a step ahead of the university. The university-industry relationship should be strengthened by both parties, as the advisory board remains only an advisor and not so much involved besides that the two parties have not succeeded in building STI&DUI relations. In terms of DUI, the internship scheme and the formation of clusters have, to some degree, led to graduate recruitment; in contrast, the STI, there is no evidence regarding the inventions or patents sold to the industry, though, the idea and the initiative of strengthening collaboration should come from the university in parallel with the industry's commitments.

What remains challenging for the university and the near future is undoubtedly the transfer of knowledge, which is an inferior university aspect. The case study points out that the university is doing better in creating knowledge than in transferring knowledge. Transferring knowledge to ecosystem innovation actors, particularly to the industry, is underdeveloped, and what needs to be addressed urgently is creating an appropriate legal framework and the

ability to enforce it. In conclusion, many achievements are evident, and challenges remain in all directions, such as the quality of teaching and scientific research activities. The university should build the ability to enforce the requisite legal framework and the motivation and assessment system for academic staff to be engaged in practice-oriented, high-value-added cooperation.

Chapter 6 Conclusions and future research challenges

Chapter six aims to identify and clarify key similarities and differences between the three key actors in Kosovo's innovation ecosystem case studies. As a consequence, the chapter is divided into three parts: the first section of the conclusions reflects on the lessons learned from the literature review and what we have learned from it and proceeds to identify the challenges encountered at that point and, despite that, how we have progressed in designing the methodology and fieldwork. The second section summarises the case studies' lessons (empirical work) that we learned from these case studies, along with the difficulties faced. Lastly, the third section reflects on the limitations of the research and possible research challenges, particularly identifies the shortcomings of the research that we have faced and tries to identify the empirical evidence required for the future researcher.

6.1 Key lessons and challenges from the literature review

Many studies have shown that innovation plays a crucial role in companies' performance and has a key role in the competitiveness and productivity of the national economy. Schumpeter (1934), a pioneering researcher in innovation recognized the value of innovation in the long-term economic development. It is critical to understand a small distinction that the invention is carried out by universities and academic institutions, whereas innovation takes place at the level of companies; it can be a new brand, but also new combinations of existing elements. In fact, companies find it challenging to innovate in an isolated environment; thus, the development of an innovation ecosystem and the position of institutions are crucial to innovation processes. The underestimated approach of the combination of STI&DUI modes by companies is always challenging; otherwise, a combination of them can result in great product innovation performance. The role of innovation policy becomes important if it focuses on issues that have not been dealt with before by firms and help to solve the problems that businesses cannot cope with; thus, innovation policy should be clearly oriented and

properly formulated and should not replace or duplicate what firms are able to do in innovation. However, the key challenge remains to increase policymakers' skills and capacity to develop appropriate innovation policies and improve policy learning and innovation policy processes.

There is a clear sign recently of shifting from linear to holistic innovation policy. In 2015, Sweden established the NIC, and the key feature of the NIC was to make Sweden move from a linear innovation policy paradigm to a holistic approach to innovation policy. As a result, Sweden is a "leading edge country" in governance innovation by separating innovation from R&D and moving away from the linear model of innovation policy to establish a holistic approach to innovation policy.

Innovation is understood as the ability to translate innovation inputs into outputs; thus, comparing the pre-and post-financial crisis (2008) periods of innovation performance by country, the study reveals some differences in ranking between the EU Member States in four different categories. The analysis shows that the overall average innovation performance of the SII pre-and post-financial crisis of 28 EU members improved by 5.8 percentage points in 2017 compared to the EIS in 2008 when the SII had an average annual raise of 2.3 percent. This considerable rise is marked after the financial crisis. Furthermore, the SII shows that while most countries did not rise significantly between 2005 and 2017, they continued to expand marginally during and after the financial crisis. However, the EU calls for closer collaboration between researchers, innovators, investors, and policymakers to boost innovation performance; presently, this remains challenging. Nevertheless, the EIS approach was strongly criticized by Edquist (2018) & Havas (2016) due to following changes:

- The SII does not meet some primary factors and insufficient data to calculate and assess the innovation framework's performance, and EIS does not have a clear definition of innovation performance.
- While SII places the importance of output on calculating the country's innovation performance, the 'innovation input' is completely ignored. None of the indicators applies to non-R&D innovation activities, and several of the indicators are not relevant.
- STI mode is important, but there is no activity to pay attention to the DUI mode.

6.2 Key lessons and challenges in the emerging innovation ecosystem in the Balkan region

In comparing EU member states and Balkan countries regarding the innovative ecosystem, the findings show that the Balkan countries have built a significant institutional infrastructure that enables innovation to be developed but compared to the EU countries, are a long way behind in catching up on innovation efforts' performance. There are visible gaps between countries in the region's innovation ecosystems; however, no country lacks an innovation ecosystem. Nevertheless, cooperation between ecosystem innovation stakeholders needs to improve and access to finance and capital remains a substantial obstacle. Regarding the role of universities, it should be noted that some of the public universities in the region provide incubators to facilitate innovative companies. However, their success is uneven and private universities are taking the lead in incorporating entrepreneurship into their programmes and activities. The lack of strategic or high-value-added collaboration between industries and academia remains a substantial barrier in the Balkan countries.

The STI results are more modest in all Balkan countries, but unfortunately, most countries invest very little in the R&D budget, below 0.5 percent of GDP, except Serbia that reaches 0.9 percent. The overall model of innovation governance in the region is rooted in a linear innovation paradigm. Nevertheless, all countries lack innovation policies to promote and enable researchers to innovate and transfer knowledge to the industry. Moreover, public procurement to foster innovation in the region is lagging behind the EU, as demand for innovative products and services is low. Furthermore, in terms of patent filing, all countries in the region lag significantly behind the EU. Finally, there is a lack of systematic collection of government and business expenditure data on R&D, which creates difficulties in measuring input and output indicators; nevertheless, joint projects between industry and academia with spin-off production are present in the Balkan countries.

6.3 Key lessons and challenges from the empirical work of the innovation ecosystem in Kosovo

Kosovo has taken several concrete steps towards developing an innovation law that encourages Kosovo to shift towards a holistic STI approach. The innovation strategy and the adaptation of the IT strategy were developed with the help of international associations and

donors. Although some progress has been made with data on entrepreneurial activities, Kosovo still lacks innovation statistics to assess the firm's capacity and commitment to innovation. Kosovo's overall governance model for research is rooted in a linear innovation model that focuses primarily on R&D and underestimates the so-called non-R&D sources of innovation. Unfortunately, the role of innovation in economic development is not yet fully recognised, but the government and business structures try to reflect the importance of innovation as a critical pillar of economic growth. Given this, the case studies were carefully selected as the key knowledge creation and transfer institutions, as we tried to understand the perception, attitudes, and the problems of the critical knowledge users or key institutions who are using the knowledge such as services companies like 3CIS consulting company as it represents the KIBS in Kosovo. Then case study on manufacturing pharmaceutical products because pharmaceutical companies worldwide are knowledge-intensive companies. Finally, the state university as knowledge creation and knowledge transfer to the Kosovo innovation ecosystem actors. Hence the research aims to understand the relations between knowledge suppliers such as universities and two important companies as knowledge users. However, it should be noted that this is a simplistic model because not only the university is the source of the new idea, e.g., the companies who are consuming knowledge like 3CIS and Tre Pharm are also knowledge creation. Moreover, the research tried to explain the role of innovation modes STI&DUI.

Findings and scientific research indicate that as young companies, 3CIS and Tre Pharm play a unique role in Kosovo's innovation ecosystem and can be considered success stories for a decade on the market. 3CIS has succeeded in becoming well integrated into the GVC in the KIBS sector, hitting exports with a total of EUR 5.87 million in 2019, focusing solely on offering a wide range of services on the international market. The United States, the United Kingdom, the Middle East, Europe, and Africa are its main markets. Tre Pharm, on the other hand, is focused on the national market, fluctuating between EUR 1.7 million of national sales while at the same time steadily raising its penetration into the GVC, reaching a peak of 87.80 percent of the country's total exports in 2018. The exported markets were Albania, Macedonia, Libya, and Turkey recently. What is vital for Tre Pharm is that it is approaching the completion of the process accredited by CPGP, which will allow the business to have a quality system recognised by the EU authority and apply for GMP and improve integration

into GVC. However, entry into the EU market remains currently a challenge. Maintaining and improving the position of the GVC in KIBS and the pharmaceutical manufacturing company requires continuous monitoring, learning and renewal of the techno-organisational and knowledge infrastructure. As a result, 3CIS has been forced to invest heavily in knowledge: thus, it spends 18 percent of its turnover annually in R&D, while Tre Pharm officially organised the R&D department in 2020 and plans to spend up to 13 percent of its turnover.

Nonetheless, since Tre Pharm was created, research activities have been entirely non-existent, although Tre Pharm has performed very well in development since it has developed 140 pharmaceutical products. To equip the R&D department, Tre Pharm must focus on raising equipment and the number of workers who must carry out research activities, which remains a challenge for the company. Tre Pharm registered 50 products as trademarks but unfortunately did not apply for patents and industrial designs. In this connection, the study shows that even the university's efforts are questionable in knowledge creation. Unfortunately, we only have aggregated statistics on university professors' publication activity, so we do not know the structure of publications according to quality indicators (e.g., the impact factor, Q1, Q2). However, the analysis shows that the university does not perform well in creating knowledge due to the low average of the scientific papers published by all faculties, which reflects the total involvement of the university with only 34 percent in R&D, meaning that the most significant 66 percent of the academic staff does not justify the academic title or ranking of the university. Findings show that certain faculties are performing well in related R&D activities, but the majority are underperforming. Nevertheless, from 1,320 papers in 2017 to 2,481 papers in 2019, it shows an increased number, but what remains challenging is that out of EUR 34,78 million budget of the university, which is the same over the years, 70 percent of it goes to salaries. Besides, the analysis reveals that no money has been allocated to R&D.

Mixing OJT and Off-JT is successfully combined by both firms; however, 3CIS is a step ahead in the application of Off-JT than Tre Pharm, since it has managed to send its workers abroad and train them in the US and EU countries while Tre Pharm has brought experts to the factory to train employees. Hence the case study suggests that Tre Pharm should follow the same practice as 3CIS. In both cases, this increased organizational innovation's role in

enhancing knowledge creation and transfer within firms. For Tre Pharm, technological and marketing innovations are seen as the driving force behind innovation. Furthermore, it demonstrates skills in using the various managerial technicians in the production chain that help the production method. For example, many types of ISO standards are in force, along with specific characteristics of the JIT, and a quality circle is also a tool that is frequently implemented and considered to be very useful and works based on the PBL. Therefore, enhancing knowledge creation and knowledge transfer within 3CIS and Tre Pharm in a quality circle and PBL (e.g., regular use of project type interdisciplinary work organization) is perceived as a beneficial non-technological form innovation. Moreover, both companies have in place the automation and IT systems at an advanced level. In the case of Tre Pharm, it is linked to all equipment in the laboratory and manufacturing system, which takes care of all and controls all processes, ranging from raw materials to the selling of finished goods. As a result, while the automation performance in 3CIS is higher than ever, senior engineers are adequately trained and qualified in their use and functions. In addition, the automation system is often designed in partnership with projects, and the automation system's application varies from project to project.

However, apart from many internal successes and challenges, two firms have to cope with some external challenges. Due to low interest and willingness from the government to support private companies in R&D, 3CIS has not been inspired to design or propose a new incentive scheme to improve its current investment in R&D. In addition, the grant structure is not appropriate and well suited to meet the needs of firms in the ICT sector including 3CIS. Thus, it has never earned any government grants to finance innovation activities. Complaints to the government are also not absent from Tre Pharm, which confirms that no grant has ever been obtained in the form of government funding. Moreover, it complains that even during the pandemic situation with COVID-19, as a leading manufacturer of pharmaceutical goods, the government has not even contacted the firm to discuss the possibility of supplying any essential products or kind of collaboration. In terms of collaboration with the university, as one of the main components examined in the case studies, it should be noted that the role of invention and innovation is becoming significant. Especially when it relates to the university's role as knowledge-creation and suppliers to Kosovo's innovation ecosystem actors, the importance of the university in the conduct of

inventions and the role of firms in innovation. Unfortunately, the three case studies indicate that cooperation between the university and industry is slow and lacks dynamics; even the university admits this. Close cooperation with high value-added partnerships between universities and companies is a prerequisite for significant innovations, most of which are characterized by reciprocity. There are, however, several developments, but few challenges remain. For example, 3CIS was invited to be a member of the university's board of directors to make recommendations on new technology and adapt it to the curricula of studies as the new semester or academic year starts. However, sadly just a few suggestions provided by the company were incorporated into the curricula. The results indicate that the university should provide graduates with skills and a professional workforce in the labour market. As has already been stated, to fast changing the knowledge sector, such as ICT through technology support, the university should increase the number of higher education students in STEM and produce students who can join various projects, not particular innovation, and technology projects.

Moreover, be able to compete in the job market after graduation, even though the university has established an advisory board to create a better link with firms. Yet, the concept and initiative to establish greater collaboration with companies are absent from the university, as it tends to change relatively slowly. Unfortunately, the university continues to produce students who do not have practical knowledge and practical experience and critical thinking since the university does not provide laboratories to allow students to acquire practical knowledge. However, though there is a good indication that in 2019 the university invested EUR 2.1 million in the development of institutions, laboratories, and facilities, which is not enough. As far as the STI mode is concerned, there is no evidence in Kosovo of the inventions or patents that have been issued to the industry, while as far as the DUI mode is concerned, only the internship scheme, along with the formation of clusters, can be seen to have led to some degree of graduate recruitment. For example, the programme of internships with students between Tre Pharm and the university in medicine and pharmacy, the so-called 3+3 programme, and the internship scheme between 3CIS and the Faculty of Electrical and Computer Engineering leads to the recruitment of new staff. This achievement consists of the DUI mode, but not at a satisfactory level. However, there is a complete lack of dual training between Tre Pharm and the university that would comply with STI, but dual training

between 3CIS and ICK and the Faculty of Electrical and Computer Engineering is present. As a result, many students have participated in the internship scheme, developed network links between the industry, and 12 university students become fully employed in domestic and foreign companies responsible for developing software on the German and national market between 2019 and 2020.

Furthermore, as a success story in collaboration between the university and industry, the cluster is created for the first time in 2017 by the Kosovo Metal Industry and Renewable Energy initiative and the university, with a focus on encouraging industry and university to work closely together. The cluster concept was designed to bring development and innovation together, and this was seen as a positive start, but unfortunately, this partnership did not continue on the university side. However, besides the lack of the university, the cluster continued to operate, and 800 participants were trained, 70 completed the internship scheme, and about 100 young people were employed in cluster companies. Therefore, employing university graduates is an important step in the process-creating as a prerequisite for STI knowledge clutches. Similarly, developing high value-added or strategic cooperation between the university and industry can significantly enhance the university's knowledge creation role and can also help boost the position of the country's firms in the GVC.

Finally, though some progress has recently been made in creating knowledge, the university is, unfortunately, well behind its possibilities in the area of knowledge transfer. Despite the lack of systematically collected data, the results suggest that knowledge creation and transfer are not well balanced, and the university has acknowledged this weakness. Knowledge transfer to the ecosystem's innovation stakeholders, specifically to the industry, is relatively slow or even – in some areas – totally absent, and the industry has also confirmed this. Technological developments have rapidly taken place in the last decade; thus, transferring knowledge from university to industry is a permanent requirement. However, few faculties offer specialized professional services to public and private businesses or individuals, e.g., in telecommunications, construction, architecture, health and agriculture, to some degree could be considered a form of knowledge transfer but still is not enough.

6.4 Limits of the research and future recommendations

Despite many developments, some future challenges to research remain evident; thus, the last part of the conclusions classifies the research's challenges and makes recommendations on which further research should focus.

Lack of innovation statistics

While there are few entrepreneurship statistics, unfortunately, official statistics on research and innovation is not readily available, government statistical institutions in Kosovo does not produce any statistic on innovation, resulting in a lack of systematic quantitative data collection and evaluation and no systematic and chronological analysis on innovation making the evidence-based evaluation. Likewise, the limited absorption ability and lack of STI statistics are also missing at the level of firms. Due to these weaknesses, we were forced to apply the qualitative case study method at the firms and the university level. Therefore, to enable future research scholars, conduct quantitative research in the innovation activities, the following recommendation arises:

- It is necessary that government statistical institutions in Kosovo initiate the data collection process on innovation activities, make the data readily available for future research scholars, enable conduct research on innovation activities, and measure statistical indicators of input and output innovation performance in the country and firm-level.

The role of government

Unfortunately, we have not grasped the Government's role in fostering innovation and innovation policies. One of the NDS priorities (2016-2021) aimed to improve ties between education and the labour market, sadly it failed, and industry confirmed this. Besides, the NSIE (2019-2023) at the micro-stage aims to enhance and improve industry and academia's active involvement and cooperation in R&D activities. Unfortunately, the empirical work shows that there is a total lack of collaboration between them. A positive move was taken in 2017 with the establishment of NCIE. Sadly, the Council met only three times and is no longer operational due to frequent political shifts and government changes.

Moreover, the Government's money on R&D has risen marginally to reach EUR 1.2 million, from 0.1 percent to 0.7 percent of the state budget, as envisaged by the R&D legislation, this is a positive move, but unlikely this small sum is not being spent adequately on "state-of-the-art" research activities. Furthermore, the analysis shows that no money has been allocated to R&D by the university. Finally, companies argue that the grant structure is inappropriate and not well-tailored to meet innovative needs, including 3CIS and Tre Pharm. Given the Government's shortcomings in the role of innovation, the study provides the following recommendations:

- To understand the importance of innovation and boost innovation policies and strengthen the role of the innovation ecosystem, the government needs to redesign and reactivate the NIC and increase the number of stakeholders from the university staff, business communities and related government ministries. Moreover, listening to the voice of businesses and considering the interests of companies is crucial. Again, Sweden can be followed as a good example, a pioneering country in the EU that formed such a council in 2015, led directly by the Prime Minister, making it a 'leading edge country' in governance innovation, shifting from a linear innovation policy model to a holistic approach to innovation policy.
- Since the university does not allocate money to R&D, and the R&D law administered by the Ministry of Education has not produced the expected results, the research recommends that the R&D fund be allocated to faculties and make it possible for the university staff to be more responsible and to invest the proper amount of money on research activities in a more appropriate manner. This, however, requires a shift from the centralised structure to the decentralised system of the university. This will facilitate and substantially increase the university role in the monitoring faculties, report the results to the Ministry of Education, and then increase 0.7 percent of the R&D fund.

Weak industry and university collaboration

The collaboration between industry and the university remains weak and lacks dynamic. There is asymmetric progress in comparing knowledge creation and its transfer; while little progress has been made in creating knowledge, knowledge transfer to the industry is almost non-existent. The advisory board remains just an advisor and not so much active; besides,

the two parties have not been able to develop ties between the STI and the DUI modes; hence the following recommendations derive:

- Collaboration with the industry must become compulsory for the university because it is mainly characterised by reciprocity. The university has to improve student's critical thinking, increase the number of STEM students, and create tools to measure critical thinking. This allows students to transfer new knowledge and ideas from the university to the industry and join various projects, not particular innovation, and technology projects, and efficiently exploit the significant R&D investment of the innovative firms. Besides, increasing the academic staff's participation in the R&D is necessary for the university staff to produce a mandatory article per year; presently, this is missing. Finally, updating the university's curricula more frequently is crucial and incorporating the industry's suggestions that emerge from the market needs. Kosovo can adapt an excellent example followed by the Aalborg University in Denmark. Thanks to its cooperation with the industry, it enables students to take an internship as a curriculum opportunity before the graduate dissertation project is written and help create trust relationships and work on development projects before they graduate. So that graduates can transfer new knowledge and ideas from the university to the industry. Firms that have collaborated with universities (building STI and DUI relations) showed much higher innovation performance of product or service (a novelty in product or service innovation) than firms that have not collaborated with the university in Denmark.
- The Metal Industry and Renewable Energy Cluster, formed for the first time in 2017, focused on encouraging industry and universities to work closely together. Unfortunately, it failed from the university side; nevertheless, boosting the triple helix or clusters' role in Kosovo is essential. Hungary has recently created the Cooperative Doctoral Program to increase the number of workers employed in research, development, and innovation. Doctoral students are participating in this program work on their subject in collaboration within the institutional framework of higher education doctoral schools operated by the Ministry of Innovation and Technology. The program shall provide doctoral students with up to EUR 1,124.73 per month for a period of up to 48 months.

Lack or research activities

To retain and improve the position of GVC, 3CIS invest 18 percent of its annual turnover in R&D and on the OJT programme; 3CIS also provides training in R&D on emerging technologies. While Tre Pharm organised the R&D department by 2020 and aims to spend 13 percent of its annual turnover. However, the analysis shows that both cases lack research activities compared to the significantly advanced development component. Hence, considering findings and scientific results, the following steps are recommended:

- 3CIS continue to invest in R&D, focusing more on research activities, as it allows it to grow by developing new services and pursuing global technological changes because technological developments are so rapid that they may emerge as a result of the advancement of networking technologies that affect the business process automation system.
- Tre Pharm to focus more on setting up the necessary equipment and increasing the number of employees in the R&D Department. In addition, these people need to benefit from the Off-JT and build skills to carry out research activities. Therefore, investing in R&D is a strong indication of the strengthening of the role of STI.
- The scientific research analysis identified that both firms lack an innovation strategy, so developing an innovation strategy and translating it into concrete operational effectiveness would help both companies competing in the international market and enhancing integration into the GVC.

In conclusion, according to the findings and scientific results of the research, the fundamental objective of the study has been considerably fulfilled. The findings of this study contribute to the innovation and open innovation literature by depicting for the first time how to implement innovation in companies operating in Kosovo. Of course, since the present study examined only two companies and a state university, the findings cannot be generalized to all businesses and universities in the Kosovo innovation ecosystem. In addition, due to various reasons, such as Kosovo's economic, political, and geographical location, generalization of the results to other countries, especially developed countries, is not feasible. Therefore, the present study suggests that a similar study be conducted in developed countries and compare its findings with the present study.

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Annexes:

Annex 1: Automation system in 3CIS

Automation Support and Implementation

- Part of initial team for Comcast commercial NSO project that worked on developing YANG service models for provisioning L2/L3 MPLS VPNs,
  common device configuration templates, and compliance report tests
- Use the NETCONF protocol and able to read/write YANG models
- Use logs to troubleshoot the Cisco NSO deployment and
  check NSO communication with network devices
- YANG/YIN (XML) modeling
- Complex validation and feature implementation using Java and Python within service model.
- Knowledge of ESC for VNF onboarding and life cycle management.
- NSO Administration and Alarm Management
- Common device configuration templates
- Network wide policy enforcement
- Compliance report test
- 20 Certified Engineers on Cisco NSO Platform
- Hardware resources used to populate Unix OS(RedHat)/OpenStack to create different types of VMs
- A single ETSI MANO VNF with multiple VNF Components (VNFCs)
- Three use cases (VNFC) with common management and orchestration:
  - Gateway Functions
  - Policy Functions
  - Service Functions

Annex 2

Course: Python Programming

Lesson 1: Introduction
Lesson 2: GitHub, Functions, Booleans
Lesson 3: Sequences, Iteration and String Formatting
Lesson 4: Dictionaries, Sets, and Files
Lesson 5: Exceptions, Testing, Comprehensions
Lesson 6: Advanced Argument Passing, Lambda-functions as objects
Lesson 7: Object Oriented Programming
Lesson 8: More OO -- Properties, Special methods
Lesson 9: Iterators, Iterables, and Generators
Lesson 10: Decorators, Context Managers, Regular Expressions, and Wrap Up

Links: https://canvas.uw.edu/courses/1026775/pages/python-100-course-syllabus
http://cs.nyu.edu/courses/fall17/CSCI-UA.0002-002/common_syllabus/

Course: Introduction to Unix-Linux

Lesson 1:
The Unix philosophy
Why learn and use Unix?
Unix and Linux variations
Lesson 2:
Introduction to the Bash shell
Basic Unix commands
Lesson 3:
Unix/Linux filesystem
File Permissions
Lesson 4:
The VI Editor
Lesson 5:
Shell operations
Basic shell scripting in Bash
Lesson 6:
FAU Specific Resources
Lesson 7:
Unix tools and techniques
Lesson 8:
Advanced shell scripting in Bash
Lesson 9:
Advanced Unix operations

Links: https://tsg.eng.fau.edu/introduction-to-unix-syllabus/
https://courses.cs.washington.edu/courses/cse391/16au/handouts/391Syllabus_16au.pdf
http://heinz.cmu.edu/Courses/329syl.pdf*(consider)

Course: Wide Area Networks

- Network Architecture Fundamentals
  - Layering, Protocols and Interfaces
- Network Design Principles and Mechanisms
  - Design Tradeoffs and Performance
- Internet Architecture Overview
  - Naming, Addressing and Packet Forwarding
- Internet Routing Architecture
- Future Internet Directions
- Internet Congestion Control Framework
- Internet Traffic Management and QoS Support
  - Resource Allocation and Scheduling
  - Traffic Shaping and Monitoring
  - IntServ and DiffServ Frameworks
  - RSVP, MPLS, SDN and other protocols

Recommended readings:

- James Kurose and Keith Ross: Computer Networking, A Top Down Approach, Addison Wesley
- William Stallings: Data & Computer Communications, Prentice Hall
- Larry Peterson and Bruce Davie: Computer Networks: A Systems Approach, Morgan Kauffman
- Douglas E. Comer, David L. Stevens: Internetworking with TCP/IP, Prentice Hall

Annex 3: Classification of products and types of trademark applications

Year		Mark	Mark Feature	Status		
Application	Expiration					
2011		Tre Pharm	Combined	Registered		
2013		aspirin	Word			Opposed
2013		CLENATRO	Word		Rejected	
2013	2023	PATREZOL	Word	Registered		
2013	2023	LOCARD	Word	Registered		
2013	2023	FUNGIZOL	Word	Registered		
2013	2023	LOCARD H	Word	Registered		
2016	2026	PRO	Word	Registered		
2016	2026	NIFUREX	Word	Registered		
2016		TRETAL	Word			Opposed
2016	2026	DICLOFEN	Word	Registered		
2016		LUNA	Word			Opposed
2016	2026	XALAM	Word	Registered		
2016	2026	ACT	Word	Registered		
2016		ASPIRIDOL PROTECT	Word			Opposed
2016	2026	DOLOKIDS	Word	Registered		
2016		MOXTIKLAV	Word			Opposed
2012	2022	ALBADOL	Word	Registered		
2012	2022	DOLOFIX ABDOMEN	Word	Registered		
2012	2022	GLIMUR	Word	Registered		
2012	2022	DOLOFIX MUSCULAR	Word	Registered		
2012	2022	DOLOFIX MENSTRUAL	Word	Registered		
2012	2022	DOLOFIX GRIP	Word	Registered		
2012	2022	DOLOFIX	Word	Registered		
2012	2022	PRIMET	Word	Registered		
2012	2022	DOLOFIX FORTE	Word	Registered		
2012	2022	TRICLAZIDE	Word	Registered		
2012	2022	ORZO HERBASUN	Word	Registered		
2012		CIPROT Ciprofloxacin	Combined		Rejected	
2012	2022	OMEGA COMPLEX +VITAMIN E HERBASUN	Word	Registered		
2012		AZITRE Azithromycin	Combined		Rejected	
2012	2022	OMEGA 3 HERBASUN	Word	Registered		
2011	2021	AZITRE	Combined	Registered		
2011	2021	TREKLIN	Word	Registered		
2011		CIPROT	Combined		Rejected	
2011	2021	TRECLOX	Word	Registered		
2011		CEFEXEL	Combined		Rejected	
2011		ERYTRE	Combined		Rejected	
2011	2021	TRECLOR	Word	Registered		
2011		TREKLIN	Combined		Rejected	
2011	2021	ERYTRE	Word	Registered		
2011	2021	MOXTID	Word	Registered		
2011	2021	AMICLOX L	Word	Registered		
2011	2021	CEFEXEL	Word	Registered		
2011	2021	CIPROT	Word	Registered		
2011	2021	AMIPEN	Word	Registered		
2011	2021	BACTRE	Word	Registered		
2011	2021	CEF	Word	Registered		

2012	2022	ALBADOL PLUS	Word	Registered			
2011		ERYTRE	Combined		Rejected		
2011		ERYTRE	Combined		Rejected		
2011		AMICLOX L	Combined		Rejected		
2011		BACTRE	Combined		Rejected		
2011		TRECLOX	Combined		Rejected		
2011		AMICLOX L	Combined		Rejected		
2011		ERYTRE	Combined		Rejected		
2011		MOXTID	3-D		Rejected		
2011		CEF	3-D		Rejected		
2011		AMIPEN	3-D		Rejected		
2011		MOXTID	3-D		Rejected		
2011		CEF	3-D		Rejected		
2011		TRECLOR	3-D		Rejected		
2011		TRECLOR	3-D		Rejected		
2011		AMIPEN	3-D		Rejected		
2016	2026	DoloHot C	Word	Registered			
2016	2026	Expergo	Word	Registered			
2016	2026	ValsaCard	Word	Registered			
2016	2026	TrioCard	Word	Registered			
2016	2026	DoloKids Grip	Word	Registered			
2016	2026	Phenocillin	Word	Registered			
2012		LISOCARD	Word			Opposed	
2012	2022	HCTZ	Word	Registered			
2012		LISOCARD H	Word			Opposed	
2012	2022	PROCARD	Word	Registered			
2012		RAMICARD	Word			Opposed	
2012	2022	ASTAT	Word	Registered			
2012		RAMICAD H	Word			Opposed	
2011		CEF	Combined		Rejected		
2011		TRECLOR	Combined		Rejected		
2011		CEF	Combined		Rejected		
2011		AMIPEN	Combined		Rejected		
2011		TRECLOR	Combined		Rejected		
2011		MOXTID	Combined		Rejected		
2011		MOXTID	Combined		Rejected		
2011		AMIPEN	Combined		Rejected		
2014	2024	PROTOPEN	Word	Registered			
2014	2024	DOLOFIX EXTRA	Word	Registered			
2014	2024	DoloHot	Word	Registered			
2014	2024	TREAGRA	Word	Registered			
2020		SULIDOR	Word				Filed
2020		PROGEL	Word				Filed
2020		SECUMET	Word				Published
2020		SECUVIA	Word				Published
2017		Sulidor	Word		Rejected		

Annex 4: List of topics of the annual training plan for OJT and OFF-JT

- Good manufacturing practice
- Quality insurance
- Policies and procedures
- Standard operation procedures
- Hygiene personal
- Human resource management
- Conflict management & performance evaluation
- General requirements for the competence of testing and calibration laboratories
- Regular participation in the congress of pharmacy in Macedonia
- Participation on professional scientific conference
- Troubleshooting and operation for Ultraviolet (UV) 1800 including software
- Efficient time management
- Assessing the short-term UV-photostability of the alprazolam drug
- General training for ISO 14001:2015
- General training for ISO 9001:2015
- Participation in the international pharmacy conference
- Training on how to conduct staff recruitment
- Training on performance evaluation policy
- Training on product certification
- Marketing training
- Vehicle policy and logistics

Source: authors compilation based on interview

Annex 5: The university budget

Kosovo Budget for year 2018
Table 3.1: Central Budget (in euro)

Cod Org.	Cod Prog Sub.	Code Funct	Ministries/ Institutions	Programs	Sub-Programs	Source of Funds	Employees for year 2018	Wages and Salaries	Goods and Services	Utilities Expenditures	Subsidies and Transfers	Capital Expenditures	Reservs	Expend. 2018 Total:	Estim. 2019 Total:	Estim. 2020 Total:
242			University of Prishtina				2,081	21,158,067	3,052,645	1,175,000	1,299,000	7,150,000		33,834,712	35,761,289	37,353,645
						Government Grants		18,346,844	2,814,086	1,175,000	198,782	3,150,000		25,684,712	27,611,288	29,203,644
						Own Sources		2,811,223	238,559		1,100,218	0		4,150,000	4,150,000	4,150,001
						Financing by Borrowing						0		0	0	0
						Revenue from PAK						4,000,000		4,000,000	4,000,000	4,000,000
				University of Prishtina			2,081	21,158,067	3,052,645	1,175,000	1,299,000	7,150,000		33,834,712	35,761,289	37,353,645
						Government Grants		18,346,844	2,814,086	1,175,000	198,782	3,150,000		25,684,712	27,611,288	29,203,644
						Own Sources		2,811,223	238,559		1,100,218	0		4,150,000	4,150,000	4,150,001
						Financing by Borrowing						0		0	0	0
						Revenue from PAK						4,000,000		4,000,000	4,000,000	4,000,000
	90400	0941			University of Prishtina		2,081	21,158,067	3,052,645	1,175,000	1,299,000	7,150,000		33,834,712	35,761,289	37,353,645
						Government Grants		18,346,844	2,814,086	1,175,000	198,782	3,150,000		25,684,712	27,611,288	29,203,644
						Own Sources		2,811,223	238,559		1,100,218	0		4,150,000	4,150,000	4,150,001
						Financing by Borrowing						0		0	0	0
						Revenue from PAK						4,000,000		4,000,000	4,000,000	4,000,000
208			Ministry of Education, Science and T				2,142	17,286,141	9,823,419	1,596,459	4,841,929	24,455,678		58,003,626	58,634,112	57,969,101
						Government Grants		16,190,486	7,815,161	1,360,369	4,826,429	21,155,678		51,348,123	52,410,981	55,313,598
						Own Sources		1,095,655	1,308,258	236,090	15,500	0		2,655,503	2,655,503	2,655,503
						Financing by Borrowing			700,000			1,300,000		2,000,000	3,567,628	0
						Revenue from PAK						2,000,000		2,000,000	0	0

Kosovo Budget for year 2019
Table 3.1: Central Budget (in euro)

Cod Org.	Cod Prog Sub.	Code Funct	Ministries/ Institutions	Programs	Sub-Programs	Source of Funds	Employees for year 2019	Wages and Salaries	Goods and Services	Utilities Expenditures	Subsidies and Transfers	Capital Expenditures	Reservs	Expend. 2019 Total:	Estim. 2020 Total:	Estim. 2021 Total:
242			University of Prishtina				2,081	21,263,857	3,402,645	1,175,000	1,444,000	7,500,000		34,785,502	35,291,821	35,398,672
						Government Grants		18,604,884	3,164,086	1,175,000	343,782	3,500,000		26,787,752	31,141,822	31,248,673
						Own Sources		2,658,973	238,559		1,100,218	0		3,997,750	4,149,999	4,149,999
						Financing by Borrowing						0		0	0	0
						Revenue from PAK						4,000,000		4,000,000	0	0
				University of Prishtina			2,081	21,263,857	3,402,645	1,175,000	1,444,000	7,500,000		34,785,502	35,291,821	35,398,672
						Government Grants		18,604,884	3,164,086	1,175,000	343,782	3,500,000		26,787,752	31,141,822	31,248,673
						Own Sources		2,658,973	238,559		1,100,218	0		3,997,750	4,149,999	4,149,999
						Financing by Borrowing						0		0	0	0
						Revenue from PAK						4,000,000		4,000,000	0	0
	90400	0941			University of Prishtina		2,081	21,263,857	3,402,645	1,175,000	1,444,000	7,500,000		34,785,502	35,291,821	35,398,672
						Government Grants		18,604,884	3,164,086	1,175,000	343,782	3,500,000		26,787,752	31,141,822	31,248,673
						Own Sources		2,658,973	238,559		1,100,218	0		3,997,750	4,149,999	4,149,999
						Financing by Borrowing						0		0	0	0
						Revenue from PAK						4,000,000		4,000,000	0	0
208			Ministry of Education, Science and T				2,269	19,815,991	17,756,888	1,616,459	6,278,498	27,770,485		73,238,320	71,932,099	71,797,576
						Government Grants		18,720,335	15,328,823	1,380,369	6,262,998	19,109,449		60,801,974	62,276,596	69,142,073
						Own Sources		1,095,655	1,308,258	236,090	15,500	0		2,655,503	2,655,503	2,655,503
						Financing by Borrowing			1,119,807			2,161,036		3,280,843	0	0
						Revenue from PAK						6,500,000		6,500,000	7,000,000	0

Annex 6: List of persons interviewed in the three case studies

Persons interviewed	Date of interview	Position
1. Kujtim Tali	December 2019	Managing partner in 3CIS
2. Burbuqe Hashimi	January 2020	Head of Quality and Matrix Department in 3CIS
3. Dren Berzati	January 2020	Senior engineer in 3CIS
4. Fitim Haziri	January 2020	Head of Finance Department in 3CIS
5. Gezim Pula	January 2020	Chief Executive Officer of 3CIS
6. Blerim Rexha	February 2020	Professor and Head of Computer Department at Faculty of Electrical and Computer Engineering at the University of Pishtina
7. Enver Hamiti	March 2020	Dean of Faculty of Electrical and Computer Engineering at the University of Pishtina
8. Myrvete Badivuku	April 2020	Professor of Economics & Vice-Rector for Budget and Finances at the University of Pishtina
9. Faton Berisha	April 2020	Professor of Mathematics & Vice-Rector for Scientific Research at the University of Prishtina
10. Vjollca Cavolli	May 2020	Executive Director of Association for Information and Communication Technology
11. Avdi Krasniqi	May 2020	Senior trademark officer, in the Intellectual Property Agency in the Ministry of Trade and Industry
12. Laura Zherka	May 2020	Director of Innovation Department at the Ministry of Education Science Technology and Innovation
13. Uranik Begu	May 2020	Chief Executive Officer of the Innovation Centre Kosovo
14. Arieta Pozhegu	June 2020	Executive Director of Kosovo Wood Processing Association
15. Astrit Rexhaj	June 2020	Executive Director of Metal Industry and Renewable Energy Cluster of Kosovo
16. Fitim Seferi	June 2020	Research Support Officer of the University of Prishtina
17. Yllza Mehmeti	June 2020	Head of Innovation Division at the Ministry of Education Science Technology and Innovation
18. Besnik Loxha	June 2020	Director of Academic Development Office of University of Prishtina
19. Mergim Prishtina	September 2020	Funder & CEO of Tre Pharm
20. Erëza Demjaha	October 2020	Senior officer in HR Department in Tre Pharm
21. Arlinda Vllasolli	October 2019	Head of HR Department in Tre Pharm
22. Shahid Raza	October 2020	Head of Operations Department in Tre Pharm
23. Leonora Prenaj	October 2019	Head of Finance Department in Tre Pharm
24. Berat Rukiqi	January 2021	President of the Kosovo Chamber of Commerce and Professor Assistant at the Faculty of Economics at the University of Pishtina

Annex 7: Case study questions:

Standard questions for 3CIS and Tre Pharm

1. When was the company established?
2. What is the structure of the company?
3. What are the turnovers of the company?
4. What is the dominant ownership of the company?
   - Private ☐
   - Public ☐
   - Mixed ☐
   - Foreign ☐
   - NGO ☐
5. What is your main area of activity?
   - Manufacturing ☐
   - Services ☐
   - Both ☐
6. What are your main products or services?
7. How many employers you have?
   - less than 10 persons ☐
   - 10 – 49 persons ☐
   - 50 – 249 persons ☐
   - 250 and over ☐
8. What is the composition of the workforce? How much percent are white collar and how much blue collar?
9. What is the education of the workforce?
10. What is your dominant market?
    - Local ☐
    - National ☐
    - International ☐

Questions based on sub-dimensions and qualitative indicators for 3CIS and Tre Pharm (STI&DUI modes of innovation)

An innovation, according to the Oslo Manual "is the implementation of a new or significantly improved product (goods or services), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations." (Oslo Manual, 2005: 46).

11. Does your firm have a specialised section dealing with innovation? Yes ☐ No☐ if Yes what kind of sections and what is its main task? If No, why that is not important for your company?
12. How important you consider innovation in your field of business?
13. Do you think there is enough government support of innovation Yes ☐ No ☐ if Yes, can you list the support, if No what would you suggest?
14. What do you think the government should be doing to promote and facilitate innovation in the part of the firms?
15. Do you receive any other sources of support?
16. Are there any support programs or grants for research and innovation that you are aware of? Yes ☐ No ☐ if Yes, can you please specify it?
17. Please explain if those grants are appropriate and well-designed according to the needs of the private sector, in particular for your organization?

18. How much do you invest in R&D?
19. Do you have any fiscal incentives for R&D&I?
    Yes ☐ No ☐ if yes what kind of incentives? If no, what would you suggest?
    Do you think that investing in R&D is profitable?
    Yes ☐ No ☐ if yes, can you please provide me some evidence?
20. What type of fiscal incentives you think will promote innovation by firms?
21. Do you know any program incubators or other facilitators in Kosovo? Yes ☐ No ☐ if yes, can you please list the incubators and what kind of help did you receive? Can you please show me some evidence?
22. If there are available such incubators, do you think entrepreneurs will use them?
23. What kind of support do you think incubators and accelerators will provide?
24. Is there any Agency in Kosovo providing innovation supporting service? Yes ☐ No ☐ if yes, can you please mention the Agency? If no, what kind of Agency would be necessary?
25. When you have technology problems in your firm whom you look for help? Can you please give me an example when the company can solve the problem internally and when you need some external help?
26. Do you think that the tender specification of government procurement promotes innovation at the firm level?
    Yes ☐ No ☐ Please explain it
27. Have you ever done any work with the university? Yes ☐ No ☐ Can you please give me some examples and explain how is the collaboration with the university?
28. To what extent there is mobility between academia and industry?
29. Do you think it will be helpful and profitable to work with academia on R&D&I? Yes ☐ No ☐ Please provide evidence?
30. Are you aware if there is any innovation voucher scheme, competitive cooperative grants, or innovation cluster in Kosovo?
    Yes ☐ No ☐ if yes, explain the types of them?
31. How often you have cooperation with researchers/university?
    Yes ☐ No ☐ Occasionally ☐ Frequently ☐ Always ☐ or never engaged in this form of cooperation ☐ very limited. Can you please describe the type of cooperation?
32. Does your firm employ university graduates? Yes ☐ No ☐ if yes, how many graduates have you employed in your company? If no, why?
33. ? Do you invite students in the form of internship program? Did you have a case that you hired students from the internship program?
34. Does the firm use IT at all? Yes ☐ No ☐ If yes, at which fields and provide examples? production ☐ service process ☐ in administration ☐ (pl. finance, HRM etc.)
35. Does the firm use website, social media? Yes ☐ No ☐ Please provide examples?
36. How much per cent of the personnel has digital skill?
37. Does the firm use interdisciplinary working groups (i.e., working groups composed by mixes of professions (e.g., rank-and-file workers, employees, engineers, marketing experts, designers etc.)? Yes ☐ No ☐ if yes, please provide concreate examples, if no, why?
38. Does the firm use such managerial technics as Quality Circles, any form of ISO, Just-in-time methods, small groups focusing cost saving etc.?
    Yes ☐ No ☐ if yes, please provide concreate examples, when you have implemented and what are the results? if no, why?
39. Does the firm involve employees into the preparation of decision or does inform them following the decision on new products/services, new ways of organising work, working conditions (e.g., working time, training etc.)? Yes ☐ No ☐ if yes, can you give me some evidence?
40. Does the firm participate in the 'project-type' work organisation: organising joint working for employees working at different functional department to speed up knowledge sharing and development Yes ☐ No ☐ if yes, can you please give me an example of what kind of project? If no, why?

41. Does your firm organise systematic collection and evaluation of suggestions of customers, suppliers, and other external stakeholders? Yes ☐ No ☐ Can you please give me an example in the case of customers in the case of supplier and the case for stakeholders.
42. Does your firm organise on the job training (OJT) and training outside job (Off – the – Job Training – OFFJT)? Yes ☐ No ☐ Can you provide examples on what topics you organized OJT and in which topic you organized outside training?
43. How much is the company active in organizing dual training?
44. What are the main drivers of innovation? Please explain it
45. What are the main technological and non-technological developments?
46. How much company is active in applying innovative marketing?
47. How automation system function in you company? Please explain in detail.

Standard questions for the university case study

1. When was the University created?
2. What is the structure of the University?
3. What is the budget of the university? Please provide evidence.
4. How much percent of this budget's University is spent for R&D and what are the results?
5. How many faculties operate under the university?
6. Do you have any plan on opening new faculties if yes in what areas?
7. How many students by faculty you have? Please provide evidence.

Questions based on sub-dimensions and qualitative indicators the university case study (STI&DUI modes of innovation)

8. What kind of the government support you receive to boost innovation? f yes when did you receive and what is the purpose and the size of the fund? if no, what university try to overcome this weakness?
9. Who are the main providers or funds to support innovation efforts?
10. What are other technology institutes or science and technology present in Kosovo?
11. To what extent there is mobility between academia and industry? Please provide examples.
12. Do you have an institutionalized mechanism to coordinate firms' cooperation in the area of R&D&I? Yes ☐ No ☐ if yes, are satisfied with that? If no, what is your suggestions?
13. If there is no much cooperation between academia and industry, why you think is that the case?
14. Do you think that the industry believes that academia can produce some value-added? Please explain Why low trust in academia and university? Knowledge competence of university is now useful for companies? Why there is no mutual interest of university people and company people?
15. When did the university start to approach the company and which departments?
16. Have you ever done any joined project with the firm on R&D&I? Yes ☐ No ☐ if yes, provide evidence if not why?
17. Is there any case if any company is active in organizing dual training?
18. How is the learning match between university and enterprises?
19. How is STI and DUI modes functioning between the university and industry?
20. How is University driven STI and DUI relations?

List of publications:

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2. Zef Dedaj :Csaba Makó ;Saeed Nosratabadi: Improving Kosovo Innovation Ecosystem: Exploration Before Exploitation. Journal: ACADEMIC AND APPLIED RESEARCH IN MILITARY AND PUBLIC MANAGEMENT SCIENCE (2498-5392 2786-0744): 21 3 12 p. (2022). Language: English. Publication: 33056707 | Published Core | Journal Article | Scientific |.
3. Zef Dedaj: THE ROLE OF THE UNIVERSITY OF PRISHTINA IN KNOWLEDGE CREATION AND TRANSFER: IS UNIVERSITY-INDUSTRY LINKAGES INCREASING? Journal: EKONOMSKI VJESNIK / ECONVIEWS (0353-359X 1847-2206): 35 2 17 p. (2022). Language: English. Publication: 32930973 | Published Core | Journal Article Scientific.
4. Krasniqi Besnik; Bajcinca Shqipe; Zhushi Genc; Kryeziu Liridon; Mehmet Sakarya; Lajqi Saranda; Zeqiri Besim; Dedaj Zef. Sports university education and entrepreneurial intentions: an analysis using structural equation modelling. Journal: ECONOMIC ALTERNATIVES (1312-7462): 22 p. (2022). Language: English. Publication: 32941510 | Published Core | Journal Article| Scientific |.
5. Armend Muja; Zef Dedaj ; Kaltrina Bunjaku: How does market size affect Kosovo economic competitiveness? Conference: Pristina, Kosovo 10.26-2018.10.28.2018. Language: English. Publication: 32970158 | Published Core Suspect | Conference proceedings | Scientific |. Comments: https://knowledgecenter.ubt-uni.net/conference/2018/all-events/294/.DOI:10.33107/ubt-ic.2018.294.
6. Zef Dedaj: THE EFFECT OF TRANSFORMATIONAL LEADERSHIP APPROACH IN ORGANIZATIONS: ECONOMY & BUSINESS: JOURNAL OF INTERNATIONAL SCIENTIFIC PUBLICATIONS (1314-7242 1314-7242): 11 1 pp 191-199 (2017). Language: English. Publication: 32941882 | Published Core | Journal Article | Scientific|.
7. Zef Dedaj: Entrepreneurship Development: the case of Croatia. Dorisz Györkő ; Vivien Kleschné Csapi ; Zsolt Bedő (eds.) ICUBERD 2017: Book of Papers . Conference: Pécs, Hungary 2017.11.30. - 2017.12.01. Pécs: University of Pécs, pp 1-12 (2017). Language: English | Book link: ISBN: 9789634292128 REAL Teljes dokumentum. Publication: 32959812 | Published Book: 3337126 Book: 3337126 Core | Chapter in Book | Scientific |.
8. Zef Dedaj: CONNECTING STRATEGY WITH INNOVATION. In: Dobrai Katalin (Sümeginé Dobrai Katalin Menedzsment) UP/Faculty of Business and Economics/Department of Leadership and Organizational Sciences ; László Gyula (László Gyula Ipargazdaságtan, munkagazdaságtan) UP/Faculty of Business and Economics/Department of Leadership and Organizational Sciences ; Sipos Norbert (Sipos Norbert Menedzsment) UP/Faculty of Business and Economics/Department of Leadership and Organizational Sciences (eds.). Ferenc Farkas International Scientific Conference = Farkas Ferenc Nemzetközi Tudományos Konferencia 2018 . Conference: Pécs, Hungary 2018.06.07 - 2018.06.08. Pécs: PTE Közgazdaságtudományi Kar Vezetés- és Szervezéstudományi Intézet, pp 113-122 (2018). Language: English | Book link(s): Kiadónál ISBN: 9789634292388 . Publication: 32952185 | Published Book: 3383009 Book: 3383009 | Chapter in Book| Scientific |