Artur Biernacki

BUSINESS INCUBATION AS A TOOL FOR ECONOMIC DEVELOPMENT

AALBORG UNIVERSITY

Project title:

Business incubation as a tool for economic development in Poland

Project type:

Master's thesis

Time period:

1st of February to
6th of June 2018

Participants:
Artur Biernacki

Supervisor(s):
Cecilia Theresa Gregersen

Editions: 3
Report pages: 71
Completed: 06-06-2018

School of Business and Economics
Study Board of Business Economics
Fibigerstræde 2
9220 Aalborg Ø
Phone 99 40 80 52
http://www.business.aau.dk

Abstract

This research paper studies the role of the biggest university business incubator network (Akademickie Inkubatory Przedsiębiorczości - AIP) in Poland for further economic development of the country. Author have seen the necessity for the research due to Poland's weak results in the Knowledge Economy and Innovation ranks despite having allegedly the biggest UBI network in Europe. Paper examines the Poland as knowledge economy and also its regions separately in order to understand does the whole country is struggling within those fields or only particular regions. Further the assessment of National Innovation System in Poland is provided, which also analyzes the regional strategies perspectives for the innovativeness improvement. The analysis is finished with UBI network in Poland analysis through the perspective of theoretical incubation model. What is more the interaction and positioning within the NIS is also provided and depicted in the model of incubation AIP is using. The theories and gathered data is cross analyzed to get results which bring more in-depth view on the topic. Finally, answer for the research question is included in the conclusions, which are discussed by the author in order to understand what possible future perspective could be chosen for further analysis of the topic.

Keywords: National Innovation System, University Business Incubator, development, business incubation, knowledge economy, regional innovation system, regional development, Smart Specializations.

Table of contents

1. Introduction.

The aim of this paper is to investigate the determinants of a university business incubation role within economic development in Poland. Each country reaches out and strives to create better life for its people, since it is the most important goal of socio-economic strategy (United Nations, 2015), that is why economic development is a primary issue for each country. Based on New Growth theory economic development could be reached through knowledge and innovation creation, which later through entrepreneurial activities (e.g. business incubation) could be monetized and affiliate in the economic development of the country. Poland is not doing well in terms of knowledge and innovation, what are the reasons behind that? Could the universities and business incubation within them help out in this issue? Or the issue is on the macro level in the national innovation system. This research will help to define the role of university business incubators in Poland and how do they relate to knowledge and innovation creation within the regions or in the national perspective for further economic development.

1.1 Knowledge Economy and Innovation

The connection of country competitiveness with innovation and economic development have been analyzed elaborately (Schumpeter, 1954; Rosenberg, 1982; Metcalfe,1994; and Archibugi et al., 1999). What is more, innovation itself has been recognized as an effective tool within the development of economy which is strongly reliable on the knowledge society (Lefebvre et al., 2001).

UNIDO (2005), defines knowledge as one of the most important components when it comes to development of the country through innovativeness, publications of scientific paper, well developed infrastructure of communication and information and high quality of education.

Societies develop and evolve, and the most recently society leaped towards the knowledge economy (Żak, 2016). According to Drucker (1999), knowledge economy can be defined also as an economy in which knowledge has substantial importance and replaces capital or labor. Measuring of the knowledge is extremely problematic (Żak, 2016). However, the set-up of four fundamental pillars of knowledge-based economy can provide guidance as to how to assess different dimensions of it (Debnath, 2002) (Figure below):

- Education and Human Resources
- Innovation System
- ICT

- Economic Incentives and Institutional Regime.

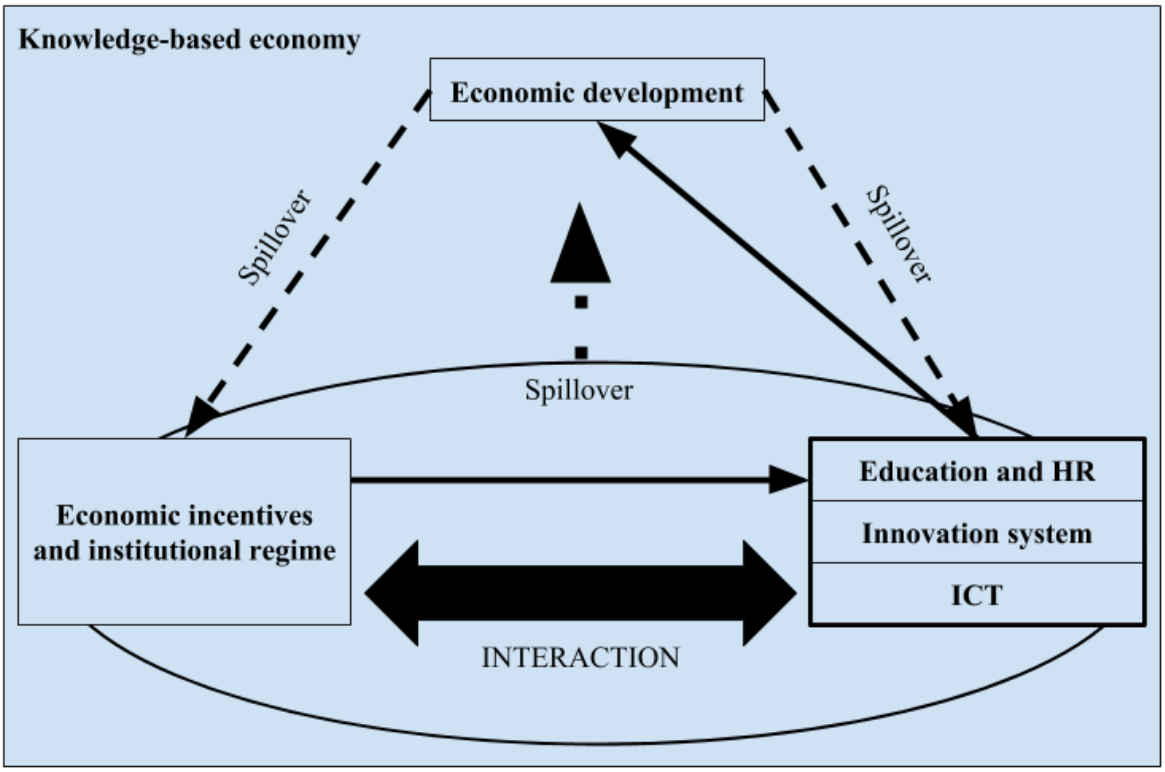

Figure 1: Knowledge-based Economy (Adapted from: Debnath, 2002).

The major impact for the today`s economy and overall rules of it, had the change within the global economy (e.g. emergence of ICT, knowledge diffusion, importance of innovation), which led to emergence of a knowledge-based economy (Żak, 2016). Accordingly, to OECD, knowledge economy is the foundation for society and economy development (Kukliński, 2003). Koźmiński (2001) perceives it through the micro-economic perspective and argues that within the knowledge-based economy, all the organizations are using knowledge to create the gap of advantage between themselves and competitors. Based on those thoughts, the conclusion that overall country economic development dynamism strongly relies on how enterprises effectively use knowledge to innovate and succeed in the market, can be made.

1.2 Incubators as components of effective innovation system

One of the pillars of knowledge-based economy, which is a substantial contributor when it comes to any countries economic development, is an effective innovation system (Figure 1), its components should be also considered as important within those frames. One of the innovation system substantial component is business incubation phenomenon within the country (Tsai et al., 2009).

There are three forces which are forming the current global economy: technological development, entrepreneurial activities and competitiveness (Lalkaka, 2002). What is more there are some less influencing forces (e.g. creation of knowledge, social changes) which are also relevant in building an innovation led economy in which knowledge is one of the most important assets (Volkov et al., 2007).

Lalkaka (2002) outlines the most important activities which can help to increase the innovativeness and knowledge creation within the country:

- Formation of policies and institutional instruments which support innovation and knowledge creation;
- Redirecting focus of academia towards innovativeness;
- Putting pressure on importance of monetization of innovations;
- Promotion of innovation and entrepreneurship must be substantial;
- Services which help in the business development process;
- Promotion and supporting of actors such as business incubators or university business incubators.

The business incubators primary goal is to help the early-stage businesses to grow and enter the market. Those activities are fitting into business incubator environment (Smilor, 1987), lack of one of those components leads to decrease of business incubation effectivity.

Business incubators are not able to create an economy basing on innovation and knowledge by themselves, but it can work as a catalyst in the process of achieving high results in terms of NIS and knowledge economy as a country. That is why the overall importance of business incubation in perspective of innovation and knowledge creation which contributes to economic development cannot be undermined.

1.3 Eastern Europe – New Era

After the collapse of communism, changes have emerged within the economy and politics of Europe (Bröcker & Schneider, 2002). The necessity for Central Eastern European Countries (CEEC) to readapt in order to be able to be integrated in the global economy market has growth (Rozmahel et.al., 2013). Development of the continental economies has varied, and since the gap was so big between them, the integration process had to be a long-term task (Baldwin, 1994)). The summit held in Lisbon determined a goal for 2010 that EU will be, “the most competitive and dynamic knowledge-based economy in the world” (European Council 2009). That meant that all countries in Europe have to embrace the knowledge-based economy

principles and try to implement all the components in the politics and economy actions (Khaleel et al., 2003). Poland as a one of the lowest innovation index countries in Europe is a great case to investigate how enhancing the business incubation could positively influence its economy and further development in the broader context (European Innovation Scoreboard, 2017). Despite the fact that Polish national innovation system has the biggest network of university business incubators (UBI) (54 in 2017), the country struggles with innovation and knowledge creation. To understand what causes such an issue in the country, research question will be provided in the following section, which will help assess the problem.

1.4 Research Question

Within the academic areas there is an overall lack of empirical researches which examine the impact of Business Incubation on country economic development, but when we talk about countries like Poland, there is even less research. The importance of this area for this research paper is significant since business incubation are getting more and more popular not only in well developed countries, but also those left behind (Bergek et.al., 2008; Scillitoe et.al., 2010; Bruneel et al., 2012), that is why the knowledge of its influence on the overall country development is also important. Stenberg (1993) states that, companies which were nurtured properly in the incubators, can influence the local economy in a positive way. The focus on role of business incubators in different countries can vary, but the main task is to gather people with different knowledge and help them, in order to create innovations (Grimaldi & Grandi, 2005). The Polish agency of entrepreneurship development claims that, in the economy which is basing on knowledge and innovation the role of institutions which are connecting academia with industry is substantially growing, like innovation centers which are the catalyst for the national creativity, innovation and entrepreneurial expansion (Skrzypek, 2011). The most important strategic policies underline the importance of organizations in business environment for the most effective monetization of knowledge and technology transfer.

Like every national innovation system, the Polish one is no different, it has one important goal – to improve the interaction (e.g. knowledge and technology flow) between institutions, enterprises and people. To do that they are using NIS actors – industry, governmental and academia institutions, those actors in a long-term perspective are creating knowledge which can be transitioned to innovation.

When innovation and knowledge management is done effectively (e.g. high KEI and KI indexes) on the national level, the visible outcome can be a long-term country competitiveness increase and that results in the overall development context. One of the main concern is, can

the business incubation in Poland be set-up in an efficient way in order to improve the overall economic condition of the country. To gain knowledge and find out, author proposed the research question: which will be followed by theory overview and practical analysis of the problem, and after the analysis the answer and solution are proposed:

● *What is the role of University Business Incubation for broader economic development in Poland?*

Main aim of this paper is to better understand the set-up and outcomes of university business incubation phenomenon in Poland. What is more the insightful analysis of Polish NIS will give even more information about the policy influence on entrepreneurship in Poland. Furthermore, the relationships among Innovation System actors in Poland is examined and the best possible set-up is proposed. Is innovation the only substantial component in the Polish development process when analyzing the NIS, or other parts are also relevant on the same level? To answer the research question, theoretical analysis has to be performed, which has to be supported by practical research and examining all of the secondary data.

2. Methodology

With the stated research question and presented topic settings, next section will focus on the methodological part of this paper. All the considerations about how the topic should be analyzed will be assessed and described, additionally the philosophical approach will be presented. An explanation within the field of data collection process and analysis will be provided. The section will end with the depiction of a proposed research design, to help reader understand it better.

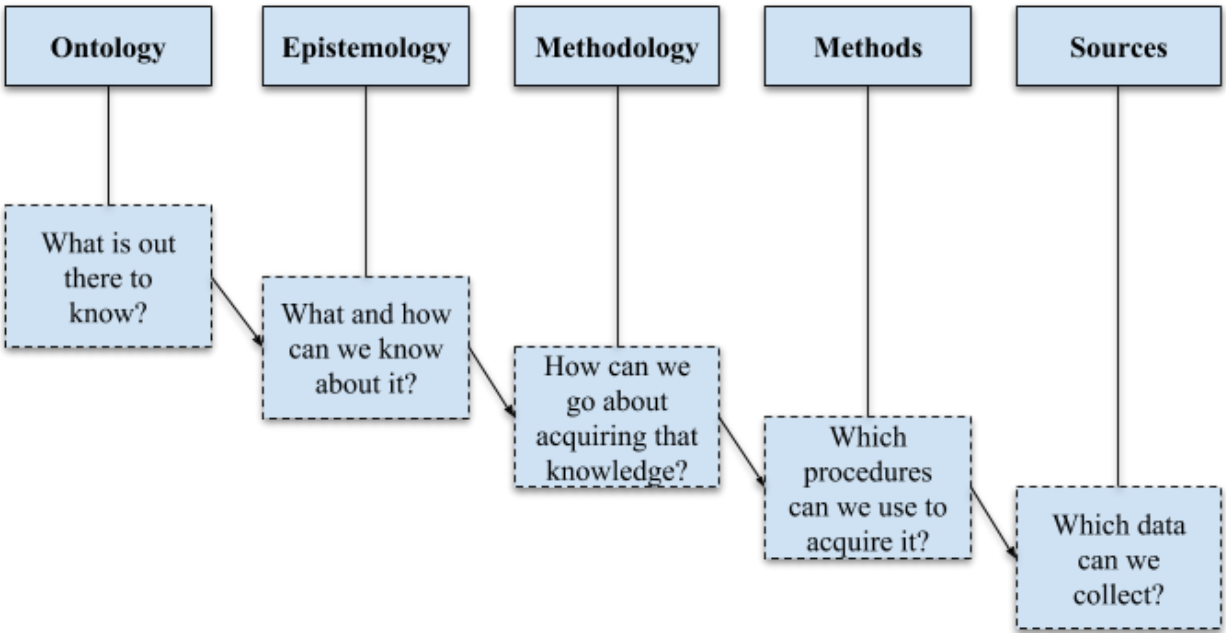

Figure 2. Methodology overview order (Adapted from: Pandey, 2016).

The methodological part will follow the order presented above (**Figure 2**). The first subsection will discuss the manner of ontology, it will be followed by the epistemological analysis of a research. Then the methodology type will be discussed, and the last part will bring the reader closer look to the methods used by the author and the data sources used within this research.

2.1. Ontology: objectivism vs constructionism

Objectivism

According to Lakoff (1987), objectivism was created from the basis of realism and essentialism. Realism claims that worlds exists with no regards for human perception of it (Jonassen, 1991). We as humans, are willing to gather and experience all the knowledge which is out there in the world (Peikoff, 1991). In the epistemological perception it is important, because all humans can understand everything in the same way (Jonassen, 1991). Essentialism stands for idea that everyone has some properties which help them to realize their role and identity in the world (Cartwright, 1968). Objectivism can be treated as a more developed version of essentialism

(Lakoff, 1987). The important theoretical stance of objectivism (See Table 1) is understanding that world is real and has its structure which has to be also understood (Jonassen, 1991). Process of learning is basing on grasping the words of other individuals, which are the depiction of processes and concepts creating the reality (Rand, 1966).

Assuming to the objective approach treats process of learning as a recreating the knowledge in the minds of individuals and role of education is limited to role of a helper in the learning process about real world (Jonassen, 1991).

	Objectivism	**Constructivism**
Reality (real world)	• External to the knower • Structure determined by entities, properties, and relations • Structure can be modeled	• Determined by the knower • Dependent upon human mental activity • Product of mind • Symbolic procedures construct reality • Structure relies on experiences
Mind	• Processor of symbols • Mirror of nature • Abstract machine for manipulating Symbols	• Builder of symbols • Perceiver/interpreter of nature • Conceptual system for constructing reality
Thought	• Independent of human • experience • Governed by external reality • Reflects external reality • Manipulates abstract symbols • Represents (mirrors) reality • Atomistic: decomposable into "building blocks" • Algorithmic Classification • What machines do	• Grows out of bodily experience • Grounded in perception/construction • Grows out of physical and social experience • Imaginative: enables abstract thought • More than representation (mirrors) of reality • Gestalt properties • Relies on ecological structure of conceptual system • Building cognitive models • More than machines are capable of
Meaning	• Corresponds to entities and categories in the world • Independent of the understanding of any organism • External to the understander	• Does not rely on correspondence to world • Dependent upon understanding • Determined by understander
Symbols	• Represent reality • Internal representations of external reality	• Tools for constructing reality • Representations of internal reality

Table 1: Assumptions Inherent in Objectivism and Constructivism (Adapted from: Jonassen, 1991).

Constructivism

A person with a constructivist belief has mind filled with reality, rather than he creates it or interprets it on his own behalf, when objectivism focuses mainly on the object, constructivism is following how the knowledge about the object is constructed (Bryman, 2011).

Constructivism does not rule out the reality, it only declares that reality is created by everyone through his own perception of the world and we as humans are able to understand different perception of reality and use them as a perspective for own reality perception (Jonassen, 1991). Within constructivism the mind is a tool in the interpretation process of everything that surrounds the individual (Bryman, 2011). Constructivism finds its roots in Critique of Pure Reason by Kant, which divided knowledge into priori - what we know, and posteriori - what we get from the surroundings (Bruner, 1986). Even though the overall knowledge which we carry is an outcome of our mind (Jonassen, 1991).

Constructivism is relying on the idea which underlines that thinking is a result of attempts taken by individuals to comprehend the physical world and social interactions (Jonassen, 1991). The thoughts are just pictures in the individuals' mentality which help to explain what individual have observed (Bryman, 2011). What is more, constructionism believes into individual perspective of the world, the picture of reality is created out of the range of experiences individual has felt (Jonassen, 1991).

The author of this research strongly believes in the ontological statements of constructivism, that reality can be determined by the individual and his perception of a real world. Reality in which research about the role of University Business Incubation in Poland will be conducted will be determined by the authors mindset. What is more all the relevant conclusions and answers with regards to this topic will also be a product of the authors mind. Using priori and posteriori knowledge within the business incubation role in national context of Poland author will present the reality in which he believes and explains the stated research question.

2.2. Epistemology: positivism or interpretivism

The focus of epistemological concern is nature of knowledge and the reliability of knowledge (is it true of not) within the area of research. It also takes into consideration the knowledge perception through the prism of natural sciences (Macionis et al. 2011). In positivist stance the natural sciences are treated as a base and necessary component for analysis of knowledge nature (Bryman, 2011).

To oppose the epistemological stance of positivism, the term of interpretivism was created (Macionis et al. 2011). Within the field of business studies, researchers where critical to application of nature science methods to the analysis of social fields (See Table 2). They saw natural science approach as not applicable for analysis of social phenomenon which analyze people, institutions and organizations within the society. That is why a different perspective and logical stance should be used in a process of analysis and understanding of these phenomena (Bryman, 2011).

POSTIVISM	INTERPRETIVISM
How society and individual interact	
Individual is formed and controlled by the society. Actions taken by individuals can be understood as a result of their interaction within society and their place in it.	Individuals are relying on themselves not on the society, they can control the actions they are taking. Individuals are complex beings with different thoughts and experiences about the reality around them.
The aspect of the research	
The goal of the research is to get insights about what influences the actions taken by individuals.	The main point of the research is to understand in a deeper manner the background of activities taken by the individuals.

Table 2. Positivism vs interpretivism (Source: Webber, 2004).

Within this case author is not looking for one role of business incubators. Namely, business incubators have numerous roles in today economic environment and each incubator gives different results and outcomes as well. More suitable will be interpretivism approach, since author within those frames can have different perspectives analyzing the topic, have multiple opinions and perceptions of a real world (Lincoln et al., 2008), in the business incubation role in Poland context. What is more there is a strong belief in authors perception that every individual and every organization or institution created by the individuals is different. That is why, although there are researches examining business incubation role in different countries, it cannot be explained using generalizing in frames of Poland, since there is diversity among institutions of each countries and even within the countries.

2.3. Methodology Deductive or inductive

There are basically three types of approaches when it comes to methodology and its perspective to the research (principles which will be followed during the research process): inductive, deductive and inductive (See Picture X), each of those has its advantages and disadvantages (Krippendorff, 2013).

Inductive Approach

Overviewing the data in order to find repeating parts or patterns is called data-driven approach (Schreier, 2012), or just simply inductive approach. Throughout this kind of analysis, the researchers have to spot within the data, parts which repeat and parts which completely differ, in the areas of similar categories (Graneheim et al. 2017). While using inductive methods there is a possibility of being lost in the repeating empirical researches cycle (Eriksson et al., 1997). The biggest focus of a researcher when analyzing data using inductive approach is not to generalize summaries and use only shallow descriptions, the process should be more in-depth (Graneheim et al. 2017). Namely, inductive approach takes a theory, then looks in the theory for finding a hypothesis. Later on the confirmation of those hypothesis is tried to reach through observations.

Deductive Approach

The approach in which researcher is analyzing the outcomes of existing theories or created models within the particular phenomenon with no regards to data analysis implications is called deductive (Schreier, 2012). There is a risk to create a data themes basing only on theories, which does not take into consideration outcomes of data within the field of studies (Eriksson et al., 1997). Another problematic issue raises when there are some left over information from not analyzed theories in the research field, who determines what theories should be left out and why (Schreier, 2012). The left-over data could get some useful insights which could give the research another dimension, but by not infusing them into the research, researchers does not provide the reader full-dimensional explanation and analysis of the problem he states (Graneheim et al. 2017). In deductive approach through information gathering and analysis, the patterns can appear. Those patterns serve to create a tentative hypothesis, which in the end are merged to create a theory. It takes the opposite direction as the inductive approach.

Abductive Approach

Complementary approach (Blackstone, 2012), retroductive approach (Sayer, 1992) or fuzzy logic (Rolfe, 1997), those are the names for an approach which process relies on balancing between inductive and deductive approach, it can be called also abductive. Researchers use the term ‘abductive ‘and there are examples of researches in which use of inductive and deductive approach mix in various levels of qualitative analysis can be observed (e.g., Graneheim et al., 2001; Rejnö and Berg, 2015). According to Eriksson et al. (1997), usage of abductive method lets to get for the researcher the best picture of analyzed data, since it goes from the surface knowledge of the area of research to the deep insightful information.

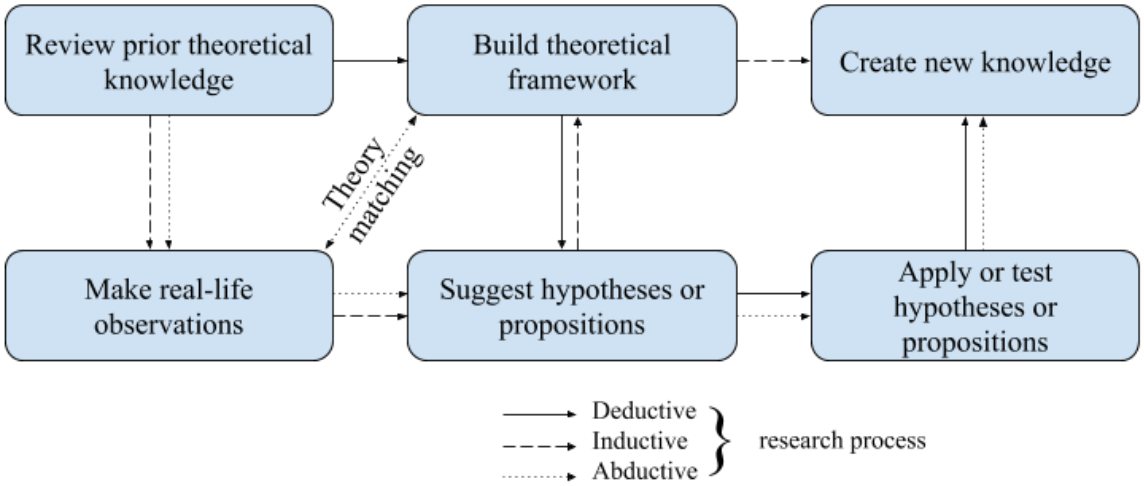

Figure 3. Comparison of deductive, inductive and abductive research processes (Adapted from: Spens et al., 2006).

Within this topic of research which author chose, the most suitable will be an abductive approach.

Conclusions and explanations are the result of two simultaneous processes – data gathering and theoretical analysis, which are meant to help within the understanding of research outcomes and findings.

Theories are of significant importance for this paper, since it has to be merged and analyzed with the regard for secondary data, but also to provide additional information needed to understand insightfully presented topic. Author focuses on the role of university business incubation for the further economic development of Poland. Theories are analyzed and connected within this research. Additionally, to create the full picture of this investigation, right placement and usage of secondary data was fulfilled.

2.4. Methods, data and limitations

This research paper will be using both qualitative and quantitative methods to obtain data and information – combination of those two methods is often called a mixed method. The first researchers using these methods were referring to them as multi-method, integrated method, hybrid method (Creswell et al. 2017). There is a variety of reasons why researchers decide to apply it in their research, but in a broad scope they can be seen as a method which help to reduce the disadvantages of quantitative or qualitative method when used alone (Blake, 1989; Greene et al., 1989, Rossman et al., 1991).

Author used methods from quantitative research: secondary analysis and official statistics using secondary data. On the other hand, there are used some components of qualitative research – documents were treated as sources of data, also a grounded theory was built based on data gathered throughout the whole process. Namely, the theoretical overview will help to build a grounded theory which will be used as a framework for the assessment process of the object – in this case Poland. Both qualitative and quantitative data which was be gathered was also coded into themes and placed in sections relating to them.

Gathering and analysis of secondary data was conducted within the fields of Knowledge Economy, University Business Incubation and National Innovation System. Namely, author has taken the data about Polish ratings in the Global Knowledge Economy ranks. What is more, the regional data about Knowledge Economy rates in Poland was found and used due to its importance for the research perspective. Use of official statistics and data from the Academical Business Incubators (AIP) organization was necessary to obtain relevant information about the University Business Incubation setup in Poland and to assess the economic development indicators within the country. There was the analysis of Polish Innovation Policy documents from European Commission mostly, which got author the information what direction the Innovation System in Poland is going. Additionally the assessment of Poland through the rankings of Global Innovativeness data is also provided further. After theory matching the relevant data a grounded theory within the context of research question was built.

The limitations regarding the topic research are few. First, author limited himself to only assess the university business incubators which are a part of AIP network – the biggest UBI network in Poland and Europe. Limitation was established due to limited time and expansivity of the business incubation role for economic development phenomenon. Secondly, there was a limited amount of data regarding AIP. Author have initiate the contact with AIP representatives and despite the fact that there was agreement for an interview, the contact was cut by AIP. What is

more author, has used some theoretical thoughts adapted from the research he conducted in the past. This was decided to do, due to the overlap of the topic which was also consisting the areas of NIS, UBI and development. All of the adapted elements will be referenced with regard for past research. The theories from past research were not copied, they were used for an inspiration and to notice possible fit for this research context about UBI role in the Poland development. Next section brings to the reader the research design depiction and description, to get a better, more clear view.

2.5. Research design

The depiction of the whole research from the choice of topic, through data gathering and analysis, till the conclusions of a paper is showed within the Figure 4. It helps to grasp the essence and gives a quick look on the research from a side.

The research area was selected with regard for different senses. First of all, author was born and raised in Poland, that is why he felt strong necessity to conduct a research relevant for his country. What is more, the role of university business incubation in economic development of a particular country strongly covers with the curriculum of innovation, knowledge and entrepreneurship fields of authors study. Namely, knowledge societies are tending to innovate, to help them innovate effectively there is a necessity of National Innovation Systems and also Business Incubators which nurture the innovators and innovations, which in the future perspective can be relevant actors within the country's economic development context. Secondly, there is a lack of deeper and more insightful analysis of University Business Incubation and its role for a smaller or less developed countries like Poland, which are not developing as dynamically as other countries. For instance, is the Polish government aware how the University Business Incubation affects the economy of country and are innovation policies used by country effective. Because prior to the research conducted desk research by the author, showed that with all necessary resources Poland is not innovative enough.

These are the issues that created a willingness in authors mind to analyze the phenomenon in a broad scope. Author has given the theories about knowledge, development, Knowledge Economy, National Innovation System and University Business Incubation a significant importance and it can be observed throughout whole research.

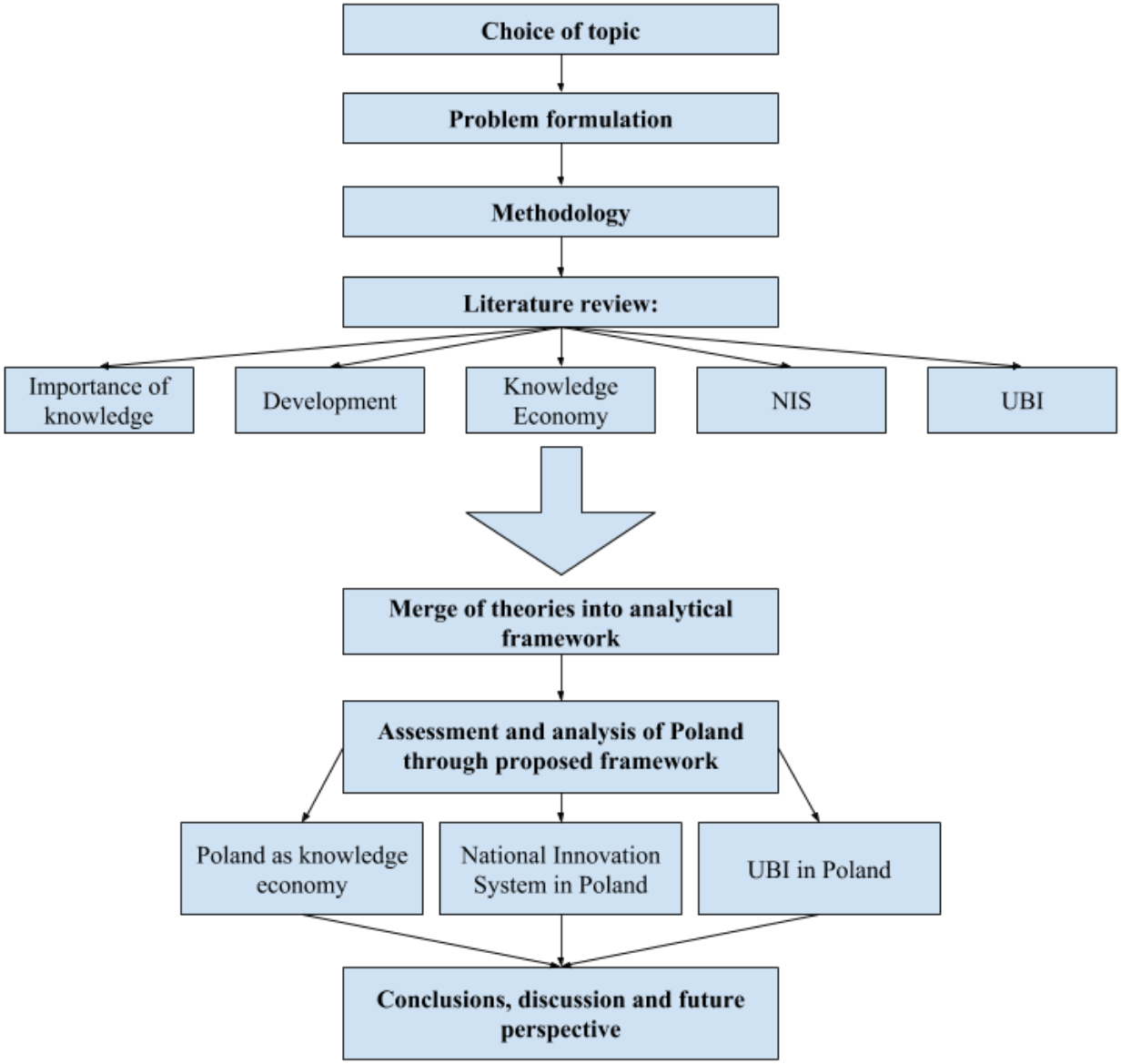

Figure 4. Research design (Source: self-made).

First of all, theoretical overview has helped to set the framework in which the Poland case is assessed in regard to the research question which supports the abductive approach in methodological perspective. Namely, theoretical background of this research comes from the topics mentioned above, additionally by merging the most relevant and suitable data and information, framework is created, which also fits into abductive approach since those processes were simultaneous. What is more it also interpretivism perspective was held during those processes due to the interactionist nature of the analyzed phenomenon (e.g. University Business Incubation, National Innovation System). Quantitative and qualitative data needed for the research was collected using mixed methods with the focus on secondary research. Moreover, the whole information that came from theoretical analysis, was filled in the research

topic assessment of Poland. The theories of Knowledge Economy, NIS, University Business Incubation and Economic Development were used for assessment of the Polish Innovation System and University Business Incubations in Poland with regard to local economy development. Namely it emphasizes the constructivist nature of the project which is also supported by the fact that author uses knowledge obtained from past researches he has conducted in order to build on them this paper. The process of theoretical merge with an object of research - Poland, as author believes, helps to understand and compare real-life facts with theory, it also can help in proposing solutions and changes. Perception of research outcomes are grounded on the framework proposed by the author, this allows to underline the conclusions and implications for future researches.

3. Theoretical overview

This part of the research paper will provide an overview of the relevant literature, within proposed research question. The literature review will consist of five subsections which will follow in this order:

- Importance of Knowledge
- Development
- Knowledge economy
- National Innovation System
- University Business Incubators.

Each subsection will insightfully study the subject of interest, and connect to following subsection topic, to create a framework for further investigation of chosen case.

3.1. Importance of knowledge

Nowadays in business world to create a competitive advantage, a company has to know how to create and diffuse knowledge in an efficient way (Li et al., 2009). The usage of knowledge as a resource in economy is not a new approach (Cooke et al., 2006). The first on which underlined the importance of knowledge in economic environment was Schumpeter, he noticed that "*recombination of old knowledge*" leads to innovation (Schumpeter, 1911, p. 57).

In innovation creation process there is an underlined role of knowledge (Farace et al., 2015). There are only two scenarios in business world – survive or die (Heinrich et al. 2003). The global market has become very dynamic, with improvements of existing products and services proposed all the time, innovations emerge very fast so is the new technology, in order to stay alive as business, you must adapt as quick as possible (Rosenfeld, 1997).

Li et al. (2009) argues that to be able to keep competing with others in business area, company has to keep up with changes in the market instantly, or other path could be obtained through creating innovation from new knowledge, which in a long run will provide financial and competitive success. Nonaka (2000) notices that a majority of companies are not able to properly manage or create knowledge and that has a major impact on their incapability to compete in a market. Countries in knowledge perspective are similar to businesses, it is important for them to be capable to manage knowledge, because knowledge is one of substantial components of country competitiveness (Li et al., 2009). In the NIS setup knowledge has important role, when it comes to innovation creation (OECD, 1997). Tödtling (2006) have insightfully examined knowledge creation process within the NIS and stated that knowledge

produced by universities has the highest reliability level. Universities in the NIS can be treated not only as knowledge creation tools, they gather a lot of talented people with various ideas and capabilities, which can be used to increase the economic (Nishikawa et al., 2013).

To understand what the role of University Business Incubators in the country development is, it is crucial to understand the knowledge creation process which takes part in the university. What is more, it is also important to analyze the knowledge diffusion paths in the NIS with regard for universities, and how it affect the overall innovation creation process in a country perspective.

Knowledge transfer role have recently increased, due to global economic development and improved collaborative activities between the companies (Eliufoo, 2005). Companies started to emphasize the importance of knowledge, since in the most recent years it is used as a main tool for overcoming the gaps between the enterprises (Alavi et al., 2001). Knowledge allows a company to maintain the competitive advantage and to plan the future, possible expansion or strategy changes (Eliufoo, 2005). As it can be concluded from this part of theoretical overview, knowledge is important not only in terms of company development, but also in country development process in NIS context.

This information is basis for the next subsection, which will provide overview of literature focused on development theories, which is crucial to understand in order to get a better picture of this research topic.

3.2. Development

Business incubators and knowledge have much bigger role than only being a components of National Innovation System, they are used as tools in the business growth, innovation creation and overall development (Al-Mubaraki and Busler, 2011). Author acknowledges all contributions of knowledge and business incubation for country improvement, although this research will be only investigating the connection of business incubation role with economic development. Economic development is a really complex phenomenon, which have evolved and changed throughout the years (World Bank, 2000).

Economic beliefs of Smith (capitalism) and Marx (communism/socialism) have started the discussion about economic development issues. Different views on development have been interacting and combining in order to create a contemporary theory – new growth theory, in which believes that economic development can be obtained by effective management and creation of innovation and knowledge (Table 3) (Dang G. and Pheng S. L. 2014).

According to Romer (1986), Lucas (1988) and Aghion et al. (1992), process of knowledge creation is strongly linked and dependent on development of new technologies (innovations). New growth theory underlines the important role of knowledge intensive activities within the economy (e.g. R&D), and states that through these kinds of actions are more effective in terms of economic development. As economic resource knowledge is different from all other resources, because it cannot be limited in any way (Dang G. and Pheng S. L. 2014). Knowledge spillovers can increase the development created through knowledge intensive activities, what is more policies can help to maintain this process (Dang G. and Pheng S. L. 2014).

Development thoughts (prime movers of economic development):
Early views: • Capitalism: free trade, private property and competition (Smith, 1776); • Communism: social or public ownership of property, and independence of foreign capital and goods (Marx, 1933).
Classical theories: • The linear-stages-of-growth models: savings and investments (Rostow, 1960; Harrod, 1948; Domar, 1947); • Structural-change models: transferring resources from low to high-productivity activities (from traditional/agricultural to modern /industrial sector) (Lewis, 1954; Chenery, 1960); • International-dependence models: withdrawal from the international economy and pursuit of self-sufficiency or autarky; • Neoclassical counter-revolution models: liberalization, stabilization, and privatization.
Contemporary theories: • New growth theory: knowledge or innovation; • Theory of coordination failure: • Underdevelopment as a coordination failure among complementary activities; • Government intervention to move the economy to a preferred equilibrium.

Table 3: Evolution of economic development theory (Source: Dang G. and Pheng S. L., Theories of Economic Development, 2014; adapted from Biernacki et al., 2017).

Foreign investments with solid knowledge background would be willing engage in the country development process through important role of policies in new growth model perspective (Meier, 2000). Socio-economic development strategy is relying on innovation and knowledge creation and diffusion within the knowledge-based economy (Dang G. and Pheng S. L. 2014). Due to importance of knowledge for economic growth, author decided that to understand knowledge interaction within the national innovation system and connection to business incubation, it is crucial to look into the knowledge economy theory and how it is linked to the NIS theory.

3.3. Knowledge economy

The most recent years have centralized the knowledge role in the economy, knowledge intense processes are full of uncertainty, which are affecting the actions of markets, companies and individual people (Chen, Derek H.C. and Dahlman, Carl J., 2005). Not all companies have embraced the knowledge in the value creation process and those companies struggle and eventually will go under, if they will not change their perception (Johannessen et.al., 2010). This shows that use of knowledge in value creation is the main ingredient if company wants to succeed.

Last decade of a recent century has brought a new economy, which was strongly influenced by information and communication technologies, that lead to more effective and wider knowledge and information spread globally (Johannessen et.al., 2010).

The existing economy strongly embraces dynamic competitive advantage, speed, shorter life-cycles of products and services and competition have taken different direction and has spread across the globe (Hitt, Ireland, Camp, & Sexton, 2002). Dynamic competitive advantage has become crucial in order to overcome competition, and knowledge has been a catalyst for seeking those advantages (von Krogh, Ichijo, & Nonaka, 2000). Knowledge economy have emerged thanks to progress in the field of information and communication technology (ICT), but also due to overall globalization and liberalization of society, organisations and (Cooke, De Laurentis, Todtling, & Trippl, 2007). The knowledge-based economy can be perceived as an evolution of economy, from industrial economy, to economy which will be even more reliable on knowledge-intensive processes (Johannessen et.al., 2010).

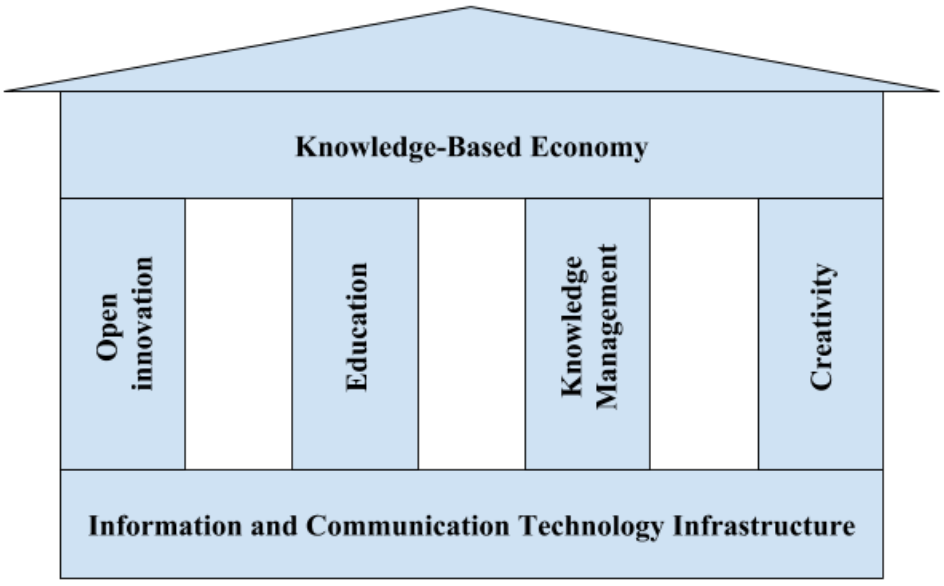

Figure 4. Structural components of Knowledge-Based Economy (Source: White et.al., 2013).

White et.al., 2013 argues that Knowledge-Based Economy has been structured from five components (Figure 4):

- Open innovation
- Education
- Knowledge Management
- Creativity
- Information and Communication Technology – which is also a base for effective interaction between other four components.

While on the other hand Leydesdorff (2006) presents more complex model of Knowledge-Based Economy, which takes more components into consideration.

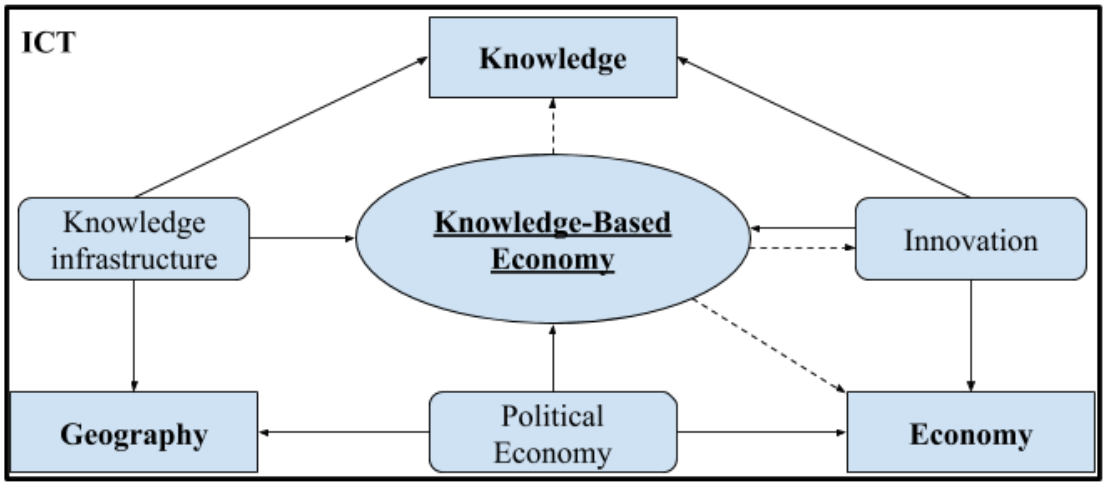

Figure 5. Interactions which generate Knowledge-Based Economy (Source: Leydesdorff, 2006).

Leydesdorff model is much more expanded and depicts also the dynamism (which is obtained due to continuous interaction of components) in process of creation and maintenance of Knowledge-Based Economy.

Chesbrough (2003, 2006) and von Hippel (1986, 2005), argue that to understand the role of innovation in Knowledge-Based Economy, it is important to recognise the importance of open innovation, since a lot of useful and important information and knowledge are not able to reach out further than borders of particular enterprise. The hierarchical boundaries within the companies have been declining due to globalization of knowledge and communication network which have resulted in more complex, unstable and ambiguous global market (Marion, 1999).

According to Luo (2007), the most important and effective way to create innovation and value in Knowledge-Based Economy is to not underestimate importance of new ICT technologies, knowledge and information. It will result in new cooperation between companies and

institutions. Johannessen et.al. (2010) believes that enterprises which are willing to innovate and create value that is important for the customer, have to embrace the importance of external information, knowledge and competencies.

To have a clearer view and put some more stable base for further analysis of research topic it is necessary to lookup deeper into one of the pillars of Knowledge-Based Economy which is relevant to the field of this research – National Innovation System. Knowledge economy and National Innovation System must interact to enhance the overall innovativeness within the country. Could business incubation play a role in the innovation creation and in economic development? Following subsection will provide most important theoretical insights in the topic of national innovation system.

3.4. National Innovation System

This subsection will provide overview of NIS theories, which will present the roots of this approach, and its connection to knowledge economy, business incubation and innovation.

The national innovation system is a young approach, it was introduced in the end of 80s in the last century (Freeman, 1987; Dosi et al., 1988) and it has been elaborated throughout following years (Lundvall, 1992; Nelson, 1993; Edquist, 1997). NIS is widely used by researchers but also by people which are in charge of policy making within the innovation field (Sharif, 2006). Most often it is used as a tool for better understanding and assessment of innovation processes which take place in NIS (which consist of Regional Innovation Systems and Technological Innovation Systems), it also helps to understand and optimize the setting of NIS through policies (Edquist, 1997; Furman et al., 2002; Lundvall, 2007). Edquist defined NIS as *the network of institutions in the public and private sectors whose activities and interaction initiate, import, and diffuse new technologies (Edquist,2005, p.183).* This definition was chosen due to nature of research which will be focusing on the new technologies and how they are enhanced by NIS actor interaction. The setup of NIS is based on interaction between actors which are operating within three areas: industry (e.g. individual companies), academia (e.g. universities) and government (e.g. institutions) and the outcomes of this interaction (Balzat et al., 2004).

The role of the actors in a NIS is to provide the framework for innovation creation at a national level. Within those boundaries government must develop policies which will help to improve the innovation process (Guan et al., 2012). Actors of NIS are connected by intermediary organizations (Howells, 2006), or through structures facilitating the interaction (Molas-Gallart et al., 2008). Those connections are crucial for better connection and relationships between the

actors involved in the innovation production, but it also enhances the overall environment for innovation creation process (Guan et al., 2012).

Researches of NIS have proposed different directions of focus, Etzkowitz (2013), have developed a Triple Helix concept which describes the interaction between actors placed in three areas mentioned earlier. In this research, this concept will be used to assess the components of Polish national innovation system, since it can provide a relevant insight on how those components interact and relate. This paper will be using Triple Helix literature which focuses on the organizational nature of NIS since the whole research is built around the influence of university on other components of case innovation system (Etzkowitz, 2005).

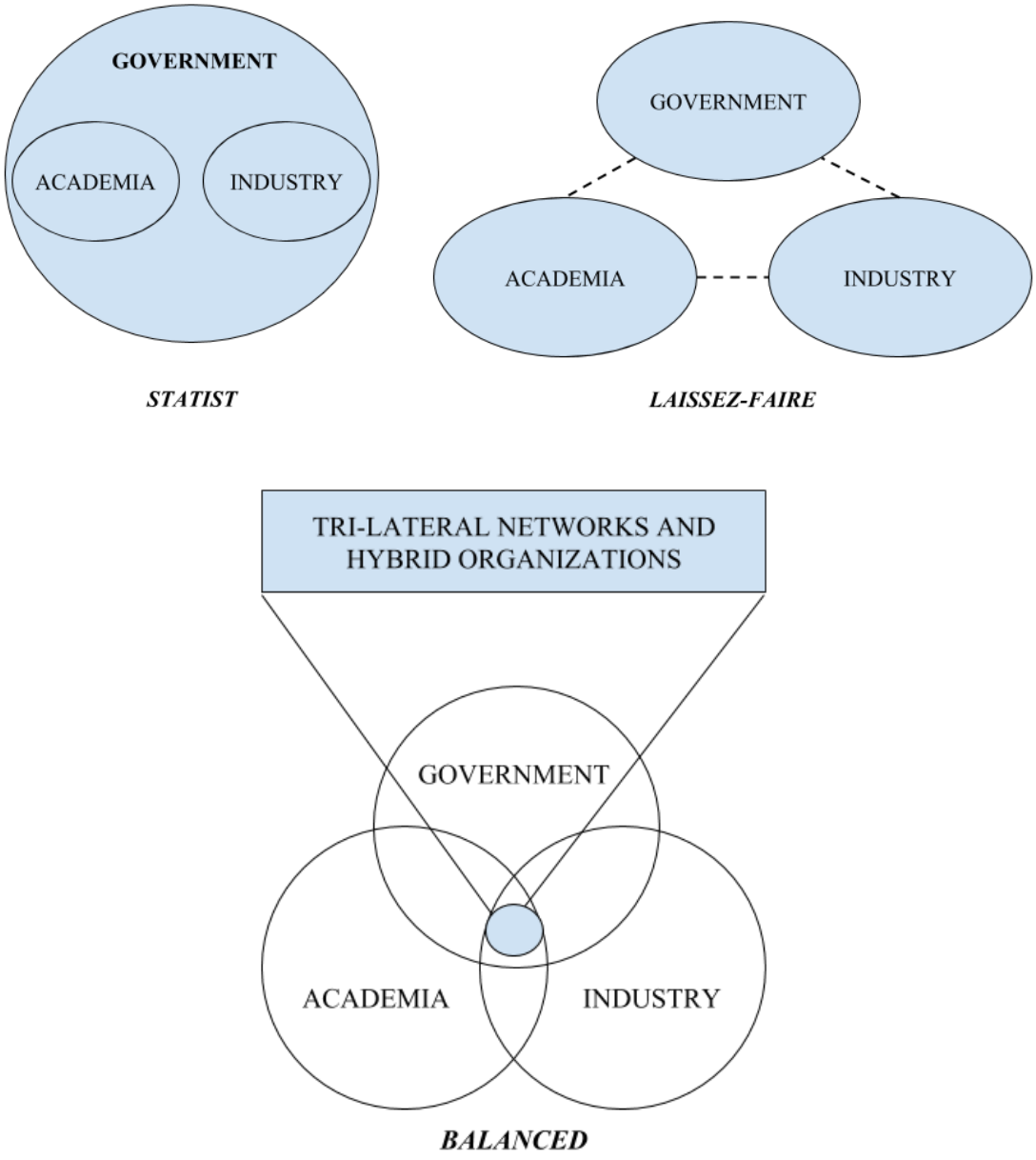

Figure 6: Configurations of Triple Helix model (Source: Etzkowitz, 2003; adapted from Biernacki et al., 2017).

Institutional perspective of NIS in this research will focus on the university third mission tasks such as knowledge transfer, enhancing of entrepreneurship and making an influence on development in social and economic context. Universities in this setup play also a huge role when it comes to interacting with industry. Etzkowitz (2003) have introduced three different setting and positioning of three main areas of NIS – university, industry and government. Those three setting are presented below in simplified depiction.

It is important for the author to understand how NIS in Poland is set up. Namely it will provide important insights in the following analysis. Balanced configuration is most effective when it comes to enhancing the innovation within the economy (Etzkowitz et al., 2005). Author also emphasizes those areas of overlap, which are the best environments when it comes to creation of innovation and knowledge. On the other side there are statist and laissez-faire setups of NIS. Accordingly, to Etzkowitz (et al., 2005) statist configuration puts government in the role of ruler among industrial and education institution in the innovation system. This setting limits the role of education which have no bigger role than just providing well educated people to industry (Etzkowitz, 2013).

If to look more insightfully into tasks of academic actors (e.g. universities) of balanced NIS, Etzkowitz (2008) have developed and proposed a concept of entrepreneurial university (Figure 7), which has much more elaborated role, in comparison with static setup, it must take part in knowledge diffusion but also in the knowledge creation process. This concepts strongly relates to the university business incubator. What is more, entrepreneurial university initiates actions, which engage the cooperation between themselves and actors from governmental and industrial helixes, to diffuse the knowledge created within the university in a more effective way (Etzkowitz, 2013). While government is in charge of policy creation for NIS and also sometimes has a role of a venture capitalist, industrial sectors with technologically intense knowledge are improving the knowledge diffusion process within the NIS (OECD, 2012). That is why innovation creation process is no longer dependent on the industries with strong R&D, it is more dependent on innovation system actors and interaction areas between them, including universities (e.g. Sweden and the Uppsala Innovation Center, which connects Uppsala university student skills with partners from industry to create innovation in the life science field).

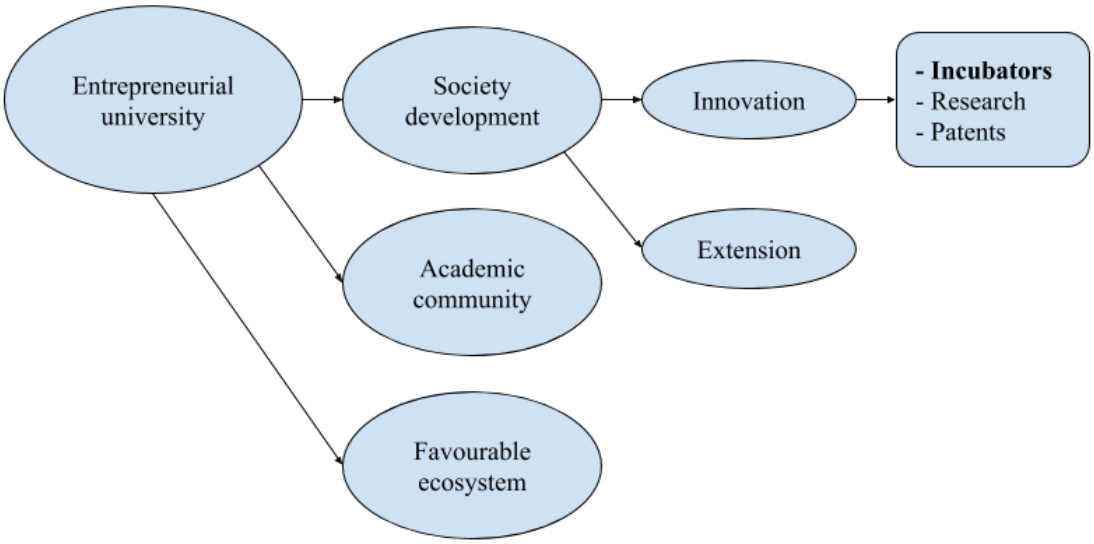

Figure 7: Entrepreneurial university components (Source: adapted from Etzkowitz 2013; adapted from Biernacki et al., 2017).

NIS perspective does not depict the whole interactional activities of innovation system actors, that is why deeper levels of innovation system were presented (Ranga et al., 2013):

Regional innovation systems (Cooke, 1996; Maskell and Malmberg, 1997) concept have been established due to global trend of regionalization in each country in the last decade of 20th century. It focuses on regional actors which are able to increase the innovation capacity and region competitiveness through processes like: 1) technological learning (Doloreux and Parto, 2005); 2) partnerships between technology developers which affects the regional technological and economic development (Storper, 1995); 3) business environments (clusters) which have high level of dynamism and are able to interact in an efficient way (Johannson *et al*, 2006).

Sectoral innovation systems (Breschi and Malerba, 1997; Malerba, 2002) put emphasis on the industrial setup and examine performance indexes of a firms through analysis of organizational issues within the sector from supply chain perspective.

Technological innovation systems (Carlsson and Stankiewicz, 1991; Carlsson, 1997; Bergek *et al*, 2007) concentrates over the network of innovation system actors which interact through usage of similar technologies.

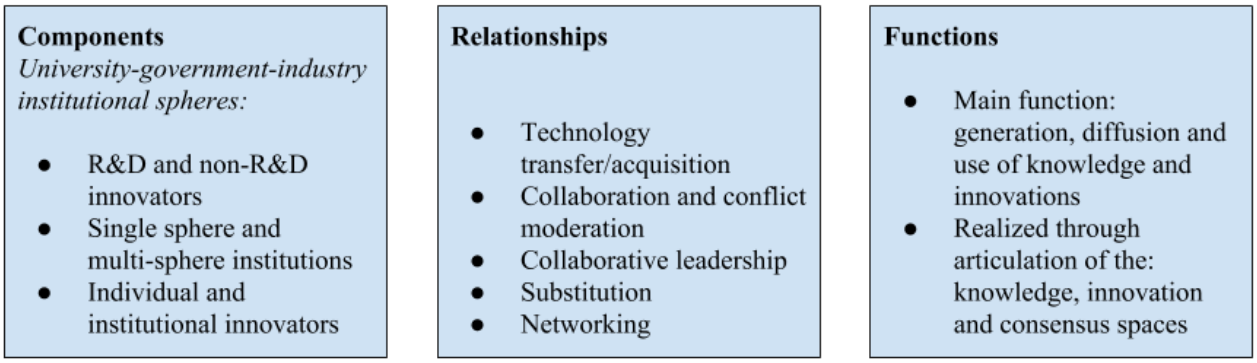

Figure 8: Elements of innovation systems (Adapted from: Ranga et al., 2013).

All of those innovation system types are made out the same three elements (Carlsson and Stankiewicz, 1991; Carlsson, 1998, 2003; Carlsson *et al*, 2002; Hekkert *et al*, 2008):

1) Components (and boundaries): university, industry and government spheres of innovation system, are combined through own individual and institutional actors (Ranga et al., 2013). These actors can be put in one of three categories of components which are: individual, institutional innovators; R&D, non-R&D innovators; single, multi-sphere institutions. In other innovation systems boundaries were treated as obstacles for interaction between actors, in Triple Helix systems they are overlapping, and, in this way, they create an interaction and circulation of resources (e.g. knowledge) area for those three spheres.
2) Relationships between components: all types of relationships within the Triple Helix matter, starting from technology transfer, through collaboration, conflict moderation, collaborative leadership, substitution and ending with networking. Those relationships are crucial due to their insightful reflection on innovation system actor interaction on all levels (e.g. economic, social etc.) (Ranga et al., 2013).
3) Functions of innovation systems: main function of any innovation system is creation, diffusion and utilization of technology (Carlsson *et al*, 2002, p 235). Triple Helix embraces broader functions of knowledge and innovation creation, diffusion and utilization. It takes into consideration functions which are not directly linked with the main purpose of innovation system. These functions are a remodel versions and mixes of gathered competencies in Triple Helix Spaces: knowledge, innovation and consensus spaces. Those combinations are much more effective in serving the main purpose of innovation system (Ranga et al., 2013).

Numerous researchers (e.g., Edquist, 1997; Furman et al., 2002; Doloreux, 2002; Lundvall, 2007) underline the importance of understanding the innovation path in the innovation system.

However, the economic development through innovation can only be finalized when the first monetization of innovation has place (Freeman and Soete, 1987). This shows the importance of business processes connected with process of knowledge and innovation creation within the NIS and knowledge economy.

3.5. Business incubation and university business incubators (UBI)

Business incubation is a great tool which can be used within the NIS for intermediation between industrial and governmental spheres of NIS (Verma, 2004). Small and medium enterprises are a living proof that business incubators are efficient tools for technology, innovation and value creation (Udell, 1990). What is more, business incubation positively affects the economic development, due to its knowledge intensive activities which enhance innovation and the entrepreneurial processes within the society (Caravannis et al., 2000). This proves that NIS is influenced in some level by the business incubation process effectivity within the country.
Etzkowitz (2000) states that in order that country could stay competitive within the global market, NIS have to be effective and dynamic in terms of response to global trends. The investigation of university business incubators and their tendencies to create knowledge and innovation will help to understand the importance of business incubation and its outputs, which help in the process of economic development in new growth theory perspective (Romer, 1986).

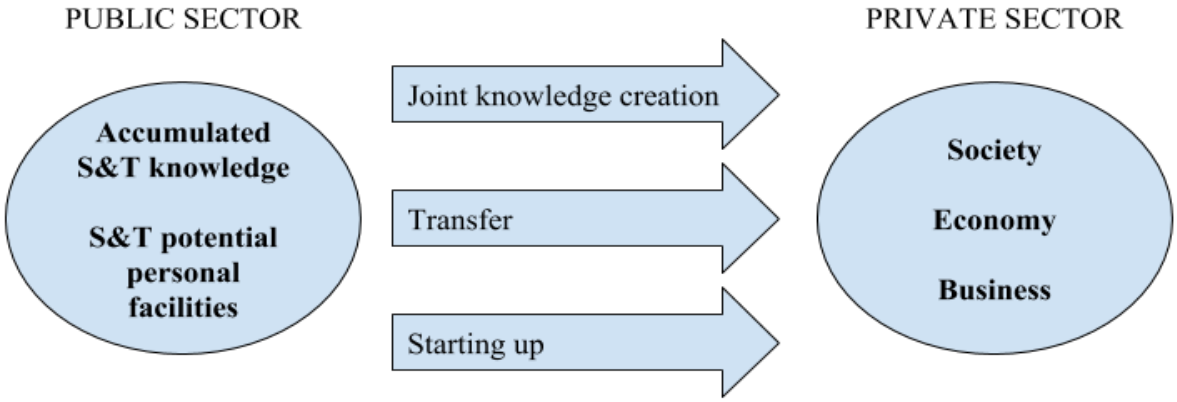

Figure 9: Science & technology (S&T) utilization from public to private sector (Adapted from: University-Industry Partnerships in Japan, Masayuki Kondo, 2006; adapted from Biernacki et al., 2017).

Intermediation within NIS can be possible also from different actors than university business incubators (e.g. university itself), but this role will differ dependent on participants of interaction (Figure 9). UBI can work as catalyst for knowledge generation and diffusion through the utilization of S&T process between public and private sectors (Verma, 2004).

Bayhan (2006) claims that there are various differentiation methods between the types of business incubators, but if we will divide them basing on the input source, there will be four types:

- Public incubators: main emphasis put on development enhancement within the local economy, also consists of activities which are engaging closest community to be entrepreneurial.
- Private incubators: main goal is profit, all investments come from private funds, investors are taking part in incubation process, helping tenants business wise.
- Academic related incubators (UBI): main goal is to create innovation and knowledge which can be diffused to improve development of country or region, high reliability on resources of university like knowledge, people and other. Also, interacts with government and industry representatives.
- Public-private incubators: they are focused on helping the private businesses through government funds and other forms of support. Mix of features from incubator types presented above.

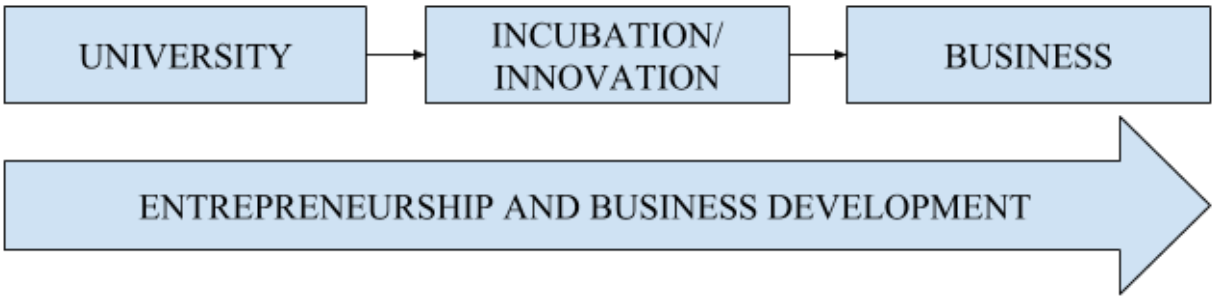

Figure 10: Academic related incubators and private/public incubators (Source: Bayhan, A 2006; adapted from Biernacki et al., 2017).

Business incubation is not only a great tool to improve entrepreneurship within small and medium enterprises, it also enhances the technological capacity of countries (Lesáková, 2012). Incubation process is combined from diverse activities which are helpful for well growth of enterprise (office space, funding, coaching, networking, IT support etc.), what is more it can also contribute to a broader goal of country or regional development in areas of economy and technology (Wang, 2012). Etzkowitz (2002) noticed that style and strategy on business incubation is different and dependent on geographical proximity and development level of particular country. Majority of incubator tenants in Eastern Europe are concentrated on readapting the technologies created in more developed countries technology wise, while in the

United States there is tendency to invest and incubate business built around spin-offs emerging from the universities (Etzkowitz, 2002).

It is important to notice that what business incubator is for a potential tenant is relying on his needs and expectations towards the incubation process. Throughout the years from creating the concept of business incubator in 1959 by John Mancuso till recent years, the set of proposed activities in order to help business to grow has expanded. Zablocki (2007) stated that even though the list of business incubator services is expanding, its effectiveness is dependent only on knowledge capacity and abilities, which are important for innovation creation. Business incubator abilities which relate to external actors can be positioned in the national innovation system relation level (Etzkowitz, 2013). The most effective connection and partnership between academia, government and industry can be placed in the incubation process, in which each of those components can infuse the process which each own ability (Etzkowitz, 2002). Leydesdorff and Etzkowitz (1995) saw the potential of collaboration between those three actors and decided to create model and theory focused on them as source of knowledge and technology or innovation creation – called Triple Helix model (Section 3.4). Etzkowitz (2002), have also analyzed and proposed the business incubation as a main tool when it comes to growth of economy in regional context, through enabling and enhancing the interaction between universities and industry. It makes business incubators due to its placement in the NIS as a perfect catalysator for these kinds of interactions.

Downsides of business incubation

Business incubation is not perfect it has also some negative outcomes, some of them will be overviewed in this subsection. Of course, some incubators have less flaws than others and opposite, even though business incubation process is not protected from problems.

When entering the incubator startups have to go through very strict assessment procedures which will show how developed are they (Hannon et al., 2003). Of course, incubators want to minimize the fail rate possibility, but it is connected to the fact that a lot of innovative and groundbreaking ideas are thrown out simply because of not objective assessment (McAdam et al., 2007).

Other issue with business incubators is connected with financial side of the process. While public incubators are using public funds to enhance the entrepreneurial ventures, majority of them fail (Rothaermel et al., 2005), and in that way, they burn a lot of money which could be used in a more efficient way. On the other hand, there are private investors which are mostly

looking for a quick profit opportunity within the financing of a startup (George et al., 1985). In that way they create tension and pressure on startup, which takes decisions and actions too quick, which lead them to fail (Giardino et al., 2014).

The latest studies of Kolympiris and Klein (2017), show that university business incubators tend to lower the quality of patents (e.g. create patents which are only slight improvements of existing technologies, no groundbreaking findings) produced by the university. With establishing of incubator, the pressure for innovating instantly emerges in order to get financial support from government, so universities are patenting everything what is possible, going for the numbers, not taking into consideration the quality (Kolympiris et al., 2017).

Business incubation within the entrepreneurial university

Incubators which are placed in the universities help students to create a viable business and reduce costs of this process by providing office, consultation in the area they lack knowledge, but also it encourages students outside the incubator to be entrepreneurial and create business. The first university business incubator has been developed in the 1980 in USA at Rensselaer Polytechnic Institute, the success has resulted into copying the concept by modern universities across the globe (Rice and Matthews, 1995). What are the differences between university business incubator and regular business incubator? According to Verma (2004), the main difference is the strong reliability on university resources and the provision provided by the academic institution, simple business incubators do not have those features, which also contributes to the business success. Smilor (1987) also underlines the importance of ties with universities in the networking between industry and government process, which helps the business to achieve success.

"Innovation performance of an economy depends not only on how the individual institutions, such as firms, research institutes, universities, perform in isolation, but especially on how they interact with each other in connection with collective knowledge creation" (Metcalfe, 1995 in Lundvall et al., 2005, p.1).

When it comes to national development context, universities are trying to improve the situation of regional development by using business incubation to create knowledge and also some innovation within the technology area (Leydesdorff et al., 2005). Universities have an important role in innovation creation from the historical perspective, since universities are institutions which are not strictly put under provision from government side, in the years of war or economic declination of country (Etzkowitz, 2002). Ruttan (2006) brings the USA example from the past, where universities during the Second World War, due to industrial recession and incapability,

were the main R&D source in terms of military technologies. Through usage of universities as a background for enterprises, the firm creation started from few activities which through managing have become a formal company, with its own strategy, which helped in the process of regional socio-economic growth (Ruttan, 2006). When the World War ended, new small businesses chose locations near the universities, two clusters for new and small businesses emerged in the USA near MIT and Stanford universities, since businessmen acknowledged universities as sources for knowledge and well-educated labor for their companies.

Policies forming strategies of development in the context of regions, have evolved, due to seen positive influence of knowledge and knowledge sources, and the increased importance of university-industry connection which produces much more effective R&D results with the same inputs (Stiglitz, 1994, p. 148). Triple helix actors can be very effective in the knowledge creation process through knowledge spillovers outlined in following subsection: University as knowledge source), but there is necessity of governmental interaction through policies and financing activities, so the creation of knowledge effectivity will increase (Etzkowitz, 2002). There is no difference in which part of the triple helix model business incubation will start, through past years, an obvious decrease of gaps between industry, academia and government, which positively resulted the knowledge production and socio-economic development of the regions within the NIS (Etzkowitz, 2005).

University as knowledge source

Knowledge creation in academic institutions is a very diversified process. The created knowledge can appear as a simple publication, or a patent for some innovative technology (Hermans et al., 2006). Academic organizations are responsible for enhancing three activities:

- Education of the future laborers;
- Research conduction and diffusion of results;
- Development in context of socio-economy through direct and indirect interactions;

Those activities take active part in the knowledge creation process within the universities (Etzkowitz and Leydesdorff, 2000; Van Looy et al., 2006).

Knowledge flow between university and industry can be explained by using one of two proposed approaches. But to understand these it is important to acknowledge the differences between tacit and explicit knowledge – differences between them is presented in the table below.

	TACIT KNOWLEDGE	EXPLICIT KNOWLEDGE
Definition	Undocumented knowledge	Documented or encoded knowledge
Examples	Experience of what works Expertise Indigenous knowledge Informal business process	Manual Source code of working program Blue print Work template
Advantages	The highest stage of knowledge Difficult to steal Makes knowledge workers valuable Source of all explicit knowledge Evolves with practice Full of nuances Linked to the personality of owner	Can be patented Very easy to share and multiply Can be owned by company More tangible Easy to manage Measurable Easy to facilitate with technology
Disadvantages	Cannot be patented Sharing is personal & contextual Not owned by company Not tangible Difficult to manage Transfer is time consuming Impossible to facilitate with technology Difficult to measure Lost if person leaves	Must be adapted to new context Does not capture all tacit knowledge Easily stolen Not completely independent of humans Depreciates over time Small fraction of total knowledge Utility depends on user skills Utility changes with context Must be practiced to be owned as tacit

Table 4: Explicit knowledge versus tacit knowledge (Source: Sanchez, 2005).

Untargeted knowledge transfer

University and industry knowledge flows can be explained by using approach called "untargeted knowledge transfer" (Table 4), it embraces the approach of knowledge as public good and that knowledge is transferred one way - from the university to industry, (Hermans J. et al., 2006). Maskus and Reichman (2004), argue that knowledge can become a public good, only when restriction regarding accessibility of that knowledge does not bring any positive outcomes e.g. innovation. One of the most known examples of public knowledge is the patent, in order to get the patent, person which invented something has to agree on publication of his idea.

	Targeted knowledge transfer	Untargeted knowledge transfer
Direction	**U ⇒ I**	**U ⇔ I**
Nature of knowledge	Public, explicit knowledge	Private, explicit knowledge
Instruments	Publication, conference proceedings, patent	Consulting, exclusive licences, collaborative project

Table 5: Knowledge transfer flow between university and industry (Adapted from: Hermans et al. 2006; adapted from Biernacki et al., 2017).

Targeted knowledge transfer

The second approach is named "targeted knowledge transfer" (Table 5), knowledge flows between university and an actor from industrial area both ways, each of participator has access to the knowledge used in process (Hermans J. et al., 2006). There is some separation when it comes to access of potential users, it can be achieved by the agreement between two sides, but sometimes it is caused by the nature and characteristics of knowledge which can be forwarded only in straightforward way between participants (Marr, 2005). Hermans et al. (2006) underlines the importance of tacit knowledge in the process of innovation creation, it contributes to the success and development of innovation, but it also hard to copy by the actors which are not involved into that process.

If the purpose of knowledge has to contribute to the development and work as a tool in the business growth, the knowledge has to be innovative and possible to monetize (Van der Poel, 2013). Verma (2004), discusses the nature of companies within the incubators and states that most of the time companies have a component of innovativeness. There is no possibility that knowledge creation process is a linear process, since to create knowledge various and complex interaction between many participators and knowledge types have to take part (Hermans et al., 2006). Van der Poel (2013) argues that knowledge can only be divided into codified and tacit. Due to major increase of technological capacity in the area of information and communication, codified knowledge can be diffused globally with low cost, time and capability resources (e.g. low level of know-how) (Storper et al., 2004). While on the other hand there is tacit knowledge, which cannot be codified, and it makes the transfer of this knowledge dependent on face-to-face interactions between individuals (Van der Poel G., 2013). Examples of tacit knowledge could be: work experience, routine etc., which undeniably are very important to obtain success as a business. Tacit knowledge is relying on the geographical positioning of knowledge flow

process participators (Asheim et al., 2007; Broekel & Boschma, 2012). What is more Bathelt et al. (2004) have discussed the development of technologies have a positive influence on diffusion of tacit knowledge as well, since it is crucial component for maintaining the competitiveness of clusters dependent regions. Reasoning behind creating clusters vary dependently on industry type, or nature of knowledge used in the processes by companies (Van der Poel, 2013). Placement of companies in a near proximity encourages workers to change the workplace, what leads to knowledge exchange, share of experience with other people within the cluster (Storper et al., 2004). Majority of spin-offs, developed by company employees are basing on the both knowledge types, due to the obtained tacit knowledge in the past workplace, which is related to the service or product spin-off company proposes (Van der Poel, 2013). Wenting (2008) underlines, that organizational activities and routines which have been used in a previous company, can be infused into spin-off company.

University business incubator

Universities have no problem with generation new innovative knowledge and creating breaking discoveries, however they have issues when it comes to diffusion this knowledge in order to monetize the innovations (Feller et al., 2002). To maximize results of university research and technological innovations, universities have to cooperate (Bergek, 2008). UBI in this setting could be used as a platform for diffusion of knowledge to the industry, additionally it will produce innovations, jobs and enterprises (Smilor, 1987). Although there are numerous setups of business incubators, the most relevant and used within this research will be Smilor`s model, which will help to assess the position of UBI within the NIS (Figure 11). The choice of this model is supports the authors perception of UBI as platform for interaction field between three spheres of Triple Helix model. What is more, Smilor (1987) states that his model puts entrepreneurs as a center of the model, but he also underlines the importance of business incubator outcomes, which contribute in some level the economy of country or region. This focus on outcomes in Smilor model which also leaves out the incubation process analysis and assessment, fits within the research question topic.

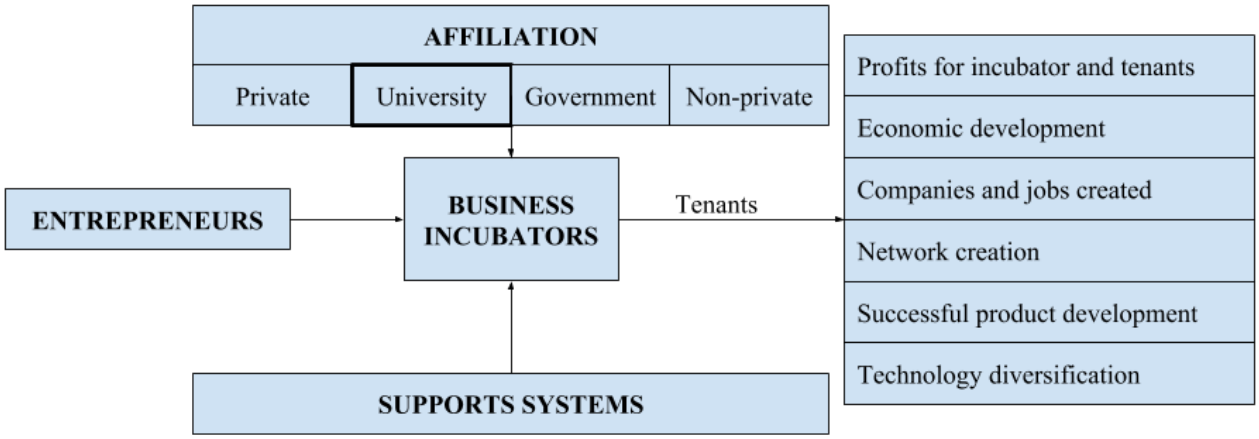

Figure 11: Conceptual framework of business incubator (Adapted from: Smilor, 1987).

Support systems are basically the services which incubator provides to tenants in order to help them nurture the business (e.g. facilities, business or law advice etc.) (Smilor 1987). Within this research there are the most notable UBI outcomes which help in the economic development issue:

Profits for incubators and tenants

This outcome of business incubation within university is relating to monetization and commercialization process of intellectual property (e.g. patents) university possesses, or creating spin-off companies, which bring money for universities (Schramer, 2000).

Economic development

There is an undeniable contribution of business incubators as active and effective influencers in positive economic development, through created jobs, taxes payed, improvements in business environment and other benefits in the perspective of NIS (Wiggins & Gibson, 2003).

Graduate companies and jobs created

One of the most important goals of governmental institutions is to help in job creation process or at least facilitate in it, that is why they are actively interacting with business incubators which seem to be effective platform for job creation within the industry (Fagerberg, 2008).

Network creation

Triple Helix spheres in the UBI perspective are interacting in between and this creates networks for further business development. There are no boundaries for network growth, since NIS do not limit them in order for free knowledge spillover. Networks are crucial for idea generation, market analysis, partnerships within industries and investment attraction – which contribute to successful business incubation (OECD, 2015).

Technology diversification

Technology diversification can be described as the diffusion of capabilities within the technical area, also it can be evaluated through assessment of patents (Patel, 1999).

3.6. Analytical framework

Analysis of chosen case – Poland, will be based on proposed analytical framework in this section. This section will also provide all the assessment indicators with explanations. Analytical framework is based on the literature review conducted throughout whole section and takes into consideration main points of theories.

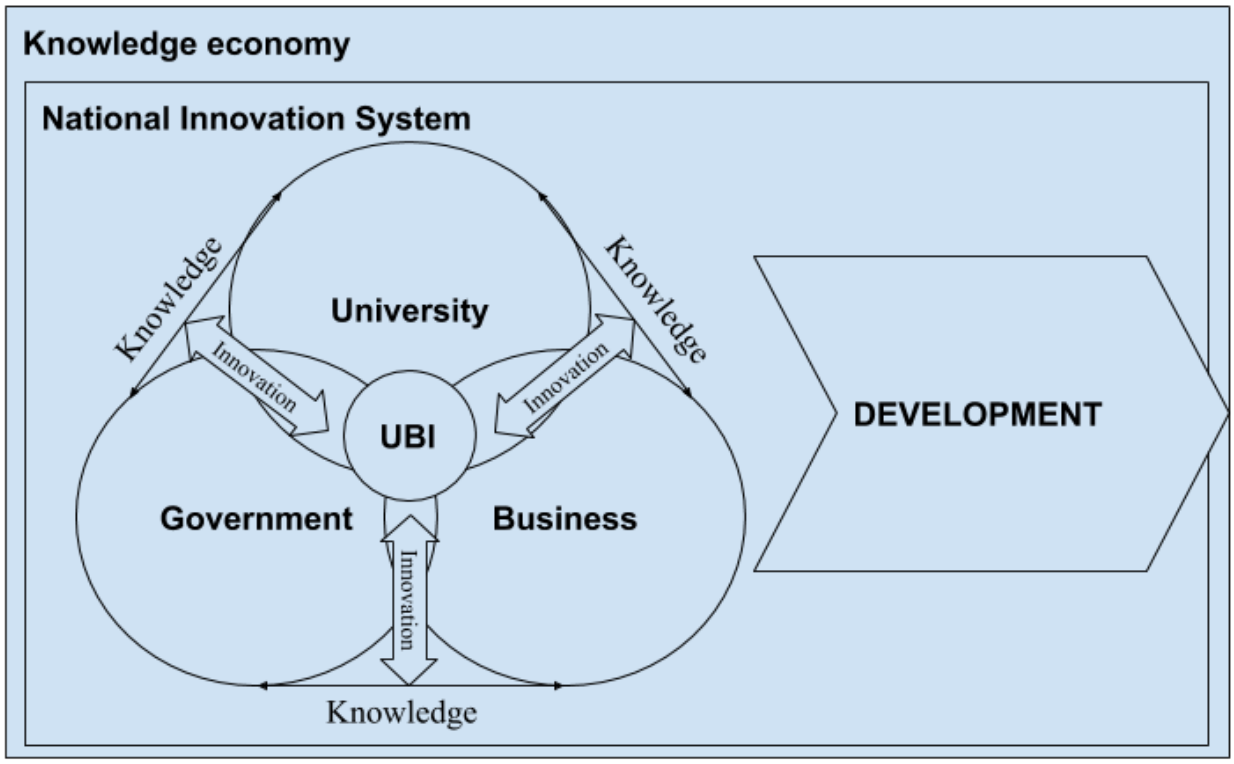

Figure 12: Analytical framework (Source: self-made).

Within the theoretical overview, author has overseen the overlap of knowledge economy and national innovation system, however, they are substantial for each other effectivity. What is more, NIS has taken the perspective of Triple Helix model within this research, and since it is created by the interaction, knowledge is flowing in between the three spheres. The interactions create knowledge, which then could be developed into innovation with is an input as well for the UBI base likewise for further knowledge creation. This whole system depicted in (Figure 12) helps within the development in regional and national perspectives.

The analysis of Poland case within the RQ and topic of business incubation role in development of country will follow as proposed:

Knowledge economy

This subsection begins with assessment of Knowledge Economy Index (KEI) in Poland and defining how Polish economy is related to knowledge economy theories. The data is also analyzing each Knowledge Economy pillar index, to show the better overview which components have what influence on the overall rating. Later analysis is going into regional Knowledge Economy indexes and overviewing the differences between the regions. The data used in this subsection is mostly taken from The World Bank statistical data bank. The assessment of Poland through the perspective of Knowledge Economy helps to understand the problem Poland has in terms of knowledge creation. What is more it helps to affiliate the knowledge creation process to the business incubation and role of the universities within the country. Theories imply the major importance of knowledge for modern economic development, which also shows how significant the level of knowledge economy in Poland is for further analysis of proposed research question and topic. Due to close interactions between Knowledge Economy pillars and National Innovation System components, the necessity of assessment of Polish NIS has emerged.

National Innovation System

The assessment of National Innovation System in Poland begins with analysis of Innovativeness Index ratings in the national perspective. To help reader imagine better Polish positioning in the ranks, the scores of Germany and Denmark are provided as benchmarks. Later on the regional innovativeness scoreboard is presented and analyzed with regard for the national perspective. Further the overview of main NIS policies which oversee innovation development within the regions and country. The data used in this subsection is mainly using European Commission data bank, since European Commission monitors the innovativeness of EU countries and regions, which helps them to provide necessary tools for effective policy creation for improvements in the field of innovation creation.

University Business Incubation

It begins with overview of university business incubators biggest network in Poland – AIP. Analysis of these business incubators is conducted with regard to the theory. Secondary data used to show the results of AIP work in terms of proposed RQ is gathered from the AIP official website, like also the reports which assess their work and contribution to Poland. It is followed by the business incubation model AIP is using which is built by author in the perspective of

grounded theory, by using all the means possible to find out the most about how business incubation is conducted in that organization.

The following section of the research aims to analyze Poland within the perspective of proposed research question. The assessment of Poland as Knowledge Economy, NIS in Poland with focus on the regional differences and UBI setup in country will be conducted. After the analysis of chosen case, conclusions, discussion and future perspectives will be proposed.

4. Poland – case analysis

In 2004 Poland became a member of the European Union. In the 1990s, after the collapse of communism there was an economic turmoil, but thanks to applied “shock therapy” (sudden economic liberalization and privatization within the country), Poland had transformed its economy into one of the healthiest economy in the Central Europe region by 2007 (Gomułka, 2016). Poland now is a democratic state, with a market-oriented economy (Lipton et al., 1990). In the 2000 - 2018 the most important sectors of Polish industry were: wholesale and retail transport, accommodation and food services, public administration, defence, education, health, social work activities (European commission, 2017). Most of the production is exported to Germany, UK and other nearest neighbours (e.g. Czech Republic, Russia), while the biggest importers are Germany, Russia and China (The World Bank, 2017).

Figure 13: Administrative division in Poland (Source: European Commission, 2018).

Capital: Warsaw

Geographical size: 312 679 km2

Population: 38,422,346 (2017)

Gross domestic product (GDP): € 514.66 billion (2018)

Administrative divisions: 16 voivodeships

Voivodeship	
in English	**in Polish**
Greater Poland	Wielkopolskie
Kuyavian-Pomeranian	Kujawsko-Pomorskie
Lesser Poland	Małopolskie
Łódź	Łódzkie
Lower Silesian	Dolnośląskie
Lublin	Lubelskie
Lubusz	Lubuskie
Masovian	Mazowieckie
Opole	Opolskie
Podlaskie	Podlaskie
Pomeranian	Pomorskie
Silesian	Śląskie
Subcarpathian	Podkarpackie
Świętokrzyskie (Holy Cross)	Świętokrzyskie
Warmian-Masurian	Warmińsko-Mazurskie
West Pomeranian	Zachodniopomorskie

Table 6: Administrative division of Poland (Source: Central Statistical Office of Poland, 2013).

Since 1990 Polish economy was under the process of "injection" of the Polish economy into global market, this strategy went well, since Poland was the only European economy which had not felt any downfall during the economic crisis of 2008-09 (European commission, 2017). EU membership has positively boosted the economy of Poland, through subsidies and funds for further development of country (Ministry of Public Affairs, 2014). The country has significantly improved within the field of employment, which grew above the EU average, while on the other hand Poland struggles with the GDP index improvements, since it is still well below the average in the European Union (European commission, 2017).

Even though Poland has come a long way through economic development path, a lot of obstacles emerge on its way. First of the major problem Poland is facing is the fact that it has the most rapidly aging society within the EU (The World Bank, 2015). Over 35% of Polish citizens will be older than 65 years by the 2030 (The World Bank, 2012). In the near future it will become a problematic issue, since less workforce will be available, which will affect the national health care system and the finances of the country due to pensions.

What is more the global race within the technological development has resulted in an increasing demand on innovations built by sustainable industries (World Bank, 2015). Which in a long term will be needing bigger and better human resource investments. But that is not the only problem Poland is facing in the topic of innovations, the country has been struggling with innovativeness since the 2000. The last decade of twentieth century have proven that Poland can increase its innovative capacity, but after the year 2000 despite the fact of large fund from EU to improve the innovation index and innovation system setting, Poland is not improving nor developing. Based on the Etzkowitz et al. (2005) theory about business incubation positioning within the triple helix, one of the most efficient innovation sources within the country are the business incubators, so could they help out in the national perspective on innovation increase?
The last problem which Poland will be facing, and it is relevant in the light of this research is growing gap between regions not only in EU but also within its own boarders (World Bank, 2015). That is why Poland has to face and decrease the gaps and inequalities between regions for further stable and sustainable country development process. The capital region (Masovian) stands out in comparison with other regions in terms of innovation index (Table 10) and in knowledge economy index (Table 8) . Even though the region has better results in those two areas it is not the leading one in the university business incubation. This gives another perspective to the problem which is also emphasized by the theory – business incubators cannot build innovation system by themselves, they need substantial actors from academia, industry and government, which through policies will help in the regional development issue. Can we say that the capital region has the best setting in terms of innovation system and knowledge economy since it has the best results? Further subsection will answer this question and also will relate to the university business incubators as an important regional actors and intermediaries between academia, industry and government.
In light of this information it is obvious that Poland has to increase its economic capacity by all the means possible. Basing on new growth theory which implies that economic development could be increased by the innovation creation, Poland should be more innovative and create more knowledge which can be monetized through the business incubation processes across the country. A good starting point could be increasing the business incubation capabilities within the universities, which later through interaction with industry could diffuse the knowledge how effectively nurture the growing business, but also how to innovate and how to monetize those innovations. From theoretical perspective universities could become a substantial part of innovation creation process in Poland. The OECD (2017) have conducted a research which is

assessing the support of entrepreneurship and innovation in higher education in Poland, despite the fact that Polish government plans to do a lot for improvement of this issue, the country is still falling behind other EU countries. The OECD came up with a conclusion that Polish universities create a lot of knowledge, but students and researchers are not encouraged to be more innovative, that is why that knowledge has little value in terms of innovativeness and potential monetization (OECD, 2017). The problem is probably deeper within the society also, which due to lack of pro-entrepreneurial encouragements from governmental side, do not concern themselves with the issues country is struggling with in terms of innovation creation.

Government saw that they have to take some actions to change that. That is why in the year 2005 Polish government have presented the Act on Higher Education which emphasized the importance of engagement of Polish universities into entrepreneurial activities. What is more those activities should have an increased importance within the universities and be one of the main focuses. Basing on the act the main pressure relies on developing and maintaining partnerships and collaborations between universities and industrial environment. Along the academical activities, universities should actively engage themselves intro promoting entrepreneurship among students and allow for knowledge spillovers between them and industry. That is why the university business incubators in Poland have emerged.

To sum up the introduction to analysis of Poland in the economic development through university business incubation perspective, goal of this paper is to answer the RQ which contributes in some level to the strategy which Poland should choose for further economic development. Author will assess what is the role of university business incubation in economic development of Poland which will help to answer the research question. The focus will be put on university business incubators, but the analysis will begin on assessment of Poland as knowledge economy based on the indexes and ratings of knowledge economy created by the World Bank. Further Poland will be analyzed through the scope of national innovation system, with substantial focus on regional innovation systems and regional inequalities. The last subsection will assess the organization of ABI (Academical Business Incubators) which are the biggest network of university business incubators in Poland and its contribution to the national economic development.

4.1. Poland as Knowledge Economy

Knowledge Economy can be measured through the Knowledge Indexes which work as a tool for benchmarking and positioning countries (Chen et al., 2005). The Knowledge Index (KI) was developed by the World Bank and defines the level on how well a country can create, adopt and

transfer knowledge (Żak, 2016). It is calculated through average scores of country or regions in the areas of Knowledge Economy (Chen et al., 2005):

- Education and human resources
- Innovation system
- Information and communication technology.

The Knowledge Economy Index (KEI) assesses the ability of a country to use the knowledge in an effective way for further economic development (The World Bank, 2008). It is a cumulative indicator, which presents the level of Knowledge Economy development within particular country or region (Żak, 2016). The KEI is calculated with the same variables as KI with an additional one: economic incentive and institutional regime (Strożek, 2012).

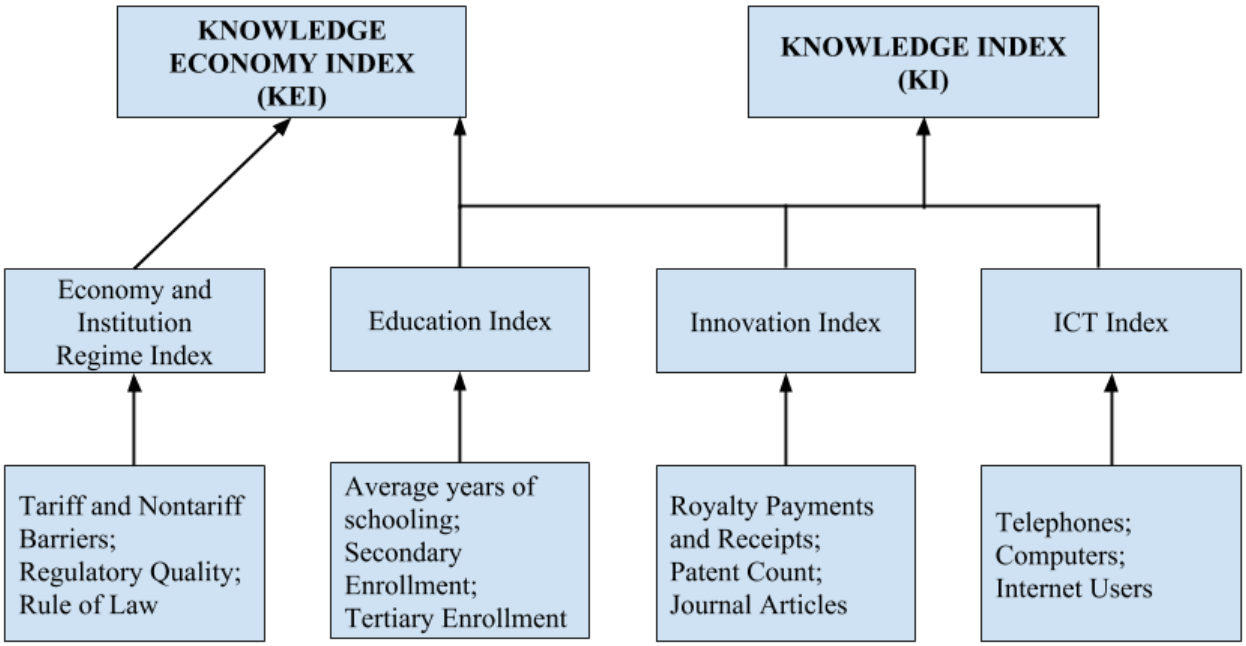

Figure 14: KEI and KI components (Source: The World Bank, 2012).

The knowledge economy is a very complex phenomenon, which needs to assess many components of the four pillars of knowledge economy (Figure 14).

1. **Economy and Institution Regime Index** is combined from:
   - Tariff and Nontariff Barriers which can be defined as taxes, technical barriers or licenses for entry to the market;
   - Regulatory Quality – the governmental capabilities to implement and created policies for the private sector development;
   - Rule of Law - is the level of following the law by the society.
2. **The education index** is combined out of:

- Average of years society members have been schooled;
- Number of people enrolled to the secondary education institutions;
- Percentage of successfully enrolled to universities high school graduates.

3. **The Innovation Index** is composed out of:
    - Number of patents in the area;
    - Royal payments for the patent or license usage;
    - Number of published scientific articles in journals.
4. The last **ICT Index** is defined by the:
    - Number of telephones in the assessed area;
    - Number of computers in the assessed area;
    - Number of internet users in the assessed area.

Each of those knowledge economy pillars have its own purpose and they describe different phenomenon within the knowledge economy. Economic and institutional regime is tending to encourage the actors to create new knowledge which can be used in an effective way (Żak, 2016). Educated and skilled population is also important in the processes of creation, diffusion and usage of knowledge (OECD, 2001). The effective innovation system centralizes and facilitates the interaction of all the actors, through which new and innovative knowledge can be generated (Fischer, 2013). The last information and communication technology helps and eases the diffusion, processing and sharing of knowledge (Lechman, 2014).

Knowledge is important for economic development. The correlation between index of knowledge economy and economic development indicators is almost 90%, which is supported by the fact that countries which are more developed in terms of economy tend to have higher KEI and KI (World Bank, 2012). This type of connection between those two indexes do not show or imply that less developed countries could improve economically by only increasing the knowledge capabilities. The KEI is hard to measure due to its complexity, what is more the development as a knowledge economy is also complex process. Despite the complicated nature of the index its results and ratings are interesting in terms of insights they bring, cause they are valid and reliable. What are the indicators of Poland as Knowledge Economy and how does it position it in the global list?

Before answering the question the small introduction of the presented data will follow. The data assessing national KEI and regional KEI in Poland is different. The differences emerge due to the complexity of those indexes, and national KEI is not just an average score of regional KEI. For example the national Economic Incentive Regime Index in Poland in the Table 7 has a

value of 8.01, when in the regional overview the maximum score is 7.23. Namely, there are some governmental institutions or policies (e.g. export policies which are only for the national level) which are only effecting the national perspective and do not interact with regional actors and the opposite. What is more, the data in national perspective is from 2012 and the regional assessment is from 2014. The World Bank have stopped to assess the KEI of the countries due to the high costs of this process, that is why the year 2012 was the last year from which data can be obtained. Author due to the limitations was not able to approach more recent data. While the regional assessment of the KEI was presented by Strożek (2015) which conducted the complex process of data gathering and analysis to obtain those results. For the same reasoning as with the national KEI author of this research had to base on researches made by others, and the 2014 data is the most recent one when it comes to regional KEI.

Country	KEI	KI	Economic Incentive Regime	Innovation	Education	ICT	Rank (2012)
Poland	7.41	7.20	8.01	7.16	7.76	6.70	**38th**
Denmark	9.16	9.00	9.63	9.49	8.63	8.88	**3rd**
Germany	8.90	8.83	9.10	9.11	8.20	9.17	**8th**
Europe	8.26	8.21	8.42	8.16	8.20	8.27	**-**

Table 7: Comparison of Polish KEI and KI indicators to chosen European countries (Source: The World Bank, 2012).

To get a clearer view on how Poland is situated in the European and global knowledge economy context, Table 7 presents the comparison with European and Global leaders in terms of knowledge economy. Also, the European average is presented for a better benchmark. The European average is included Denmark and Germany were chosen due to the proximity to assessed country, but also due to their high placing in the KEI and KI. While analyzing the knowledge economy index reports from the past decade, it can be seen that Poland has not been very dynamic in the improvement of overall KEI but also its components. The most obvious areas in which Poland is falling behind the European average is innovation index and ICT, in this research the low innovation index (7.16 – Table above) in comparison with European and central Asia average, are those which are analyzed more insightfully, due to its importance for the RQ and answer.

In the table we can observe what a rather large gap is between Poland and global knowledge economy leaders, even when comparing it to the European average, Poland in all fields of KEI is underdeveloped. It does not change the fact that country which has a big economic potential

(McKinsey, 2015), has not doing so well as a knowledge economy. Poland is in the end of European ranks in these index ratings. The problem has its roots mainly in the fields of ICT and innovativeness, due to the fact that those indicators are the lowest in comparison with European average and they are one of the lowest in the whole EU. How could Poland increase its innovativeness and ICT index in order to become more competitive as a knowledge economy? To get a better picture of how the country gets along with catching up in knowledge economy rankings, it is crucial to overview the KEI and KI situation in all voivodeships separately. This will allow for further investigation into regional differences and inequalities which influence the performance at the national level.

Region	KEI	KI	Economic Incentive Regime	Innovation System	Education	ICT
Łódź	3,00	2,83	3,54	2,34	3,61	2,53
Masovian	6,08	5,70	7,23	7,07	5,00	5,04
Lesser Poland	3,83	4,03	3,24	4,71	3,70	3,66
Silesian	4,00	3,86	4,43	3,10	4,59	3,90
Lublin	1,78	2,02	1,09	1,58	2,47	2,00
Subcarpathian	3,08	3,27	2,51	3,50	2,07	4,26
Podlaskie	2,72	2,23	4,17	0,86	3,25	2,59
Świętokrzyskie	1,91	1,52	3,09	1,76	2,09	0,72
Lubusz	1,37	1,43	1,17	0,57	2,22	1,51
Greater Poland	3,63	3,31	4,58	3,05	3,48	3,39
West Pomeranian	2,56	2,33	3,27	2,07	2,48	2,42
Lower Silesian	4,71	4,68	4,81	4,60	5,57	3,87
Opole	2,73	2,50	3,41	1,53	4,45	1,52
Kuyavian-Pomeranian	2,56	2,26	3,48	1,31	3,53	1,94
Pomeranian	4,63	4,55	4,87	3,94	3,98	5,72
Warmian-Mazurian	2,82	2,82	2,80	1,12	2,71	4,65

Table 8: Regional knowledge economy development in Poland in 2014 (Adapted from: Strożek, P., 2015, Gospodarka oparta na wiedzy w ujęciu regionalnym.).

Table above shows the KEI and KI indexes and its components, and rather substantial differences can be observed between the regions. While the capital region (Masovian) is and was a leader over the past decades, it shows significantly moderate indicators in comparison with European average of KEI and KI. On the other hand, there are numerous regions (e.g. Lubusz, Lublin and Świętokrzyskie) which show low KEI and KI componential indicators. Regions like Podlaskie and Lubusz struggle in innovation area (indicators for both regions is below 1), Podlaskie is not falling behind so drastically in other index ratings (education, ICT), that is why by simple increase of innovativeness in the region, the overall KEI could be improved. Lubusz and Lublin regions have significantly low economic incentive regime index, which indicates that regional government is not doing well towards policy implications, rule of

law is on low level or there are some tariff and non-tariff barriers. Świętokrzyskie region is in a bad condition when it comes to the ICT index, which can be increased by establishment of the policies regulating and implementing usage of ICT in the regional institutions. Theory implies (Etzkowitz, 2005) that close collaboration between three helixes of NIS can affect the effectivity of policies proposed by the government. Namely, Poland case shows that the KEI can also be improved by closer collaboration between actors of innovation system. Conclusion, that there are significant gaps between regions in terms of knowledge economy and its components, can be made. What could Poland do to decrease those gaps? To answer that it is crucial to go deeper into Poland analysis, which will also show how could business incubation relate to those problems within the country.

Using the insights from Knowledge Economy Index components like Innovation Index and ICT Index could help to improve in Poland and help within the economic development issue. What is more Schumpeter (1911) underlined the importance of knowledge for innovation creation and development of the country, so the higher those indexes are the better. Polish government should learn from those insights and understand what areas of knowledge economy should be focused and worked on. According to Leydesdorff (2006) knowledge economy model, innovation contributes to the development of knowledge economy and vice versa. Namely, the innovation could be treated as the main catalyst for development in terms of knowledge economy. What is more, Innovation Index also strongly relies on the National Innovation System effectivity, entrepreneurial activities and business incubation processes within the country. That is why next subsection will provide information and data about National Innovation System – which centralizes business incubation and entrepreneurship. Additionally, knowledge economy pillars are also substantial part of NIS, the necessity of recognition of its biggest issues and overall analysis must be conducted.

4.2. National Innovation System in Poland

This subsection will begin with analysis how Polish NIS looks like from inside and how it ranks among other countries, it will be followed by the overview of the most important actors within the NIS and defining which setting is it. The subsection will end with regional innovation systems in Poland overview.

Poland			Denmark		Germany	
Year	Innovation Ranking	Innovation Index	Innovation Ranking	Innovation Index	Innovation Ranking	Innovation Index
2013	49th	40.12	9th	58.34	15th	55.83
2014	45th	40.64	8th	57.52	13th	56.02
2015	46th	40.16	10th	57.70	12th	57.05
2016	39th	40.22	8th	58.45	10th	57.94
2017	38th	42.00	6th	58.70	9th	58.40

Table 9: Comparison of Poland, Germany and Denmark Innovation Indexes (Source: The Global Innovation Index Report, 2017).

To get a better look how Poland looks in terms of global innovativeness, the Table 9 presented above shows the comparison of index values with the countries which are in the leading group in global innovation – Denmark and Germany. The difference between those two countries through presented years is fluctuating between 15 and 20 innovation index points. The fact that Poland is struggling with improvements in knowledge economy area and with innovation within the country, can be seen in the table.

Based on the European Commission's Innovation Scoreboard (European Commission, 2017) indicators, the European States divide into four performance groups:

- Innovation Leaders – innovation performance is more than 20% above the EU average (Denmark, Finland, Germany, the Netherlands, Sweden).
- Strong Innovators – performance is defined in the interval of 90-120% of EU average (Austria, Belgium, France, Ireland, Luxembourg, and Slovenia).
- Moderate Innovators – innovation index is placed between 50% and 90% of the European average (Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Malta, **Poland**, Portugal, Slovakia, and Spain).
- Modest Innovators – innovation performance is rated on level lower than 50% of the Europe average (Bulgaria and Romania).

To get a better picture why innovation creation and diffusion in Poland is on moderate level (European Innovation Scoreboard, 2017), NIS setup of Poland is presented below.

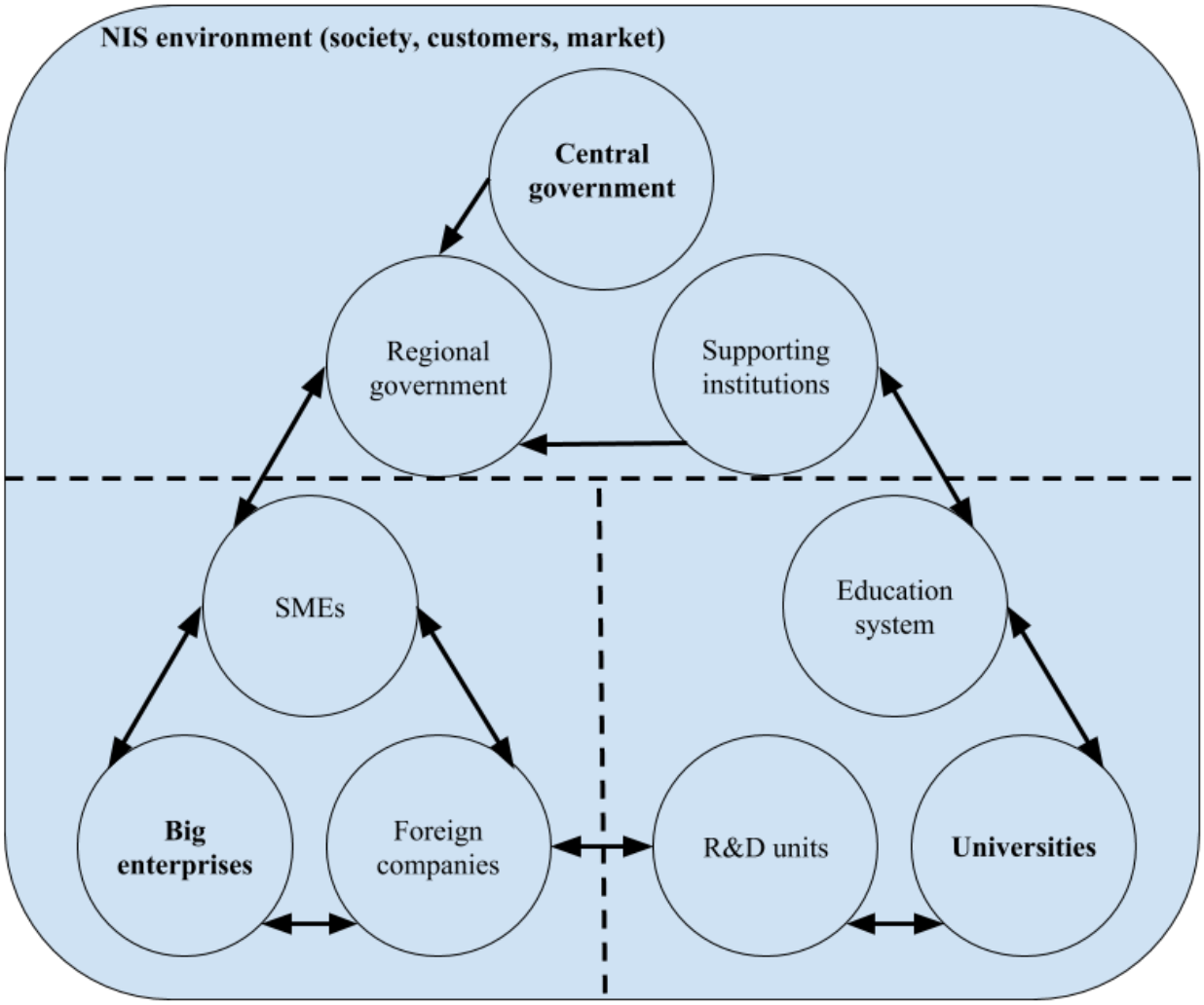

Figure 15: National Innovation System in Poland (Source: Szajt, 2008).

The Polish National Innovation System has a Triple Helix setup, but it is not in right configuration, due to its weak collaboration between the actors for the most effective innovation capacity development. As it can be seen on the Figure 15 universities and industry are just connected through the tie of foreign companies and R&D units, which is obviously not an overlap of those spheres in the perspective of NIS. What is more Figure 15 depicts on how passive the local enterprises are when it comes to R&D, they do not engage any direct collaboration between them and academical R&D which could possibly increase the industrial innovativeness. Foreign companies do not bring the innovation from their home countries, Figure 15 shows that those companies are willing to use possible innovation created by the local (Polish) academical actors. Etzkowitz (2013) states that the most effective mode of NIS for economic development through innovation is interactive mode, which enhances the knowledge and innovation creation within the NIS. Even though that Polish innovation system has improved through past decade, it is still in a transition mode (Baković, 2010). The transition in

this case is going from Laissez-Faire setup (which characterizes by strict separation of actors and their roles in the innovation system) to the interactive mode (where actors are interacting and their roles are overlapping). Despite the fact that Etzkowitz (2003) defines the NIS as continuous evolvement, Poland is not evolving for more than a decade (from 2000), when it changed its mode from statist (which characterizes by the governmental superiority over other actors) to Laissez-Faire. The country had taken one step towards interactive mode and then stood still for more than 10 years, while other countries transitioned much faster. The Poland is still slowly moving forward to the more effective NIS setup which would enhance the innovativeness within the country or in regions.

The main issues with which Poland and its NIS struggles with are (Weresa, 2014):

- Academical and industrial actors' collaboration is on low level;
- Enterprises are not active when it comes to the R&D funds;
- Country does not export and import innovative goods which limits the absorptive capacity in the innovativeness perspective;
- Universities and public R&D units are not able to monetize their research in an effective way;
- Low number of patents within the country, and over low value of patents;
- Lack of qualifications within the public R&D units, due to weak financing.

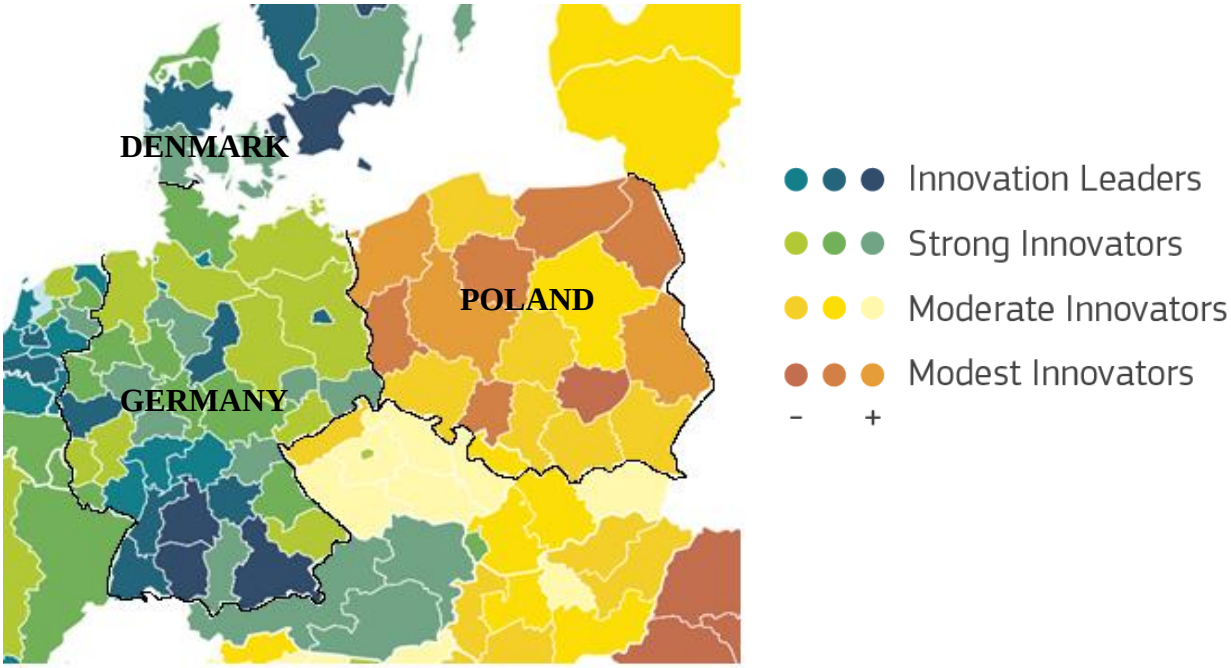

Figure 16: Regional innovativeness indexes in Poland, Germany and Denmark (Source: European Commission, 2017).

In order that reader could grasp the whole picture of NIS in Poland, author have also determined NIS analysis on regional level, what are the ratings of innovativeness indexes in each region with presentation of regional strategy framework in innovation and development perspective.

When looking on the map with innovativeness appearance within each region, the clear distinction between Germany, Poland and Denmark can be observed. While Denmark is mostly created out of regional innovation leaders, in Germany there is a mix between regions leading in innovation and regions strong in innovations, Poland is a combination of mostly modest and moderate innovators.

The figure below (Table 10) presents how Polish regions ranks amongst other European regions (220 in total). Mazowieckie (2), is the capital region and ranks on the highest place from all Polish regions in the innovation – but is also a Moderate Innovator. On contrary while overlooking other regions in Poland creates an image in which Poland is more a Modest Innovator, since region like Świętokrzyskie (7) ranks as 213 from all 220 regions taken into analysis. Increasing the innovation capacity with those regions ranking the lowest, could help in countries economic development, but to understand what is wrong in those regions, the evaluation of regional innovation system is provided below, but before that the Smart Specialization platform of EU will be explained since it a crucial policy which also will help to understand regional strategies for innovation development.

Region	RII 2017	Rank	Group
Łódzkie (1)	50.4	197	Moderate -
Mazowieckie (2)	63.6	159	Moderate
Małopolskie (3)	57.2	178	Moderate -
Śląskie (4)	50.3	198	Moderate -
Lubelskie (5)	47.4	201	Modest +
Podkarpackie (6)	51.8	192	Moderate -
Świętokrzyskie (7)	36.8	213	Modest -
Podlaskie (8)	45.5	207	Modest
Wielkopolskie (9)	49.3	199	Modest +
Zachodniopomorskie (10)	47.0	204	Modest +
Lubuskie (11)	41.1	210	Modest
Dolnośląskie (12)	56.9	179	Moderate -
Opolskie (13)	43.7	208	Modest
Kujawsko-Pomorskie (14)	46.3	206	Modest
Warmińsko-Mazurskie (15)	38.9	212	Modest
Pomorskie (16)	55.0	181	Moderate

Table 10: Poland regional innovation index appearance (Adapted from: European Commission, Regional Innovation Scoreboard, 2017).

The Smart Specialization Strategy was established in Europe with purpose of creating strategies for particular regions which should increase the innovativeness based on the background (e.g. cluster, academical focus) region has. The platform of Smart Specialization serves as a supportive tool for local governments in the policy, for innovative development, creation process. Namely, the main goals of the project are:

- The increase of the knowledge capacity in particular areas of technology within the regions;
- Encouraging the collaboration between innovation system actors for purpose of policy creation;
- Increase the level of governance which could improve the assessment of regional needs in terms of innovation (European Commission, 2014).

EU smart specialization program is aiming at job creation increase and economic development enhancement, through identifying specialization possibilities within the regions. Through collaboration between academia, government and industry like in Triple Helix model, regions can overcome the issues and increase its regional capacity in fields of economy, innovation and knowledge (European Commission, 2017).

In order to make smart specialization strategy work, regional governments and policy makers have to interact with all the actors (e.g. universities, enterprises) to understand which path (what specialization) would be the most suitable for the region (McCann et al., 2014). Theory implies that interaction within the innovation system actors is the most effectively facilitated by entrepreneurial activities (e.g. business incubation). The strategy for smart specialization will differ in each region, due to its complexity and dependency on the context of the region (e.g. industry specialization, cluster, academical focus). Each region will enhance the interaction in different way, level and between different actors which will result in differences in institutional framework for the region. The assessment of Smart Specialization in Polish regions will follow.

Smart Specialization in Polish RIS

The assessment of Regional Innovation System in Poland will begin with Smart Specialization (Table 11) strategies overview table in regions of Poland.

Area	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	No
Bio-economy			*		*			*	*	*	*	*		*			8
Construction	*					*	*	*					*				5
Water economy															*		1
Energy management	*		*	*	*	*	*				*		*	*		*	10
Marine economy										*						*	2
ICT/multimedia	*	*	*		*	*	*		*	*		*		*		*	11
Logistics				*					*	*				*		*	5
Aeronautics and aviation						*											1
Medicine	*			*	*									*			4
Modern business services		*														*	2
Environmental protection													*	*			2
Plastic products production														*			1
Chemical industry			*						*			*	*			*	5
Wood and furniture industry					*			*			*				*		4
Machine and metal industry							*		*	*	*		*	*			6
Textile industry	*																1
Creative industries									*	*				*		*	4
Pharmaceutics and cosmetics	*															*	2
Off-shore technologies																*	1
Tourism/health tourism						*	*	*		*	*	*		*			7
High life quality		*															
Healthy food	*	*				*	*	*	*		*	*	*	*	*		

Table 11. Smart specialization in Polish regions (Source: European Commission, 2017).

Łódzkie (1); Mazowieckie (2); Małopolskie (3); Śląskie (4); Lubelskie (5); Podkarpackie (6); Świętokrzyskie (7); Podlaskie (8); Wielkopolskie (9); Zachodniopomorskie (10); Lubuskie (11); Dolnośląskie (12); Opolskie (13); Kujawsko Pomorskie (14); Warmińsko Mazurskie (16); Pomorskie (17).

ICT and multimedia specializations are the most often chosen by the regions for further development. Majority of regions are basing on the specializations which are basing on natural science: bio-economy, health food and also health tourism. Even though there are regions which

are relying on more traditional specializations like machine and metal industry or energy management. In authors opinion the more diversified specialization within the regions there is a too much distraction on regional level to obtain truly good results in one specialization. That is why there is a necessity of focus only on one or two specializations per region. What is more, chosen specialization should differ in each region, so that the whole country could benefit innovation and development wise from this diversification. There are some regions which are focusing on one specific specialization:

- Kujawsko - Pomorskie region in plastic products manufacturing;
- Podkarpackie specializes in aviation (Aviation Valley);
- Warmińsko - Mazurskie have chosen the water economy;
- Pomorskie specialization is off-shore technologies.

Universities in RIS

If looking from Etzkowitz Triple Helix perspective, higher education institutions play an important role in the regional innovation system and Poland is a country with significant number of those institutions – 401 in the year 2017 (The Ministry of Science and Higher Education, 2017). This means that each region has a significant number of institutions which provide higher education for Polish society. Since 2011 there were over 5 million students attending those educational institutions (Central Statistical Office Republic of Poland, 2017).

Despite those large numbers of academical institutions, there is something wrong with the linkage between universities and industry (enterprises), due to the fact that companies in Poland are not willing to collaborate with universities (Weresa, 2014). Namely, the links between academical actors (e.g. universities) and industrial actors (e.g. businesses) are weak. Programs aiming to increase the effectivity and maintain the collaboration between industry and universities are just starting to be implemented (Smart Specialization started in 2014). Those programs serve as tools are and are not proven yet in the practice, that is why a lot of academical institutions and industrial representatives are not tending to use them as facilitating link in their collaboration. Despite the introduced new law on Higher Education institutions in Poland (which aims to increase of entrepreneurial activities and innovation within the academia), universities in Poland have old (post-communist) setups in which student and his needs are not important, and there is a necessity to reform them. This causes the lack of collaborations between industry and universities, because industrial actors are not willing to collaborate with educational institutions having old, not effective setups (Weresa, 2014), which drag down the overall regional innovation system. Universities are not able to be active in terms of

entrepreneurship, When looking on Polish universities from the perspective of Entrepreneurial University model (Figure 7) it becomes obvious that the only common element they have is academic community, there is no focus on society development due to the old setup of universities (mentioned before). In the recent years there were some regional institutions established in order to help universities with this issue, but after all the problem has to be solved from its roots (universities). To be an efficient regional innovation system actor, Polish universities have to change. The change have to be embraced by all the parties involved: industry, academia and government. Universities also have to improve their capabilities in terms of entrepreneurship and interaction within the innovation system environment. The process of reforming universities in Poland and redirecting its focus towards innovation creation will be a long term plan. But it has to be done in order to help regions to develop, reduce inequalities and be attractive for investments. The topic of academical change in Poland for further improvement of innovativeness in regional perspective is broad and can be used for future researches.

There is one example in Poland where industry and universities are collaborating within the same field and they present good results. Namely, the Podkarpackie region mainly focuses on aviation industry, that is why it is called the Aviation Valley (The Aviation Valley, 2017). There is an obvious lead within the aviation industry of the region since almost 90% of the Polish aviation products are produced in Podkarpackie voivodeship. The Aviation Valley consists of 100 companies employing over 24000 people, and the numbers are continuously growing. The main academical institution which closely collaborates within the aviation field is Rzeszów University of Technology. Collaboration brings benefits for all of the parties – government (Aviation Valley is one of the most important clusters in the country), universities (brings a lot of outside knowledge and also funds for further researches), industry (obtains knowledge from spill overs with university, but also has educated workforce in the same location). What is interesting, the whole RIS setup is focused on aviation and this cluster, academia is conducting researches which can be used in aviation industry, industrial actors are investing money in the researches also their other resources (e.g. time, machines, laboratories) and regional government is helping through active policy implementation (e.g. reduced taxation for cluster activities). The local area and country benefits from the strict focus of the region towards one industrial specialization.

The question emerges, why other regions in Poland are struggling with collaboration between universities and industry? Is it caused by lack of specialization within the region or by wrong

setup of universities and entrepreneurial environment within them? Podkarpackie region shows that those problems can be solved though as Etzkowitz (2003) defines close collaboration between the RIS actors. The Rzeszów University of Technology is the biggest university in the Podkarpackie region. It has its own technology transfer centre and business incubator. Technology transfer centre main activity is to establish and maintain the collaboration and dialogue between university and companies operating in the cluster (The Rzeszów University of Technology, 2018). The collaboration is beneficial for both side, companies are obtaining young skilful workers, while university can maintain the knowledge spill over and increase its knowledge repository. What is more universities through the collaboration with industry have simplified access to the market and automatically monetization of the ideas created by students of researchers (The Rzeszów University of Technology, 2018). Business incubator within the Rzeszów Univeristy of Technology is one of the most effective ones, it have won numerous prizes as the most entrepreneurial academical incubator in Poland (The Rzeszów University of Technology, 2018). These facts show and underline the importance of university business incubators, for regional development and innovation creation in region and country.

If Poland is willing to develop its economy and increase its competitiveness within the global market, it has to improve in the area of regional innovativeness. Theory implies that business incubation in the right innovation system (does not matter if national or regional, due to universal applicability of Triple Helix model) setting (balanced) can improve the innovation and knowledge capacity within the country (Etzkowitz et al., 2005). That would help Poland to overcome its problems in the Knowledge Economy development and Global Innovation ranks. If looking on Polish NIS from Edquist (2005) perspective, Poland is not very good at interactions within NIS which produce new innovations. In order to answer the research question, the analysis of university business incubation in Poland will follow. Regarding to research limitation only University Business Incubators which are a member of AIP (Akademickie Inkubatory Przedsiębiorzczości – Academical Business Incubators) organization will be analyzed. It will help to gain insights on why Poland struggles in the fields of innovation and knowledge creation and diffusion on national level. What is more the UBI assessment will help to define and name the business incubation role in the further development of Polish economy.

4.3. University Business incubation in Poland

This subsection will bring to the reader the introduction and analysis of AIP through the Smilor model perspective. Further the overview of the most important regional business HUBs will be presented. The whole section will end with discussion of presented analysis.

AIP – network of UBI in Poland

Polish law defines the university business incubators as: *" a unit managed by the university in order to use better the intellectual and technical potential of the university, offering support for economic activity of academia, university staff and students who are entrepreneurs."* - (The Act on Higher Education of 27 July 2005; Journal of Laws No. 164, item. 1365 as amended).
The year 2004 was important for the whole entrepreneurial environment in Poland, since in this year the AIP was founded – the biggest network of UBI in the Europe (56 university business incubators). They were rapidly growing, since they have increased number of their facilities almost 4 times through the past decade (AIP, 2017).
When looking on the university business incubators from the perspective of Smilor model (1987) of incubation we can see that tenant companies produce those results:

- Profits;
- Economic development;
- Job creation;
- Profitable companies;
- Successful products;
- Technology diversification.

How those indicators affiliate to the AIP in Poland? In 2016 AIP have stated that start-up companies which are the part of their organization, have generated almost 13 million euros of income, from which almost 7 million were the profit of those start-ups. Those companies have paid almost 2 million in taxes and over 500 thousand euros for healthcare. In 2016 AIP have helped to create 3028 companies, which were 1% of overall created companies that year in Poland. Within those companies over 7000 people were employed during the year 2016 (AIP, 2017).
AIP is an active member of Polish NIS which can be seen based on the annual reports AIP provides on their website. Companies incubated by them bring profits, through that they contribute to the economic development (by paying taxes). They are very effective in creating jobs (over 7000 jobs in 2016), they also create profitable companies (3028 companies) and

bring some successful products to the market. According to Smilor (1987), that kind of contribution can be treated as a substantial for economic development of the country. But is that enough? There is a downside of that, AIP do not track how well the tenants do after they graduate from the incubator, there are no official statistics about UBI activities in Poland. Additionally, while having the biggest network of UBI in Europe, Poland is scoring very low in innovation among other European countries, this underlines the problems of Polish NIS and its components (e.g. university business incubators). To emphasize those issues author depicts below the setting of AIP incubation model.

AIP business incubation model

Based on information obtained from official AIP website and their reports of annual results, author has depicted the AIP incubation model in the picture below. The depiction is also based on other findings (e.g. Startup Poland reports, articles describing UBI in Poland).

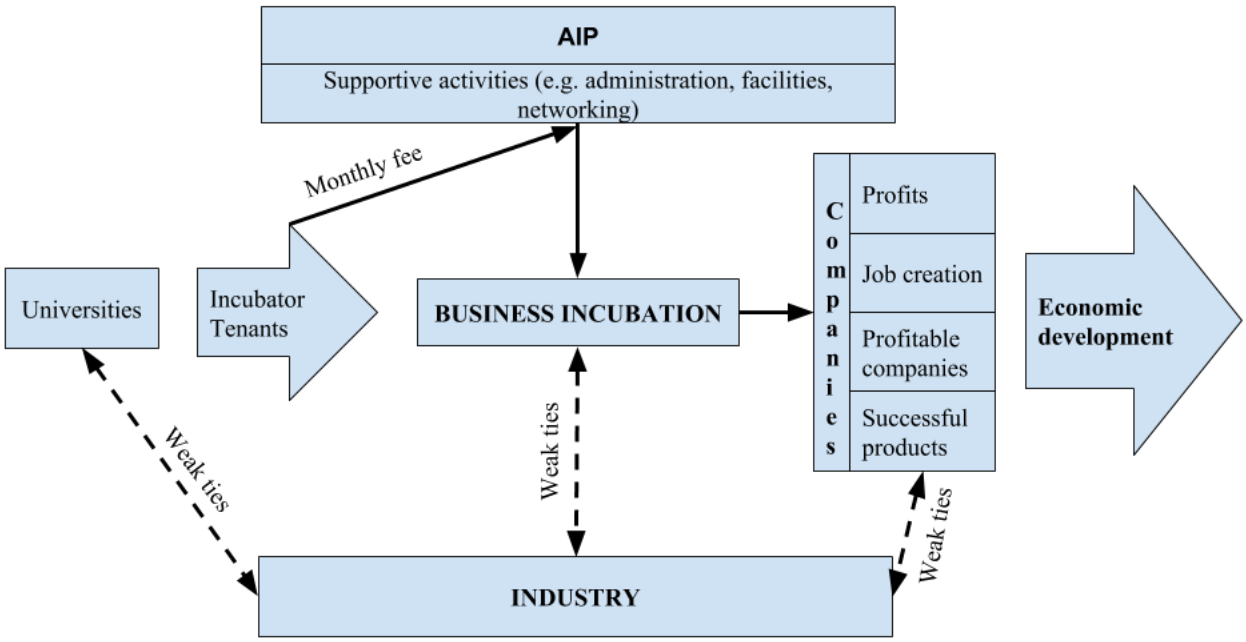

Figure 17: AIP incubation model (Source: self-made, inspired by Smilor: Figure 11).

Universities work only as a source for incubators tenants (e.g. students, researchers, graduates), with no other connection to the AIP (e.g. as a knowledge repository, helping with laboratories and other needed resources). What is more, universities have weak ties with the industrial actors (Waresa, 2014; Startup Poland, 2017) and are not trying to improve this situation. Tenants have to pay monthly fee (around 60 euros) to the AIP for the support they obtain (e.g. administrative help, law advices, networking). The problem with weak links to the industry is also visible at this step, neither industry wants to affiliate with them (Mroczkowski et al., 2017), neither AIP

makes some radical steps to improve these potential collaborations (AIP, 2017). It can be caused by the stance of universities in perspective of entrepreneurial collaboration with the industry. After the incubation companies create profits and jobs, they also create successful companies and products, which contributes to the regional and national economic development. Despite the positive results, the AIP could be used in a much efficient way. It could be done by much more proactive stance universities should represent in the entrepreneurial and collaborative activities which could improve the innovativeness, knowledge spillovers and new knowledge creation within the country. In order to do that universities have to engage themselves as an important actors in the UBI activities, they have to engage the dialogue, talk with students and industry to see what are the potentials of region, and how should universities focus their capabilities (e.g. should they concentrate on nanotechnology or on medicine). But it will not change, till radical reforms will be performed in the educational sphere of Poland. Nation has to see the importance and necessity for entrepreneurship and it has to be nourished from young days in the primary schools (Jusoh, 2012, Schumpeter, 2000).

Region	Most important business hub in region	Affiliation
Łódzkie (1)	Startup Spark	Private
Mazowieckie (2)	"Smolna" entrepreneurship center	Private
Małopolskie (3)	Hub:raum	Private
Śląskie (4)	AIP Uniwersytet Śląski	AIP
Lubelskie (5)	Science and Technology park in Lubelskie region	Town and region
Podkarpackie (6)	The Aviation Valley incubator	Cluster
Świętokrzyskie (7)	TechnoparkBiznesHub	Town
Podlaskie (8)	Białystok Science and Technology park	Town
Wielkopolskie (9)	AIP Poznań	AIP
Zachodniopomorskie (10)	AIP Szczecin	AIP
Lubuskie (11)	Technology Park "Interior"	Semi-private
Dolnośląskie (12)	Wrocław Technology Park	Town
Opolskie (13)	Startup café "Barbara"	Private
Kujawsko-Pomorskie (14)	AIP UMK	AIP
Warmińsko-Mazurskie (15)	Olsztyn Science and Technology Park	Town
Pomorskie (16)	AIP Gdańsk	AIP

Table 12: The most important regional business hubs in 2017 (Source: Startup Poland, 2017).

To sum up, AIP is presenting good numbers in many terms (e.g. number of incubators, profits, jobs). Although based on Startup Poland report from the year 2017 (Startup Poland, 2017) only 5 regions recognize AIP incubators as important actors (Table 12) within the entrepreneurial

environment in the region (Zachodnio-Pomorskie, Śląskie, Pomorskie, Kujawsko-Pomorskie, Wielkopolskie).

That is caused by not recognizing the UBI by industry as an important actors in terms of regional or national innovation creation in Poland. What is more, they are not the leading entrepreneurship and innovation hubs within their regions, they are suggested as an alternative for the private incubators. What is worth mentioning that data show that 5 other regions state that most important hubs are those affiliated with the city or regional government, 5 other regions are naming private or semi-private hubs as the most important ones and only one region is relying on the cluster business hub which facilitates ale the triple helix representatives and maintains their interaction and collaboration. This indicates how weak are university affiliated actors of innovation system in Poland, those weaknesses emerge due to the lack of entrepreneurial universities defined by Etzkowitz (2005). Universities in Poland are a knowledge sources, but they are not able to diffuse that knowledge in an efficient way. What is more while having a great network of UBI across the country they do not use it as a tool for facilitating the process of knowledge and innovation diffusion and interaction with industry. The last section of this chapter will discuss and conclude all the finding with regard for the research question and topic.

5. Conclusions and discussion

Conclusions

Poland is moderate as knowledge economy and as national innovation system, the result is caused by issues in interactions between the actors. Namely universities and industrial actors do not collaborate. The fault in some part relies on universities and lack of changes within them. But also the society is not aware of positive influence of entrepreneurship on country. That is why an obvious lack in entrepreneurial promoting actions can be seen. Government is also responsible for that, because they are not forcing changes in universities which could improve the overall shape of entrepreneurship and innovativeness in the country.

When going deeper and looking on the UBI, it could seem that everything is in order, Poland seem to have the biggest network of UBI in Europe, it produces profits, jobs, successful companies. But still, something is wrong. Namely the setting of this AIP incubators is not relying on universities at all even though they are defined by universities as university business incubators. What is more, there is an obvious lack of innovative companies within the AIP incubators, of course it's impossible that all of those companies should create something innovative. But due to its distinction from universities it is hard for tenants to perform or create some innovative activities or products in them. Since those AIP incubators do not have labs or technological resources which could help to develop the business based on technology, students with that kind of businesses choose private incubators or develop their ideas in the university, which again, lacks of entrepreneurial skills and is not able to help to monetize the idea.

The role of university business incubation in Poland – AIP, is contributing to the economic development of the country, by paying taxes, generating profits, creating jobs and companies, but it is not enough when having this big network, due to bad management of universities and their activities country is suffering from deficiency of knowledge and innovation creation by the university business incubators which could facilitate the efficient interaction of industry and universities. It could seem that universities do not have similar goals as industry (e.g. creating innovation) which could contribute to the countries further economic development in a more effective way. Instead the Polish universities have chosen the path in which they try to prove that entrepreneurship is unnecessary and being not innovative as institution is just fine. Poland has to make drastic changes and they have to be done soon, cause country is falling behind more and more each year.

Discussion

Poland is basing its economy on knowledge but it's done in a weak way, that is why country scores low in index of innovativeness. Government expects that innovations will be developed by the industry on their own, however it has been long proven ineffective. Poland has numerous universities but none of them could be defined as entrepreneurial universities, majority of entrepreneurial activities lies on a private incubators created by the industrial actors in the innovation system. What is more, Poland has the biggest network of UBI which is set up in a distinct way (not necessary good), cause the only resource provided by university to the business incubator are students or graduates, with no knowledge spillover what so ever. Universities have weak links with industry and are not even trying to improve the situation. That is caused by two things:

1. Universities operate in old setups which do not focus on other activities despite academical (e.g. research, education).
2. Industrial actors are not keen to interact with universities which have such and old approach and no pro-entrepreneurial stance what so ever.

There are some activities which could help to develop and enhance entrepreneurship within the universities, one of those actions is Smart Specialization Strategy implementation. However it has one issue, there is majority of overlap between the regions within those strategies and also regions are choosing to specialize in 5 or more specializations having their focus distracted, that is why regions should more concentrate on maximum 3 specialization dependently on their size (bigger regions 3, smaller 2, smallest 1). In that way the focus within the region on that particular area should be more effective in terms of development. Smart specializations should be the background for further changes within the regions to be more effective in knowledge and innovation creation which could let to economic development. Next step would be reforming the academical actors in the regions, with focus on the Smart Specializations. That would encourage the industry to collaborate with universities which would become a good knowledge source within that particular area. Last but not least, the promotion and enhancement of entrepreneurship should begin in the earlier level of education (possibly primary education) it has to be transitioned in that kind of way that Polish society would understand and embrace the entrepreneurs, which can bring a lot of positivity to the countries development.

Future perspective

Future research could concentrate on getting insights why universities are not taking active stance in the UBI activities in Poland, how it should be reformed in order to work well. What

is more for a better understanding of university business incubation phenomenon in Poland an analysis of Polish universities through the proposed by Etzkowitz entrepreneurial university perspective should be done, it would help to get insights on the setup of academical institutions in terms of entrepreneurship. To get even broader understanding of this phenomenon the analysis of a Polish society and its stance towards entrepreneurship should be conducted. There is a variety of issues that could be examined in order to make this research more complete and useful.

Refferences

A. Hitt, R. D. Ireland, M. S. Camp, & D. L. Sexton (Eds.), Strategic entrepreneurship: Creating a new mindset. UK: Blackwell Publishers Ltd.

Aghion, P., & Howitt, P. (1992). A model of growth through creative destruction. Econometrica, 60(2), 323–351.

AIP, (2017), Official website: https://inkubatory.pl.

Al-Mubaraki H. and M. Busler, (2011): The Incubators Economic Indicators: Mixed Approaches-, Journal of Case Research in Business and Economics,Vol 4, 2011(c). Available online: http://www.aabri.com/manuscripts/11884.pdf.

Archibugi, D, Howells, J and Michie, J (1999) Innovation Policy in a Global Economy, Cambridge University Press, Cambridge.

Asheim, B., L. Coenen, & J. Vang, (2007) Face-to-face, buzz, and knowledge bases: socio spatial implications for learning, innovation, and innovation policy. Environment and Planning C, 25(5), 655.

Axel-Berg J.H., Pimentel D.N., Rosso G., (2016): "Grassroots Student-led Entrepreneurial University Ranking in Brasil".

Baković, T. (2010). Managing innovation systems in transition economies. EFZG working paper series, (01), 1-11.

Baldwin, Richard E. (1994). Towards an Integrated Europe, London: Center for Urban Policy Research.

Balzat, Markus & Hanusch, Horst. (2004). Recent Trends in the Research on National Innovation Systems. Journal of Evolutionary Economics. 14. 197-210. 10.1007/s00191-004-0187-y.)

Bathelt, H., A. Malmberg, P. & Maskell, (2004) Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. Progress in Human geography, 28(1), 31-56.

Bayhan, A., (2006): 'Business Incubator Process: A Policy Tool for Entrepreneurship and Enterprise Development in a Knowledge-Based Economy', Competitiveness Support Fund, 2006.

Bergek, A., & Norrman, C. (2008). Incubator best practice: A framework. Technovation, 28(1-2), 20-28.

Bergek, A., Jacobsson S., and Hekkert, M. (2007), 'Attributes in innovation systems: a framework for analysing energy system dynamics and identifying goals for system-building activities by entrepreneurs and policy makers', in Foxon, T., Kohler, J., and Oughton, C., eds, Innovations for a Low Carbon Economy: Economic, Institutional and Management Approaches, Edward Elgar, Cheltenham.

Biernacki A., Fedotenkova A., Svede N., (2017), The role of University Business Incubators: Denmark case studies: Aalborg University and Copenhagen Business School; Semester project, Aalborg University.

Blackstone, A., 2012. Sociological Inquiry Principles: Qualitative and Quantitative Methods. (V.1.0).

Blake, R. (1989), 'Integrating Quantitative and Qualitative Methods in Family Research. Families Systems and Health' 7, 411–427.

Börje Johansson & Charlie Karlsson & Roger Stough (ed.), 2006. "The Emerging Digital Economy," Advances in Spatial Science, Springer, number 978-3-540-34488-9, April.

Breschi, S., and Malerba, F. (1997), 'Sectoral innovation systems: technological regimes, Schumpeterian dynamics and spatial boundaries', in Edquist, C., ed, Systems of Innovation: Technologies, Institutions and Organizations, Pinter/Cassell Academic, London and Washington.

Bröcker, J., & Schneider, M. (2002). How does economic development in Eastern Europe affect Austria's regions? A multiregional general equilibrium framework. Journal of Regional Science, 42(2), 257-285.

Broekel, T., & R. Boschma, (2012) Knowledge networks in the Dutch aviation industry: the proximity paradox. Journal of Economic Geography, 12(2), 409-433.

Bruneel, J., Ratinho, T., Clarysse, B., & Groen, A. (2012). The Evolution of Business Incubators: Comparing demand and supply of business incubation services across different incubator generations. Technovation, 32(2), 110-121.

Bruner, J.S. (1986) Actual Minds, Possible Worlds. Cambridge, MA: Harvard University Press

Bryman, A., & Bell, E. (2011). Business research methods. Oxford: Oxford Univ. Press.

Carlsson, B. (1998), 'Innovation and knowledge spillovers: a systems cum evolutionary perspective', in Eliasson, G., and Green, C., eds, Micro foundations of Economic Growth: A Schumpeterian Perspective, University of Michigan Press, Ann Arbor, MI, pp 156–168.

Carlsson, B. (2003), 'Innovation systems: a survey of the literature from a Schumpeterian perspective', paper for The Elgar Companion to Neo-Schumpeterian Economics, downloaded 09 April 2012 from: http:// faculty.weatherhead.case.edu/carlsson/documents/ InnovationSystemsSurveypaper6.pdf.

Carlsson, B., and Stankiewicz, R. (1991), 'On the nature, function, and composition of technological systems', Journal of Evolutionary Economics, No 1, pp 93–118.

Carlsson, B., ed (1997), Technological Systems and Industrial Dynamics, Kluwer Academic Publishers, Boston/Dordrecht/ London.

Carlsson, B., Jacobsson, S., Holmén, M., and Rickne, A. (2002), 'Innovation systems: analytical and methodological issues', Research Policy, Vol 31, No 2, pp 233–245.

Cartwright, R. L. (1968). Some remarks on essentialism. The Journal of Philosophy, 65(20), 615-626.

Cartwright, Richard L. (1968). "Some Remarks on Essentialism". The Journal of Philosophy. 65 (20): 615–626. doi:10.2307/2024315. JSTOR 2024315.

Central Statistical Office Republic of Poland, (2013), Administrative division: http://stat.gov.pl/cps/rde/xbcr/gus/LU_ludnosc_stan_struktura_31_12_2012.pdf.

Central Statistical Office Republic of Poland, (2017), Number of students in Higher Education: https://stat.gov.pl/obszary-tematyczne/edukacja/edukacja/szkolnictwo-wyzsze-w-roku-akademickim-20162017-dane-wstepne,8,4.html.

Chen, D., & Dahlman, C. (2005). The knowledge economy, the KAM methodology and World Bank operations.

Chesbrough, H. (2006). Open innovation: A new paradigm for understanding industrial innovation. In H. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), Open innovation: Researching a new paradigm. USA: Oxford University Press.

Chesbrough, H. W. (2003). Open innovation: The new imperative for creating and profiting from technology. Boston: Harvard Business School Press.

Cooke, P. (1996), Regional Innovation Systems, UCL Press, London.

Cooke, P., & Leydesdorff, L. (2006). Regional development in the knowledge-based economy: The construction of advantage. The journal of technology Transfer, 31(1), 5-15.

Cooke, P., De Laurentis, C., Todtling, F., & Trippl, M. (2007). Regional knowledge economies: Markets, clusters and innovation. Cheltenham: Edward Elgar Publishing.

Creswell, W., John & Plano Clark, L., Vicki (2017). Designing and Conducting Mixed Methods Research, SAGE Publications.

Dang G. and Pheng S. L. (2014):, Theories of Economic Development, 2014

Debnath, S. C. (2002). Creating the knowledge-based economy in Kingdom of Saudi Arabia to solve the current unemployment crisis.

Doloreux, D. (2002). What we should know about regional systems of innovation. Technology in society, 24(3), 243-263.

Doloreux, D., and Parto, S. (2005), 'Regional innovation systems: current discourse and unresolved issues', Technology in Society, Vol 27, pp 133–153.

Dosi, G., Freeman, C., Nelson, R., Silverberg, G., & Soete, L. (1988). Technical change and economic theory. Laboratory of Economics and Management (LEM), Sant'Anna School of Advanced Studies, Pisa, Italy.

Drucker P.F. (1999), Społeczeństwo prokapitalistyczne, PWN, Warszawa.

Dunning, J. H. (2002). Regions, globalization, and the knowledge-based economy. Oxford university press.

Edquist, C. (1997), 'Systems of innovation approaches: their emergence and characteristics', in Edquist, C., ed, Systems of Innovation: Technologies, Institutions and Organizations, Pinter, London.

Edquist, C. (2005), Systems of Innovation, Perspectives and Challenges, Chapter 7.

Edquist, C. (2013). Systems of innovation: technologies, institutions and organizations. Routledge.

Eliufoo, H. K. (2005). Knowledge creation and transfer in construction organisations in Tanzania: Building and Real Estate Economics, Royal Institute of Technology.

Eriksson, K., Lindström, U., 1997. Abduction – a way to deeper understanding of the world of caring. Scand. J. Caring Sci. 11 (4), 195–198.

Etzkowitz H., (2002): "Incubation of incubators: innovation as a triple helix of University–industry–government networks".

Etzkowitz H., (2003):" Innovation in Innovation: The Triple Helix of University - Industry - Government Relations".

Etzkowitz, H. and Leydesdorff, L. (2000) 'The dynamic of innovation: from National Systems and "Mode 2" to triple Helix of University-industry-government relations'. Research Policy, 29, 109-123.

Etzkowitz, H., & Leydesdorff, L. (1995). The Triple Helix--University-industry-government relations: A laboratory for knowledge based economic development.

Etzkowitz, H., & Ranga, M. (2015). Triple Helix systems: an analytical framework for innovation policy and practice in the Knowledge Society. In Entrepreneurship and Knowledge Exchange (pp. 117-158). Routledge.

Etzkowitz, H., Mello, J.M.C., Almeida, M. 2005. Towards "meta-innovation" in Brazil: The evolution of the incubator and the emergence of a triple helix. Research Policy 34, 411-424.

Etzkowitz, H., Ranga, M., Benner, M., Guaranys, L., Maculan, A. M., & Kneller, R. (2008). Pathways to the entrepreneurial university: towards a global convergence. Science and Public Policy, 35(9), 681-695.

European Commission (2017), Basic information about Poland: https://europa.eu/european-union/about-eu/countries/member-countries/poland_en.

European Commission (2017), European Innovation Scoreboard 2017, ISBN 978-92-79-67685-7 doi:10.2873/076586.

European Commission, (2014), National/regional innovation strategies for smart specialization (RIS3), cohesion policy 2014-2020: http://ec.europa.eu/regional_policy/sources/docgener/informat/2014/smart_specialisation_en.pdf

European Commission, (2017), Regional Innovation Scoreboard: http://europa.eu/rapid/press-release_MEMO-17-1674_en.htm.

European Commission, (2017). Smart Specialization Platform: http://s3platform.jrc.ec.europa.eu/what-is-smart-specialisation-.

European Commission, (2018), Regional Policies, Poland regions: http://ec.europa.eu/regional_policy/en/atlas/poland.

European Commission, (2018). Regional Innovation Monitor Plus platform: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/.

European Council (2009) "Council conclusions of 12 May 2009 on a strategic framework for European cooperation in education and training ('ET 2020')" Official Journal of the European Union, (2009/C 119/02).

Fagerberg, J. and Srholec, M. (2008) "National innovation systems, capabilities and economic development"

Farace, S., & Mazzotta, F. (2015). The effect of human capital and networks on knowledge and innovation in SMEs. Journal of Innovation Economics & Management, (1), 39-71.

Feller, I., Ailes, C. P., & Roessner, J. D. (2002). Impacts of research universities on technological innovation in industry: evidence from engineering research centers. Research policy, 31(3), 457-474.

Fischer, M. M., & Fröhlich, J. (Eds.). (2013). Knowledge, complexity and innovation systems. Springer Science & Business Media.

Freeman, C. (1987). Technology Policy and Economic Performance: Lessons from Japan.- Frances Printer Publishers.

Freeman, C. and L. Soete, Eds. (1987). Technical Change and Full Employment. London, Basil Blackwell.

Furman, J. L., Porter, M. E., & Stern, S. (2002). The determinants of national innovative capacity. Research policy, 31(6), 899-933.

George, G., Micheal, D., Smilor, R. W., Downing, D. F., Hamanaka, S., Williams, K. V. B., ... & Robinson, C. D. A. (1985). Financing and managing fast-growth companies: The venture capital process.

Giardino, C., Unterkalmsteiner, M., Paternoster, N., Gorschek, T., & Abrahamsson, P. (2014). What do we know about software development in startups? IEEE software, 31(5), 28-32.

Gomułka, S. (2016). Poland's economic and social transformation 1989–2014 and contemporary challenges. Central Bank Review, 16(1), 19-23.

Graneheim, U. H., Lindgren, B. M., & Lundman, B. (2017). Methodological challenges in qualitative content analysis: A discussion paper. Nurse education today, 56, 29-34.

Graneheim, U.H., Norberg, A., Jansson, L., 2001. Interaction relating to privacy, identity, autonomy and security. An observational study focusing on a woman with dementia and "behavioural disturbances"', and on her care providers. J. Adv. Nurs. 36 (2), 256–265.

Greene, J., V. Caracelli, and W. Graham (1989)," Toward a Conceptual Framework for Mixed-Methods Evaluation Designs. Educational Evaluation and Policy Analysis" 11:255-274.

Grimaldi, R., & Grandi, A. (2005). Business incubators and new venture creation: An assessment of incubating models. Technovation, 25(2), 111-121.

Guan, J., & Chen, K. (2012). Modeling the relative efficiency of national innovation systems. Research policy, 41(1), 102-115.

Hamel, G., & Breen, B. (2007). The future of management. Boston: Harvard Business School Press.

Hannon, P. D., & Chaplin, P. (2003). Are incubators good for business? Understanding incubation practice—the challenges for policy. Environment and Planning C: Government and Policy, 21(6), 861-881.

Heinrich, C., & Betts, B. (2003). Adapt or die: transforming your supply chain into an adaptive business network. John Wiley & Sons.

Hekkert, M., Suurs, R.A.A., Negro, S., Kuhlmann, S., and Smits, R. (2008), 'Attributes of innovation systems: a new approach for analysing technological change', Technological Forecasting and Social Change, Vol 74, pp 413–432.

Hitt, M. A, Ireland, R. D., Camp, S. M., & Sexton, D. L. (2002). Strategic entrepreneurship: Integrating entrepreneurial and strategic management perspectives.

Howells, J. (2006). Intermediation and the role of intermediaries in innovation. Research policy, 35(5), 715-728.

Johannessen, J. A, Olsen, B., & Lumpkin, G. T. (2000). Innovation as newness: What is new, how new, and new to whom? European Journal of Innovation Management, 4(1), 20–31.

Johannessen, J. A., & Olsen, B. (2010). The future of value creation and innovations: Aspects of a theory of value creation and innovation in a global knowledge economy. International Journal of Information Management, 30(6), 502-511.

Jonassen, D.H. (1991). Evaluating constructivist learning. Educational Technology, 28 (11), 13 16.

Jusoh, R. (2012). Effects Of Teachers‟ Readiness In Teaching And Learning Of Entrepreneurship Education In Primary Schools. International Interdisciplinary Journal of Education, 1(7), 98-102.

Khaleel Malik, Steven Glynn, Jeff Butler & Ian Miles (2003) Developing innovation policies for the knowledge economy in Europe, Innovation, 5:2-3, 225-233, DOI: 10.5172/impp.2003.5.2-3.225.

Kolympiris, C., & Klein, P. G. (2017). The Effects of Academic incubators on university Innovation. Strategic Entrepreneurship Journal, 11(2), 145-170.

Koźmiński A.K. (2001), Jak tworzyć gospodarkę opartą na wiedzy? [in:] Strategia rozwoju Polski u progu XXI wieku, Kancelaria Prezydenta RP i Komitet Prognoz Polska 2000 Plus, PAN, Warszawa.

Krippendorff, K. (2013) Content Analysis. An Introduction to Its Methodology (3rd ed). California, CA: Sage Publications.

Kukliński A. (ed.) (2003), Gospodarka oparta na wiedzy. Perspektywy Banku Światowego, Biuro Banku Światowego w Polsce, Warszawa.

Lakoff, George. 1987. Women, Fire, and Dangerous Things: What Categories Reveal about the Mind. Chicago: University of Chicago Press.

Lalkaka, R. (2002). Technology business incubators to help build an innovation-based economy. Journal of Change Management, 3(2), 167-176.

Lechman, E. (2014). ICT diffusion trajectories and economic development: Empirical evidence for 46 developing countries. In ICTs and the millennium development goals (pp. 19-39). Springer, Boston, MA.

Lefebvre, L, Lefebvre, E and Mohnen, P (2001) Doing Business in the Knowledge- Based Economy: Facts and Policy Challenges, Kluwer Academic Publishers, Dordrecht.

Lesáková L., (2012): 'The Role of Business Incubators in Supporting the SME Start-up', 2012.

Leydesdorff, L. (2006). The knowledge-based economy: Modeled, measured, simulated. Universal-Publishers.

Li, Yong-Hui; Huang, Jing-Wen; TSAI, Ming-Tien., (2009): Entrepreneurial orientation and firm performance: the role of knowledge creation process. Industrial Marketing Management, v. 38, n. 4, p. 440-449, 2009.

Lincoln Y.S, Denzin N.K, (2008): "The Landscape of Qualitative Research". Sage Publications.

Lipton, D., Sachs, J., Fischer, S., & Kornai, J. (1990). Creating a market economy in Eastern Europe: The case of Poland. Brookings papers on economic activity, 1990(1), 75-147.

Lucas, R. E. (1988). On the mechanics of economic development. Journal of Monetary Economics, 22(1), 3–42.

Lundvall, B. A. (1992). National systems of innovation: Towards a theory of innovation and interactive learning (Pinter, London) Google Scholar.

Lundvall, B. Å. (2007). National innovation systems—analytical concept and development tool. Industry and innovation, 14(1), 95-119.

Lundvall, B. Å., & Borrás, S. (2005). Science, technology, and innovation policy. In Oxford handbook of innovation (pp. 599-631). Oxford University Press.

Lundvall, B.-Å. (2007), Innovation system research; where it came from and where it might go, Globelics Working Paper No 07-01

Luo, Y. (2007). A coopetition perspective of global competition. Journal of World Business, 42(2), 129–144.

Macionis, J. J., & Gerber, L. M. (2011). Sociology. Toronto: Pearson Canada.

Malerba, F. (2002), ‘Sectoral systems of innovation and production’, Research Policy, Vol 31, No 2, pp 247–264.

Marion, R. (1999). The edge of organization: Chaos and complexity theories of formal social systems. California: Sage, Thousand Oaks.

Marr, B., & Roos, G. (2005). A strategy perspective on intellectual capital. Perspectives on intelectual capital, 28-52.

Marx, K. (1933). Capital. London: J. M. Dent.

Maskell, P., and Malmberg, A. (1997), ‘Towards an explanation of regional specialization and industry agglomeration’, European Planning Studies, Vol 5, pp 25–41.

Maskus, K. E. and Reichman, J. H. (2004) ‘The globalization of private knowledge goods and the privatization of global public goods’. Journal of International Economic Law, 7 (2), 279-320.

Matthing, J., Sandén, B.,&Edvardsson, B. (2004).Newservice development: Learning from and with customers. International Journal of Service Industry Management, 15(5), 479–498.

McAdam, M., & Marlow, S. (2007). Building futures or stealing secrets? Entrepreneurial cooperation and conflict within business incubators. International Small Business Journal, 25(4), 361-382.

Meier, G. M. (2000). The old generation of development economists and the new. In G. M. Meier & J. E. Stiglitz (Eds.), Frontiers of development economics: The future in perspective (pp. 13–50). Washington, D.C.: World Bank/Oxford University Press.

Metcalfe, JS (1994) Evolutionary Economics and Technology Policy, The Economic Journal, 104 (July): 931–944.

Metcalfe, S. (1995). The economic foundations of technology policy. Handbook of the economics of innovation and technological change, 409-512.

Ministry of Public Affairs Republic of Poland, (2014), Poland - 10 years of EU membership: http://www.msz.gov.pl/en/news/10_years_of_poland_s_eu_membership?printMode=true

Molas-Gallart, J., Castro-Martínez, E., & Fernández-de-Lucio, I. (2008). Interface Structures: knowledge transfer practice in changing environments. INGENIO (CSIC-UPV) Working Papers Series, (2008-4).

Mroczkowski, T., & Miller, M. (2017). Envisioning Smart Development in Poland from a Triple Helix Systems Perspective: a Critical Assessment of the Morawiecki Plan. Journal of the Knowledge Economy, 8(2), 513-535.

Nelson, R. R. (Ed.). (1993). National innovation systems: a comparative analysis. Oxford University Press on Demand.

Nishikawa, K., & Kanama, D. (2013). Universities' Role as Knowledge Sources for Product Innovations.

Nonaka, I. (2000). A dynamic theory of organizational knowledge creation. In Knowledge, groupware and the internet (pp. 3-42).

OECD (1997), Internationalization of Industrial R&D: Patterns and Trends (Paris: Group of National Experts on Science and Technology Indicators, OECD).

OECD (2012): “Guiding Framework for Entrepreneurial Universities”.

OECD (2015): “The Missing Entrepreneurs of 2015. Policies for Self-Employment and Entrepreneurship”

OECD/EU (2017), Supporting Entrepreneurship and Innovation in Higher Education in Poland, OECD Skills Studies, OECD Publishing, Paris/European Union, Brussels: http://dx.doi.org/10.1787/9789264270923-en.

Ontology, Epistemology and Methodology, 2016, Bhuwan Pandey (http://eissr.blogspot.dk/2016/01/ontology-epistemology-and-methodology.html)

Patel P., (1999): “Measurement and Analysis of Technological Competencies of Large Firms”. University of Sussex.

Peikoff, Leonard (1991). Objectivism: The Philosophy of Ayn Rand. New York: Dutton. ISBN 0-452-01101-9.

Philip McCann, Raquel Ortega-Argilés, (2014) "Smart specialisation in European regions: issues of strategy, institutions and implementation", European Journal of Innovation Management, Vol. 17 Issue: 4, pp.409-427, https://doi.org/10.1108/EJIM-05-2014-0052

Rand, A., & Branden, N. (1966). The Objectivist. New York: The Objectivist.

Rejnö, Å., Berg, L., 2015. Strategies for handling ethical problems in end of life care: obstacles and possibilities. Nurs. Ethics 22 (7), 778–789.

ReviseSociology website - https://revisesociology.com/2015/05/18/positivism-interpretivism-sociology/ (2015).

Rice, M. P., & Matthews, J. B. (1995). Growing new ventures and creating new jobs: principles & practices of successful business incubation. Seminário da Associação Americana de Incubadoras, 9. Scottsdale: EUA.

Rolfe, G., 1997. Science, abduction and the fuzzy nurse: an exploration of expertise. J. Adv. Nurs. 25 (5), 1070–1075.

Romer, P. M. (1986). Increasing returns and long-run growth. Journal of Political Economy, 94 (5), 1002–1037.

Rosenberg, N (1992) Inside the Black Box: Technology and Economics, CambridgeUniversity Press: Cambridge.

Rosenfeld, S. A. (1997). Bringing business clusters into the mainstream of economic development. European planning studies, 5(1), 3-23.

Rossman, G., and B. Wilson (1991), “Numbers and Words Revisited: Being “Shamelessly Eclectic.” Evaluation Review 9(5):627–643.

Rothaermel, F. T., & Thursby, M. (2005). Incubator firm failure or graduation: The role of university linkages. Research policy, 34(7), 1076-1090.

Rozmahel, P., Kouba, L., Grochová, L., & Najman, N. (2013). Integration of Central and Eastern European Countries: Increasing EU Heterogeneity? (No. 9). WWW for Europe Working Paper.

Ruttan, V. W. (2006). Is war necessary for economic growth?: military procurement and technology development. Oxford University Press.

Sanchez, R. (2005). Tacit knowledge versus explicit knowledge: approaches to knowledge management practice. TEAM LinG, 191.

Sayer, A., 1992. Method in Social Science: A Realist Approach, Second edition. Routledge, London.

Scharmer, C.O., Käufer, K., (2000): "Universities As the Birthplace for the Entrepreneuring Human Being"

Schreier, M. (2012). Qualitative content analysis in practice. Thousand Oaks, CA: Sage.

Schumpeter, J., & Backhaus, U. (2003). The theory of economic development. In Joseph Alois Schumpeter (pp. 61-116). Springer, Boston, MA.

Schumpeter, J., (1954) A History of Economic Thought, Oxford University Press: Oxford.

Schumpeter, J., (2000). Entrepreneurship as Innovation. Entrepreneurship: The Social Science View, Vol. , p. 51-75 2000. Available at SSRN: https://ssrn.com/abstract=1512266

Scillitoe, J. L., & Chakrabarti, A. K. (2010). The role of incubator interactions in assisting new ventures. Technovation, 30(3), 155-167.

Sharif, N. (2006). Emergence and development of the National Innovation Systems concept. Research policy, 35(5), 745-766.

Skrzypek, E. (2011). Gospodarka oparta na wiedzy i jej wyznaczniki. Nierówności społeczne a wzrost gospodarczy, (nr 23), 270-285.

Smilor, R. W. (1987). Commercializing technology through new business incubators. Research Management, 30(5), 36-41.

Smilor, R. W. (1987). Managing the incubator system: critical success factors to accelerate new company development. IEEE transactions on Engineering Management, (3), 146-155.

Smith, A. (1976). An inquiry into the nature and causes of the wealth of nations. Oxford: Clarendon Press.

Spens, K., & Kovács, G. (2006). A Content Analysis of Research Approaches in Logistics Research. International Journal of Physical Distribution & Logistics Management, 36 (5), 374-390

Startup Poland, (2017), Annual Report: http://startuppoland.org/wp-content/uploads/2017/09/SP_raport2017_single_fix.pdf.

Storper, M. (1997), The Regional World, The Guilford Press, New York.

Storper, M., & A. Venables, (2004) Buzz: face-to-face contact and the urban economy. Journal of economic geography, 4(4), 351-370.

Strożek, P. (2012). Comparative Analysis of the Level of Knowledge-Based Part of Economies in European Union Countries with Kam Methodology. Comparative Economic Research, 15(4), 249-263.

Strożek, P. (2015). Gospodarka oparta na wiedzy w ujęciu regionalnym.

Szajt, M. (2008). Narodowy System Innowacji w Polsce na tle innych działających w Europie.

The Act on Higher Education of 27 July, (2005), Journal of Laws No. 164, item. 1365 as amended:
https://www.nauka.gov.pl/g2/oryginal/2013_12/d687905792f5ff6a3ecf84d7df4f8e57.pdf.

The Aviaion Valley, (2017), Official website: http://www.dolinalotnicza.pl/en/.

The Global Innovation Index. (2017). Global Innovation Index report: https://www.globalinnovationindex.org/gii-2017-report.

The Ministry of Science and Higher Education, (2017), Number of higher education institutions: https://www.nauka.gov.pl/uczelnie/.

The OECD, (2001). Education Policy Analysis 2001: https://www.oecd-ilibrary.org/education/education-policy-analysis-2001_epa-2001-en

The Oxford English Dictionary, (2018), The phrase "rule of law".

The Rzeszów University of Technology, (2018), official website: https://w.prz.edu.pl.

The World Bank, (2008). K4D - Knowledge for Development: http://siteresources.worldbank.org/KFDLP/Resources/461197119990709046 4/k4d_bookletjune2008.pdf.

The World Bank, (2012). Poland as aging society: http://www.worldbank.org/en/news/opinion/2012/06/14/poland-aging-and-the-economy.

Tödtling, F., (2006): The role of universities in innovation systems and regional economies, Expert meeting on the future of academic research Vienna, 19-20 October 2006.

Tsai, F. S., Hsieh, L. H., Fang, S. C., & Lin, J. L. (2009). The co-evolution of business incubation and national innovation systems in Taiwan. Technological Forecasting and Social Change, 76(5), 629-643.

UNIDO (2005) Capability Building for Catching Up: Historical, Empirical and Policy Dimensions, Industrial Development Report (Vienna: United Nations).

Van der Poel G., (2013): “The role of proximity for business development in business incubators”, 2013.

Van Looy, B., Callaert, J. and Debackere, K. (2006) ‘Publication and patent behavior of academic researchers: Conflicting, reinforcing or merely co-existing?’. Research Policy, 35, 596-608.

Verma, S. (2004). Success factors for business incubators: an empirical study of Canadian business incubators. Dissertation of Master of Management Studies. Ontario: Eric Sprott School of Business Carleton University Ottawa.

Volkov, D., & Garanina, T. (2007). Intangible Assets: Importance in the Knowledge-Based Economy and the Role in Value Creation of a Company. Electronic Journal of Knowledge Management, 5(4).

von Hippel, E. (1986). Lead users: A source of novel product concepts. Management Science, 32(7), 791–805.

von Hippel, E. (2005). Democratizing innovation. Cambridge, MA: The MIT Press.

von Krogh, G., Ichijo, K., & Nonaka, I. (2000). Enabling knowledge creation: How to unlock the mystery of tacit knowledge and release the power of innovation. New York: Oxford University Press.

Wang L., (2012): "Business Incubator: a Cradle for SMEs and Innovation".

Weber, R. (2004). The Rhetoric of Positivism Versus Interpretivism: A Personal View 1. MIS quarterly, 28(1), III.

Weinberg, B. D., & Berger, P. D. (2011). Connected customer lifetime value: The impact of social media. Journal of Direct, Data and Digital Marketing Practice, 12(4), 328-344.

Wenting, R., (2008) Spinoff dynamics and the spatial formation of the fashion design industry, 1858–2005. Journal of Economic Geography, 8(5), 593-614.

Weresa, M. A. Innovation, human capital and trade competitiveness: how are they connected and why do they matter? Comparing countries in Europe, North America, and Asia.

White, D. S., Gunasekaran, A., & Ariguzo, G. C. (2013). The structural components of a knowledge-based economy. International Journal of Business Innovation and Research, 7(4), 504-518.

Wiggins, J., & Gibson, D. V. (2003). Overview of US incubators and the case of the Austin Technology Incubator. International Journal of Entrepreneurship and Innovation Management, 3(1-2), 56-66.

World Bank (1997), World Development Report (Oxford: Oxford University Press).

World Bank (2000): Economic Development and Environmental Sustainability Policies and Principles for a Durable Equilibrium.

World Bank, (2017). Poland - export and import data: https://wits.worldbank.org/CountrySnapshot/en/POL/textview.

Zablocki E.M., (2007): "Formation of a Business Incubator. In Intellectual Property Management in Health and Agricultural Innovation", A Handbook of Best Practices, Chapter 13.6.

Żak, K., (2016). The knowledge economy-the diagnosis of its condition in selected countries. Studia Ekonomiczne, 271, 176-188.