
Development of Innovation Economy - Activity of Local Government in Poland*

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Abstract:

Purpose: The paper aimed to check the activities of local governments contributing to the development of the innovation economy in Poland as well as to find the answer to the questions if local governments both support innovations, as well as implement innovations themselves. Moreover, the purpose of the paper was to find out if activities of local governments depend on their type (rural, urban, urban-rural) or not?

Approach/Methodology/Design: In order to achieve that the method of desk research, quantitative and qualitative research were used. The first part of the research was based on a literature review and the second concerned the development of the survey questionnaire based on the literature review. The questionnaire survey was developed and the whole population (2479) of local governments in Poland, was investigated, in early - using the CAWI method.

Findings: We have got the answers from 453 local governments. The conducted analysis showed what kind of innovation is undertaken by Polish local governments frequently, we also find out what kind of activities they undertake to increase the innovation economy.

Practical Implications: LGUs should continue implementing the innovations resulting from ICT infrastructure and e-government at local level development. Both the world trends as well as last pandemic time confirmed the need of boosting innovations in this area. Secondly, the LG authorities should cooperate with business actors, coming from the other public sector, academia, and civil society.

Originality/Value: The research has enabled to develop a conceptual understanding of the relationship between local government and innovative activities.

Keywords: Innovation, economy, local government, ICT infrastructure, e-government.

JEL Code: H70, O30.

Paper Type: A research study

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1. Introduction

For many years, innovations have played an important role in the development of the economy and occupied an important place in the development policy of countries, regions and enterprises. Recently, many of the world's most developed countries and regions have moved from an industrial economy to a knowledge economy, which is based mainly on information and innovation (Sawyer, 2006). "Innovation is the only way for the most developed countries to secure sustainable long-run productivity growth" (Bloom *et al.*, 2019). More and more attention is paid to research to the questions of why, how and where innovations are generated, then effectively implemented and developed (Archibugi *et al.*, 1999). Research on innovation ecosystems has also become more and more popular (Klimas and Czakon, 2021).

Thus, the subject of innovation exists not only in business but also in the public sector (i.e., education, social innovations). Traditionally, the role of government is seen as focused on politics and administration: the introduction of appropriate laws and regulations, although more and more research about their activities in the context of innovation can be indicated (Luke *et al.*, 2010). There is research that confirm that government policies and regulations can promote or hinder innovation (Patanakul and Pinto, 2014).

A very important area of influence of public authorities is the implementation of innovation policy consisting mainly in supporting entities generating and implementing innovations, the development of modern infrastructure (i.e., e-government), as well as facilitating and intensifying cooperation between science and business to create innovative solutions. An important issue in the process of creating innovation is a cooperation between the science and business sector, as the effects of such cooperation correspond to the market needs in terms of new products, services, technologies, etc. The triple helix concept states that the key to improving the conditions for innovation in a knowledge society lies in the interaction between academia, business, and government (Etzkowitz, 2003).

In recent years, many initiatives have been taken in Poland to increase the number of innovations implemented in the economy. The development of an innovative economy in Poland is supported both at the national and regional levels. An important role in this process is also played by numerous business environment institutions, which offer a wide range of services supporting both scientists and entrepreneurs at every stage of the innovation process (from idea to commercialization) (Chowdhury *et al.*, 2019).

Poland belongs to the group of moderate innovators and we are still quite far from the most innovative countries (Bloch and Bugge, 2013). According to the Bloomberg innovation ranking of 2020, Poland took 25th place out of 60 analyzed economies (and unfortunately fell by three places compared to 2019). In turn, according to the Global Innovation Index, it was ranked 39 out of 129 analyzed economies (Global Innovation Index, 2019). Therefore, efforts should be continued to support the

development of an innovative economy in Poland. The studies conducted so far allowed us to conclude that a very important role in this process is played by regional and local authorities, which on the one hand set the directions of development, and on the other hand, support activities aimed at the development of an innovative economy in the region, e.g. through science-business cooperation projects. Joint implementation of projects of companies and research units allowed to overcome barriers in contacts between these communities and changed the awareness of Polish entrepreneurs and strengthened trust in public structures.

Moreover, it contributed to the development of communication and information exchange systems among employees of companies and the R&D sector, and consequently to the improvement of the knowledge transfer and innovation process. Local governments are assumed to be important actors in the regional innovation system (Cooke, 2001; Deng *et al.*, 2019). There is insufficient empirical evidence for the role of local government in the discussion on innovation development. While the central government is expected to plan national policies with the overall welfare of the nation, local authorities play a complementary role as they are often required to implement these national policies in relation to local conditions and needs (Okamuro and Nishimura, 2020). When analyzing the literature on the subject, it can be concluded that most of the publications concern about the role of local government in supporting innovative activities of enterprises or creating a favorable ecosystem.

However, a certain gap was noticed in the research on the implementation of innovations by local government units. For several years, discussions on this subject have been undertaken in public debate and, unfortunately, the innovation in the functioning of Polish local governments still considered insufficient compared to the achievements of partners in Western countries. This is also confirmed by the competition organized in Poland, entitled Innovative Local Government 2019, to which only 181 (out of 2 479) local government units applied.

The research problem concerns the activity of local governments (LGs) in Poland in creating an innovative economy. The scientific goal of the undertaken task is to identify innovative projects implemented by local governments and to indicate examples of the so-called good practices. Do all local governments, apart from supporting innovation, undertake activities in this area and implement innovations themselves? If so, what kind? If they do not undertake such activities, why? Is there a relationship between the innovative activity of local government units and the innovation of the region they belong to?

The article aims to investigate the innovation activity of local government and to identify which types of innovations are most common. We want to find out, What actions LG are they taking? What innovative solutions does LG implement? Which type of local government (rural, urban-rural or urban) is most involved in innovative activities? Which of the implemented solutions could be implemented in other units (LGUs) in Poland, and also in other LGs from other countries.

To achieve the research aim the paper is divided into five sections. The first brings in the literature review concerning innovations in the economy resulting in development, especially at the local level. The second one discusses local governments vs innovations. The third section refers to the methodology of the research. In the fourth part, the results and discussion are presented. In this section, the relations between the innovative activity of local government units and the innovation of the region they belong are discussed. The last part concludes the paper by commenting on the research and suggesting their possible future development.

2. Development of Innovation Economy

In the contemporary world of the recent socio-economic crisis, demographic changes, global competition, protectionism, the industrial revolution, research, and innovation have proven to be an essential part of the large-scale recovery package for Europe. Economic challenges concerning the crucial environmental issues of achieving climate neutrality by 2050, improving the health and quality of life of citizens, and stimulating the economy towards global leadership in clean products and technologies while using natural resources sustainably, make innovation take on a new meaning. The new strategic guidelines are aimed at modernizing the economies, make them greener, more digital, and more resilient by implementing multiscale and multi-sectoral innovative adaptation pathways. Europe is becoming the accelerator and enabler of change and innovation that requires a multi-sector strategy based on its unique characteristics and strengths: its ability to cooperate across borders and value chains, evolution in investments, cultural and traditional diversity. The combination of social, environmental, and economic aspects based on SDGs is a mechanism of modern innovative development policy reconsidering the relationships between various levels of the local and global. The effective tools to implement it are strategies with clearly defined objectives, linked to funding mechanisms.

European Commission is constantly monitoring the results of actions taken at all levels from European through national to regional, which are to result in economic and social transformation towards an innovative Europe. The European Innovation Scoreboard for 2020 shows that EU innovation performance continues to increase at a steady pace. The most popular report's innovative indicators are the human resources (new doctorate graduates, lifelong learning, attractive research systems, innovation-friendly environment), investments, innovation activities covering public-private partnerships, intellectual assets, employment, and sales impacts. At the global level, innovation indicators for the EU have exceeded the achievements of the United States, China, Brazil but still lag behind Japan, South Korea, Australia. Since 2012, European innovation performance increased in 24 EU Member States and decreased in only three. In 2020 Poland has been classified as the Moderate Innovators, the country with a relative performance in 2019 between 50% and 95% of the EU average in 2019.

European industry continuously needs to innovate to stay competitive and aligned with its priorities including the Europe Fit for the Digital Age and an Economy that

Works for People contributing to a strong social Europe. Industrial policy should provide the best conditions for innovation to develop and to give it direction for smart, sustainable, and inclusive growth. Innovation is the main element of the current new Industrial Strategy for Europe, which sets out ambitious ecological and digital transition solutions on objectives in a world that is increasingly unstable and unpredictable. The Strategy considers solutions in innovation, investment, and skills, reinforcing the citizen participation processes and incorporation of new technologies in the decision-making processes.

Together with the Recovery Plan for Europe, the biggest ever package of measures to revive the economy, the new Industrial Strategy addressed the key challenges of today and tomorrow by maintaining Europe's global competitiveness and strengthening our industrial and strategic autonomy. The drive for an innovative, sustainable EU economy is also the European Green Deal Action Plan, which uses an innovative approach to turn climate and environmental challenges into new opportunities in all policy areas and to ensure that the transition is fair and inclusive. The human-centric approach, sustainability, and resilience mean responsible innovation, not only aimed at increasing cost-efficiency or maximizing profit, but also at increasing prosperity for all involved: investors, workers, consumers, society, and the environment, according to Industry 5.0. concept.

The above strategic guidelines clearly indicate that innovation is an important element of regional development in the process of creating new values covering the i.e. natural resources, economic potential and business environment institutions, social capital, human potential, knowledge and innovation, infrastructure (Blakely, 1994). The new assumptions of the regional policy, focusing on increasing the competitiveness of regions, assume, inter alia, a continuation of actions aimed at increasing the endogenous innovation – the quality of human and social capital recognized as modern factors of growth and socio-economic development, considering innovation important role in entrepreneurship (Arif, 2012; Schumpeter, 2005). Innovative Europe requires commitment, simultaneous and synchronous efforts from political, business, and social leaders.

In order to support the emergence of new value chains in Europe, Commission proposes that the EU Member States should combine regional and industrial policy tools when pursuing economic policy as a way to help regions to innovate based on regional specialization. Boosting innovative activities requires a combination of policy measures aimed at enhancing the knowledge base of locations, aiming at improving the efficiency of national and regional innovation systems (OECD, 2011).

The effective mechanisms for implementing regional policy are strategies aiming particularly at increasing the quality of education systems and skills to foster the innovation capacity of regions, promote entrepreneurship and the R&D-friendly culture, support knowledge-exchange, mobility and cooperation between public and private entities. The latest directions in Poland's regional policy are based on the model

of responsible development adopted in the "Strategy for Responsible Development until 2020 (with the perspective until 2030)" (SOR). It provides for the development of Poland as socially and territorially balanced, where the local resources and potentials of all regions are effectively used.

According to the SOR, responsible development is the building of competitive strength with the use of new development factors, inclusive participation in community development and benefits for all social groups living in different places of the country. The above objectives, constituting the guidelines for the regional policy until 2030, are reflected in the National Strategy for Regional Development 2030 (KSRR 2030) - the basic strategic document of the Polish regional framework. The leading idea of the KSRR is "Socially sensitive and territorially balanced development" - for the regional policy this means the necessity to focus attention on counteracting excessive developmental disproportions, both between regions and within regions. The role of the KSRR is therefore to link and coordinate measures implementing the horizontal objective of strengthening the competitiveness of all regions, cities and rural areas with the support for economically weaker areas that ensures the cohesion of the country's development.

3. Innovation and Local Government

It is widely acknowledged that innovation is the key to economic growth and nowadays it is one of the most important and most complex issues faced today (Tohidi and Jabbari 2012). The term 'innovation' has many dimensions and different ways of defining it can be identified in the literature. On the one hand, it is driven by scientific discoveries in order to find solutions that innovate the existing practices. It involves technical knowledge, which may be generally available, but may also often include new scientific and technical expertise, the outcome of original research activity (Freeman and Soete, 1997)

On the other hand, it is driven by society's evolution - adapting to emerging societal needs and realities. New technologies also play an important role in the decision-making process, allowing policymakers to know first-hand the society's needs, demands and ideas (Castro *et al.*, 2018). Innovation is therefore related to new, value-creating inventions in a specific area such as technology, finances, social and governance. Innovation is connected with all scientific, technological, organizational, financial and commercial undertakings which lead to the implementation of technologically new or improved products, processes, or organizational improvements (Hashi and Stojčić, 2013).

In economic terms, innovation is a process, but the term can also refer to the outcome of that process, such as a new product or service – changes that create added-value, usefulness and functionality (Forbes, 2016). Innovation is thus demonstrated in implementing or commercializing a new or improved product or service, introducing new production processes or improving existing business processes, developing new

supply sources such as materials, equipment and other inputs, fundamental changes in industrial and organizational structures (Betz, 1987; Tohidi, 2011).

Innovations differ in terms of the degree of novelty (Su and Tang, 2016). From the technology and market perspective, there are four types of innovation: architectural innovation - applying the knowledge, skills and technology within a different market, radical innovation, incremental innovation, disruptive innovation. Incremental innovation is the most common form of innovation – it covers the refinements of existing routines or products increasing value to the customer. Disruptive innovation creates new markets or value networks – it is the process that improves a product or service by developing a new consumer segment in a new market or by persuading consumers to defect from the existing market (Rajagopal 2014). Radical innovation gives birth to new, revolutionary industries, technological systems that involve significant conceptual breakthroughs (Kasmirea *et al.*, 2012).

However, in the literature also other classification can be founded (Berkhout *et al.*, 2006). Thus, traditional industrial innovations have been recently compared with the specific characteristics of human-related service innovation. When it comes to public sector innovations Windrum identifies six types of innovations: service, service delivery, administrative /organizational innovations, systemic innovations, policy innovations and conceptual innovations (Windrum, 2008).

In the last decade, social problems have been growing with particular intensity, both in rural and urban areas. They are related to poverty, lack of new jobs, population aging, digital exclusion, or rural depopulation. Therefore, in today's world, the concept of innovation is taking on a new meaning and also the term of social innovation has been defined as the concept of solutions to social exclusion problems (Gerometta *et al.*, 2005). Social innovations arise as a result of knowledge applied to social needs, through the participation and cooperation of different actors, resulting in new and sustainable solutions for social groups, communities or society (Souza *et al.*, 2019). Social innovation is defined as the emergence of new social, organizational and institutional arrangements or new products and services designed to meet social challenges (Bolzan *et al.*, 2019). They can take many forms, from redistribution mechanisms to providing health care, education, and even providing sustainable energy sources (Desmarchelier *et al.*, 2020).

Recently, social innovation is noticed especially in rural areas as effective solutions in overcoming typical problems, such as isolation, lack of opportunities for young people, and aging society (Lombardi *et al.*, 2020). The term „inclusive innovation” addresses the group of people who are excluded from them (base-of-the-pyramid, BoP population), covering social and economic aspects in the developing world. It involves discovering new business models, reconfiguring value chains and redesigning products in a scalable and sustainable manner with a significant outreach (Mohnen and Stare, 2013). The idea of giving citizens and employees a voice in future developments in their region, business or other institution has been expressed in social

innovations. Besides money, values such as quality of life, health, climate change, social services play a key role in citizens' perceptions and decisions. An expression of this approach is the increasing number of social entrepreneurship and cooperative-network innovation fields enhancing the product, technological, and process innovation on social and environmental results.

The multidimensional nature of social innovation offers a set of tools to support regional development - social, educational, advisory, inspirational, ecological, and recreational. Relations of the inhabitants and experience gained during jointly implemented initiatives are conducive to pro-entrepreneurial activities and should translate into the innovative activities, creation of companies, new-business models contributing to the formation of „responsible innovation” defined as the „transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products” (Von Schomberg, 2011). The given examples of just a few types of innovation, clearly show that a broad concept of innovation is the response to the economically, socially, and environmentally changing world, its threats and concerns. It definitely exploits opportunities to become more effective, sustainable, competitive, market- and people-oriented. The invaluable role of the initiator of potential future developments plays the regional government actively cooperating with the local stakeholders, contributing to the innovative economy, in line with the Lisbon and more innovative Europe 2020 Strategy to make Europe "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion, environmental protection and risk prevention" (Enhancing-the-role-of-social-economy-in-attaining-the-Lisbon-agenda-objectives.pdf, accessed 19.01.2020.).

An innovative economy responds to many challenges in the areas of research and development, research infrastructure, agriculture, ICT. It fosters the creation of innovation potential, modernization of the production base of companies and the increase in R&D expenditures. The active government's innovation policy should fill in the gap between the scientific and technical sphere, fostering the ecosystem of cooperation between education, research and industrial sector, developing measures for the transformation of scientific and technological advancements in the knowledge-based, competitive products (Safiullina *et al.*, 2014). In Poland, the abovementioned priorities correspond with the Regional Innovation Strategies (RSI), that, tailored to the regional needs, build a regional innovation system in a way that fosters the creation, transfer and use of knowledge for socio-economic development. Particular regions are characterized by different institutional capacities related to political, economic and social contexts enabling or constraining the design and implementation of place-based policies (Morisson and Doussineau, 2019). The instruments of intra-regional policy conducive to the development of a pro-innovative environment include, among others: identification of industries and institutions in the region that may become the pillars of the system (regional smart specializations), increasing

institutionalized and non-institutionalized cooperation between enterprises, business environment institutions, local administration, development of innovative SME's by creating favorable conditions for the formation and success of high-tech organizations, development of the infrastructure of the innovation process, including information support system.

Innovation research is principally concentrated on innovation in the business sector (Ramdani *et al.*, 2019), but many researchers have recently carried out research on measuring public sector innovation through large-scale in Europe and Australia (Arundel *et al.*, 2019). Research concerning innovation in the public sector till the late 2000s was conducted by researchers interested in public administration or management using case studies, interviews and specific data innovation in public sector agencies. Much of this works have focused on the effects of management, organizational factors, and personal characteristics of managers in terms of innovation. In 2002 research including innovation surveys of local authorities or public sector managers were conducted in Norway, Finland and England. After 2008 a lot of different studies on innovation in the public sector were carried out (Arundel *et al.*, 2019).

Numerous scholars argue that the public sector must find radically new ways to innovate and to deal with radical challenges such as climate change, aging society, obesity and the financial crisis. One of the example can be a new form of innovation called "collaborative innovation" which can be a remedy for the problem of public sector innovation (Bommert, 2010; Söderström and Melin, 2019). In the literature, there are many explanations for the deficiencies of public sector innovation. For example, Eggers and Singh (2009) claim that governments should not be satisfied with their ability to innovate. They underline that governments have problems with idea generation, selection, implementation and diffusion (Eggers and Singh 2009).

As a consequence of these deficiencies, government does not achieve to produce the necessary quality and quantity of innovations in order to meet the emergent and persistent social, economic and environmental challenges (Bommert, 2010). The public sector consists of general government (public administration entities at all levels of government, regulatory agencies, and government entities that provide services such as education, health, security, etc.) and publicly-owned corporations (Arundel and Huber, 2013).

However, in this paper, we concentrate only on local government units (LGU) and their activity in the field of innovation. By implementing innovation, public organizations and local government units can improve the quality of public services, improve service efficiency and streamline processes (Pratama, 2019).

In the case of LGU, product innovations include modifications, improvements and changes in the form of services it provides. The task of product innovations is to provide customers with new and greater benefits, in this case, e-services will be of

great importance for the LGU. The creation of e-services by the commune is very important for its development. They are also activities related to electronic communication between the office and the citizen. The introduction of such services causes changes in the organizational, legal and IT sphere. The introduction of a system with which e-services can be realized requires adjustments in all areas of the office's activity, from budget accounting, through recording systems, and ending with the handling of taxes and local fees. Introducing product innovations in an LGU is inextricably linked with technological innovations that may occur within the process or product. The first is the party technologically new or significantly improved methods of production. LGs around the world establish so-called innovation laboratories in order to improve their innovation capacity.

These innovation laboratories are usually embedded in a government structure and can be inter-departmental (involving two or more administrative departments) or created within a specific administrative department. They are particularly designed to create and develop innovation (Timeus and Gascó, 2018). Moreover, the authors dealing with this topic underline the need of new approaches to government development because presently almost all countries are trying to develop and innovate their government with ICT what is called e-government (Sangki, 2018).

The goal and task of e-government are to provide citizens with public services and information by new technologies. The functioning of e-government guarantees citizens access to all public services (including information) without restrictions. This groups of LG's innovations are important and satisfying for citizens/clients, what the research of Welch, Hinnant, and Moon (2005) also confirmed (people are mostly satisfied with the implementation of e-government. The implementation of the e-government and using ICT infrastructure by LGUs can be the starting point for the development of other e-services and other innovative products.

Defined research questions and the lack of an unambiguous answer, was the reason for our involvement in the research at the local level. While the innovation at the national or regional level (Morisson and Doussineau, 2019; Deng *et al.*, 2019), have more interest and frequently are analyzed in EU statistics, by an international institution. Due to the administrative diversity of particular countries, it is difficult to speak about a universal measurement of innovation in the public sector at the lowest administrative level. Basing on the literature studies (above-mentioned research in Europe) we focused and conducted research on the lowest - local level. In our research by innovation undertaken in LGU, we understand an introduction of new products, processes or services and application of distinctive administrative systems, or any combinations of these factors that influence the overall performance of LGU (Makhdoom *et al.*, 2019).

4. Research Methodology

To elaborate on the necessary information about present directions of the innovative economy development we conducted desk research. This part of the research was devoted both to establishing the theoretical framework of the innovative economy development directions as well as to broadening the knowledge related to innovative LG activities. To this end, the identification of the innovative approaches, trends and innovation types was performed. This part also presents the relationship between innovation and local government, taking into account the latest research directions. Aiming to understand LG engagement in process of the development of the innovative economy, the effects of ongoing changes were analyzed. To analyze innovations undertaken by LGUs the qualitative and quantitative methods were deployed simultaneously.

In order to complement the empirical research the survey questionnaire was developed, and by using the CAWI method whole population of LGUs in Poland was investigated. When developing the questionnaire we based on a literature review and identified types of innovations. The LGUs, most commonly known in the literature of the subject as commune and municipalities, are represented in Poland by rural, rural – urban and urban types (the lowest level in the administrative division in EU). In order to ensure the uniformity and quality of the questionnaire surveys, we asked the LGUs managers/leaders to complete the questionnaire each time. In the questionnaire, we asked them about the policy they implement (strategic document, separate department/unit for innovation in the LGUs). We also checked what kind of innovations were implemented by particular LGUs:

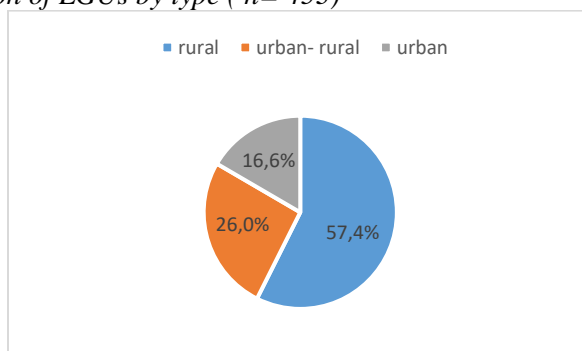
- new or improved service/product implementation (e.g., e-government as the base for the other services development, a separate unit for cooperation with business clients, a separate unit for cooperation with residents, new free time infrastructure solutions to increase rainwater retention, ecological public transport electric car, city bike, car-sharing, a place designated for cooperation with business coworking space, solutions in the field of energy transformation, infrastructure for ecological means of transport (e.g., electric vehicle charging stations, preferential parking conditions);
- new or improved organizational methods implementation (e.g., training of local government administration staff, new information and communication systems);
- new or improved administrative systems (e.g., system of shortening the time of customer service, electric car rental system, solutions to minimize air pollution (e.g., replacement of furnaces),

We also check how it looks like the relation of LGUs with other local actors and market participants (new cooperation establishments with business, other LGUs, academic sector, with non-governmental organizations). Following the importance of social innovations, we checked the educational solutions that shape the innovativeness

of children and youth, a mechanism for monitoring and evaluation of implemented solutions, a new solution aimed at solving social problems, a mechanism to support grassroots civic initiatives such as public consultation and civic education. Taking into account the trends in societies, finally, we checked if the LGUs use social media (Facebook, Twitter, YouTube).

The research was conducted between 1-31 December 2020. Research methods included surveys of the whole population of Polish LGUs, in early. There were 453 responses from LGUs leaders representing 18,3 % of all LGUs in Poland. The vast majority 57,4% of the respondents represented rural LGUs 26% of respondents represented urban-rural LGUs and 16,6% represented urban LGUs (Figure 1). In order to check the dependencies between particular innovation and type of LGU (urban-rural, urban) the Spearman's rho correlation coefficient was used.

Figure 1. Division of LGUs by type (n= 453)

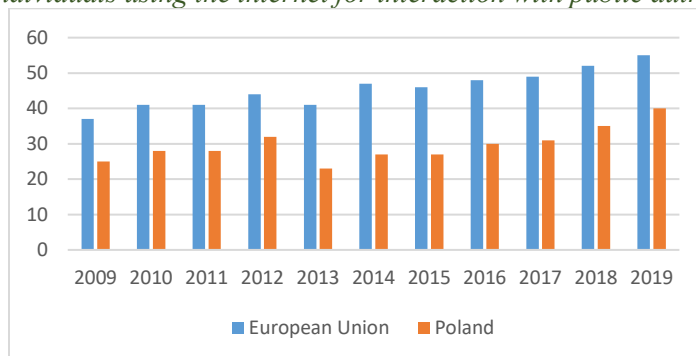


Source: Own elaboration.

Next to the primary data we also used secondary data. In order to underline ongoing changes, trends in the context of the analyzed issue we took into account data about online interaction with public authorities by individuals. To this end, we use secondary data from Eurostat concerning EU countries as the background for Poland.

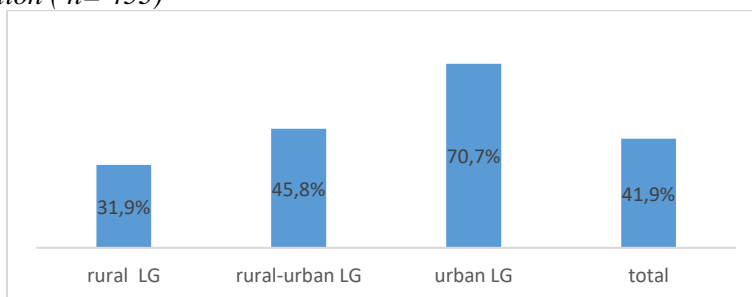
5. Results

In order to check the general trends referring to LG's innovations in the ICT infrastructure area and e-government in the international context and to assess the Poland condition, we use data of the interest of the individuals in online public sector contact. Creating and inventing innovative solutions and systems for which it is necessary to use ICT infrastructure will make sense only when people know about the availability of such a service and show a willingness to use it. As the confirmations of ongoing trends, we checked contact of individuals with public authorities in the EU (Appendix 1). We confirmed and present in Figure 2 that it is becoming more and more popular, and intensification of using the ICT infrastructure for interaction with public authorities by individuals is observed.

Figure 2. Individuals using the internet for interaction with public authorities (in %)

Source: Own elaboration basing on Eurostat data (access 19.02.2021).

To assess the readiness of Polish LGUs for developing the Polish innovation economy from the bottom up, for improving the living conditions of the inhabitants, from meeting the expectations of the inhabitants related to innovation, we used the data from the survey. The research carried out indicates that the functioning of a development strategy in a LGU, taking into account the development of innovation, is strongly correlated with its type (Spearman's rho correlation coefficient $S = -0.27$). In rural LGUs, having such a strategic document is declared by less than one-third of the surveyed entities (32%), while in urban LGs – is much more (70,7%). Most of the surveyed LGUs (58,1%) declare that they do not have a local development strategy that takes into account the development of innovation.

Figure 3. LGU with a development strategy that takes into account the development of innovation (n= 453)

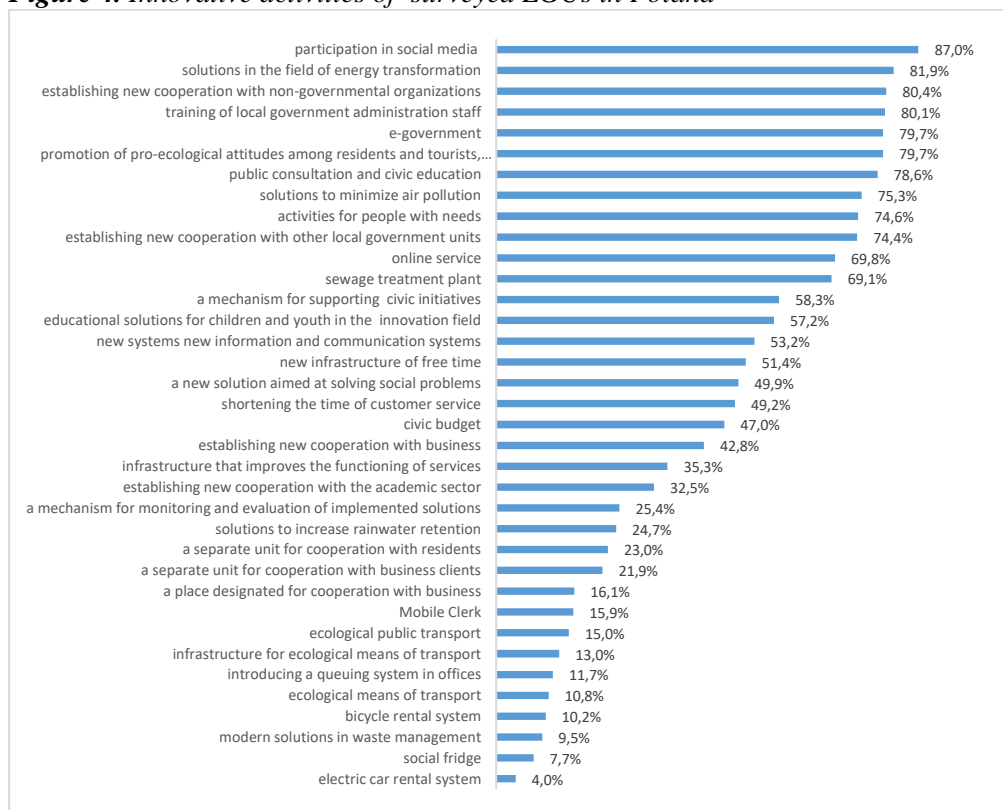
Source: Own elaboration.

The functioning of a separate department or unit for development in the commune depends on the type of municipality. The percentage of confirmatory answers in urban communes was 20% - over ten times more than in urban-rural communes. ($\rho S = -0,199$). Only in 24 of the surveyed communes (which constitutes 5,3%), there was a separate department or unit for innovation.

In terms of experience in implementing innovations by LGs, more than a quarter of the LGUs participating in the survey (25,8%) declare that in the year preceding the survey, they implemented at least one innovation.

Experience in implementing innovative solutions is strongly correlated ($\rho S = -0,251$) with the type of the LGU. As in the case of organizational and strategic solutions, the practical implementation of innovations is also the domain of urban LGs, 43% of which have introduced at least one innovative solution in the last year. In rural communes, this percentage was more than two times lower (17% of the positive answers). The most frequent innovations implemented by LGs are: activity in social media (implemented in 87% of municipalities), solutions in the field of energy transformation (81,9%) and establishing cooperation with non-profit organizations (80,4%). Also, implementation of e-government was introduced by 79,7 % and promotion of pro-ecological attitudes among the inhabitants (79,7%). The relatively least popular innovative solutions were social refrigerators (they operate in only 8% of the surveyed LGUs) and local electric car rentals (4%). In Figure 4 all innovative activities of surveyed LGUs in Poland are presented.

Figure 4. Innovative activities of surveyed LGUs in Poland



Source: Own elaboration.

The most frequent activities undertaken by Polish LGUs were: participation in social media, solution in the field of energy transformation and the development of e-government. Other indicated innovative projects mentioned by research participants were focused on two main fields: ecology and digitization.

Among the pro-ecological solutions changes in the infrastructure (such as replacement of street lighting with LED), investments in photovoltaics, support for waste segregation (e.g. by setting up "bottle dispensers" for PET bottles), investments in renewable energy, home sewage treatment plants or the construction of passive houses were implemented. In the digitization field, enabling the population to use many LGU services via the Internet, so the development of e-government. The respondents indicated for example: e-surveying, e-office, online enrollment to educational institutions or the possibility of booking books in a library via the network. Particular innovative solutions were implemented in the surveyed LGUs in different periods (2 years ago, 2-5 years ago, 5 years ago). Five years ago LGUs were most often involved in the construction of local sewage treatment plants - nearly half of the surveyed LGUs (47%) built them just then. Innovative solutions implemented in the period from two to five years ago concerned the inclusion of LGUs into the world of social media and undertaking tasks in the field of energy transformation. In the two years preceding the survey, municipalities focused on the one hand on innovative solutions to reduce air pollution, on the other hand - enabling customer service via the Internet (e-government and online service). Urban LGUs more often than others (rural, urban-rural) implemented e-government.

One-fourth of the surveyed LGUs established new departments for cooperation with business clients. In urban-rural and rural communes such units are much less frequent, however, it can be noticed that in the past two years they are observed more often than before.

The implementation of green transport solutions in urban LGUs took place primarily two to five years ago. In urban-rural and rural LGUs, the intensification of introducing this solution has been visible in the last two years. The implementation of innovative solutions in the field of queuing systems in municipal offices is the domain of urban LGUs. In the past two years, they were implemented in cities four times more often than in rural communes. The implementation of innovative solutions aimed at solving social problems does not significantly differentiate the surveyed LGUs by their type. More than five years ago, more solutions of this type were created in cities, but now the proportions are similar. The urban LGUs were the first active in social media. However, in the last 2 years, the popularity of social media also grew in urban-rural and rural LGUs.

6. Discussion

Various modernization efforts have been made in recent years in the public sector to transform public service delivery in many countries. Most efforts were focused on

improving the efficiency and effectiveness of internal government operations, communication with citizens and transactions by providing information and services on the Internet (development of e-government) (Gonzalez *et al.*, 2013) what was in accordance with our research. We analyzed LG's innovations in the ICT infrastructure area and referring to e-government. Also, Ebrahim and Irani confirmed that innovations in ICT and e-government results in many benefits for LGUs (e.g., standardization of processed data, reducing costs by giving up paper documentation, saving time needed to service the client, improving data exchange with other authorities and entities), and for customers (e.g., unlimited office hours, greater accessibility for people with disabilities, reduction of formalities, faster communication and obtaining information, etc.).

Moreover, innovation in ICT caused LGU's ICT infrastructure have become convenient channels of communication between the LGU and their customers (Ebrahim and Irani, 2005). LGU's activities referring to using ICT improves efficiency, improves service, helps to reduce corruption, promotes openness and confidence in government and it helps to build trust between the authorities and its citizens, and helps to achieve specific policy outcomes by sharing information and ideas (Putra *et al.*, 2018).

Our examination showed in line with Borins (2001) research that the most frequently observed characteristics of the innovations were: use new information technology, incorporate process improvements, empower citizens and communities, and involve partnerships with the private sector (Borins, 2001). Innovations were also more frequently a response to internal problems or opportunities for improving performance. Our research results are also in line with Gonzales exploration of Spanish LGs where the most frequent innovations were collaborative type, which encourage relationships with the external environment, especially with citizens, and which revolved around investment in ICTs (Gonzalez *et al.*, 2013).

In our research, we used the collaborative approach to enhancing public innovation through the formation of networks, partnerships and other forms of collaborative governance. We found out that cooperation establishments with non-governmental organizations and other LGs are undertaken more often than cooperation establishments with the business or academic sector - these both are undertaken rarely. The importance of cooperation at the local level presents also Torfing in his research and underlines that a large number of qualitative case studies have demonstrated the positive impact of collaboration on public innovation. Additionally, point out that LGs with weak interagency and stakeholder networks tend to have less extensive patterns of innovation. Moreover considering and including, into our research implemented by LGUs projects for innovations, we are in accordance with confirmed in USA research (Innovations in American Government Awards programme) that in public innovation projects rely increasingly on intra- and inter-organizational collaboration (Torfing, 2019).

Some limitation of our research is that we focus only on the local level and a large group of authors investigate the innovation economy by a prism of regional level e.g., a case study exploring the complexity of designing and implementing innovation policies in different regional innovation systems (RISs) in three different regional contexts inside and outside the European Union, region from the Netherlands, Spain and Colombia (Morisson and Doussineau, 2019).

7. Conclusion

Conducted literature study showed that in comparison with a long history of private sector innovation research, scholarly interest in public innovation is relatively young. Moreover, the research has enabled develop a conceptual understanding of the relationship between local government and innovative activities.

Many studies on innovations in the public sector have limitations - often deal with only part of public authorities and rather focuses on the governance of the public sector (Grčić Fabić *et al.*, 2016), concentrating only on the evaluation of implemented projects, or on assessing officially exposed websites, or focusing on internal organizational innovation e.g. how to measure organizational capacity for innovation, based on a case study diagnosis of a local government organization (Cropley, 2016). In this regard, we researched locally implemented innovations, to comprehensively understand the importance of implementing activities for the innovation economy. Generally, our study advances knowledge about the development of an innovation economy from the bottom up point of view. In detail, we extend and complement recent efforts aimed at identifying the activity of LGs in creating an innovative economy with particular emphasis on the type of LGU (rural, urban or rural-urban). Moreover, we investigated innovation activity of Polish LGUs and in parallel, we indicated examples the most common projects and we presented the example of projects which could be used as good practices for other LGs.

We conclude that it seems to be obvious continuing development of innovations with ICT infrastructure and e-government development because there are complementary for identified innovations implemented by Polish LGs. Moreover, in a national scale, the position of Poland in the sphere of residents interacting with the public sector online increased from 25% to 40% during the last 10 years. We recommend LGs should take advantage of this progress and follow customer preferences. The functioning of e-government has a significant impact on improving the public sector by developing new ways of interacting with customers.

Concluding the conducted research has a few important implications for local policy-makers. Firstly, LGUs should continue implementing the innovations resulting from ICT infrastructure and e-government at local level development. Both the world trends as well as last pandemic time confirmed the need of boosting innovations in this area. Secondly, the LG authorities should cooperate with business actors, coming from the other public sector, academia and civil society, because it enables them to create and

adapt innovations according to the needs of local actors and their preferences. The next one refers to strategic priorities for innovations, but to be conscious of endogenous limitations and to design and implement locally suitable innovations the strategy should be developed and updated. Otherwise, the lack of well-developed strategy, chaotic activities, undertaking innovations that do not correspond to the local needs or the lack of promotion of implemented innovations may result in the lack of effects for welfare, for improving the living conditions of the inhabitants, for satisfying the needs of the private sector, and finally wasting public funds.

How it results from the conducted literature review, the right level of innovations policy coordination is at the regional level, and the cooperation of LGU with authorities at the regional level is needed. This cooperation will help to avoid coordination failures. We are conscious of the limitation of the research only at the lowest local level separately and we take it as the starting point for the development of the research as a system.

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