

Article

Analysis of the Local Innovation and Entrepreneurial System Structure Towards the ‘Wrocław Innovation Ecosystem’ Concept Development

Joanna Helman 

Department for Laser Technologies, Automation and Production Management, Wrocław University of Science and Technology, 50-370 Wrocław, Poland; joanna.helman@pwr.edu.pl

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Abstract: The city of Wrocław is an important Polish center for creating innovations and modern technological solutions. In general, Polish innovation system is having problems with a lack of cooperation among different actors, a low level of commercialization and a weak uptake of technologies. Based on that, the objectives of this paper were set on the identification of the local innovation and entrepreneurial opportunities, the analysis of the current innovation system and the development of a community’s ecosystem theoretical concept. Currently, in Wrocław, many organizations are dealing with innovation. To assess the regional situation of the innovation system the ethnographic analysis was conducted. Each of the stakeholder segments was analyzed based on the resources, activities, value addition and value capture factors. The research showed a huge potential for creating an innovation ecosystem, however due to the variety of different activities, there is no common Innovation Ecosystem. Based on the analysis results, the Ecosystem Pie Model tool was used to create the ecosystem model concept. Research showed a huge potential for creating an innovation ecosystem. Therefore, Wrocław should aim to create a development policy framework that favors entrepreneurial innovation and will allow sustainable regional development.

Keywords: innovation ecosystem; innovation actors; sustainable regional development; community innovation

1. Introduction

The shift towards sustainable development requires the enhancement of innovation. Wrocław, the capital of Lower Silesia region located in SE Poland, is an important Polish center for creating innovations and modern technological solutions. The official population of Wrocław, the fourth Polish city in terms of population, in 2020 was 643,782 and estimated 1.25 million residing in the metropolitan area (Polish population is appx. 38 mln). In terms of economy, Wrocław is the third wealthiest city in Poland after Warsaw and Opole [1], having more than 126.3 thousand entities of the national economy. The GDP value in Wrocław is 86,968 PLN (19,454 EUR or 23,066 USD), where Polish GDP value is 51,776 (11,582 EUR or 13,732 USD) [2]. What is worth mentioning is that the Wrocław’s unemployment rate in January 2020 (before the COVID-19 pandemic) was 1.1% (average in Poland: 5.5%). Due to the close distance to German and the Czech Republic borders, Wrocław and the Lower Silesia region are important export and import partners for these countries.

Wrocław is influenced by its academic character, industrial and IT traditions and the presence of domestic and foreign companies. However, despite those advantages, the absence of common innovation strategy in the Wrocław municipality can be noticed.

In 2019 Poland was ranked 25th out of 27 EU countries within the European Innovation Scoreboard’s Summary Innovation Index, including such aspects of innovation activities like *Innovators*

(SMEs (Small and Medium Enterprises) introducing at least one product or process innovation, new organizational innovation or marketing innovation; either themselves or in co-operation with other organizations), *Linkages* (number of SMEs with innovation co-operation activities, number of public-private co-authored research publications, private co-funding of public R&D expenditures), *Intellectual assets* (PCT patents, trademarks and design applications per billion GDP). The distribution of scores can be seen in Figure 1.

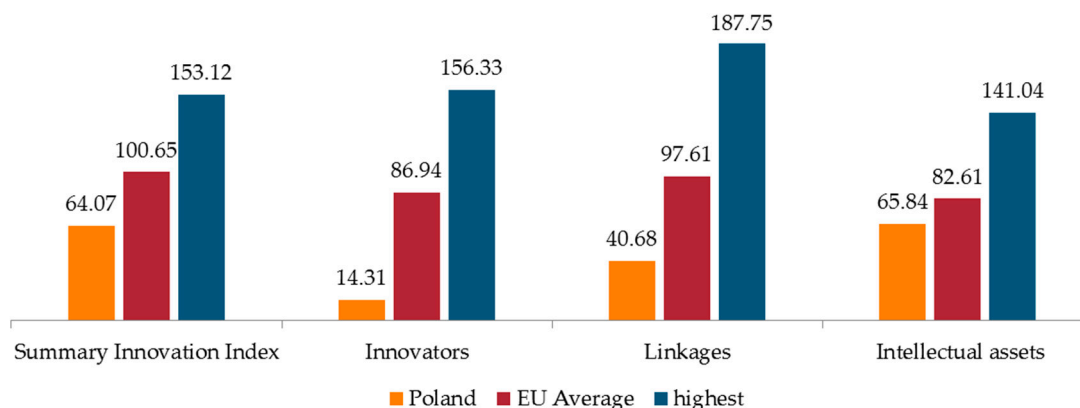


Figure 1. Distribution of Polish innovation index within European Innovation Scoreboard's Summary Innovation Index 2019.

The innovation Union Scoreboard also provides some data on Regional Innovation Systems, unfortunately they are prepared only for the NUTS 2 division (regions, not the cities itself). However, research on regional innovation activity in Poland showed that there is no statistical significance between metropolitan and non-metropolitan areas within the same NUTS 2 region in the innovative performance [3]. The Lower Silesia, of which Wrocław is the capital, in 2019 amounted to 57.04 score of the Summary Innovation Index, which is less than that of Poland (64.07). Based on that, it can be assumed that regional innovation environment of Wrocław can be generally compared to the Polish one.

As can be seen from Figure 1, the Polish innovation system, in general, is having problems with (1) low early-stage innovator's performance and (2) lack of cooperation among different actors. It is worth noticing that the number of intellectual assets does not correspond to creating innovation. This might be the result of the (3) low level of commercialization and weak uptake of technologies.

1. low early-stage innovator's performance—Polish companies in the early-stage are not focused on investments in innovation and R&D, furthermore, Poles establish fewer startups and own fewer international patents [4]. The current risk associated with introducing innovations can be considered by companies to be quite high. Some SMEs, due to the negative experiences from "innovation shock", are overly cautious when developing and implementing innovations [5,6].
2. lack of cooperation among different actors—Despite taking more and more measures to improve cooperation between science and business, there is still a number of obstacles. These include, in particular, complicated administrative procedures, maintaining very limited contacts with industrial companies, limited skills of researchers in managing joint public-private research and development projects [7–9].
3. low level of commercialization—No aggregated data on the commercialization effects are publicly available. As commercialization is still not well defined in the Polish legal and fiscal system there are no standards for collecting relevant data [8]. To present the problem of the low level of commercialization as a loss of possible profit from the research, the author used data of Wrocław University of Science and Technology—leading technological institution.

As can be seen from Figure 2, yearly incomes from R&D works and services are a minor fraction of the costs spent on research activities. This situation applies to all key technology and medicine universities in Poland [6,10,11]. Regardless of the existence of various funding programs and schemes, there are still some bottlenecks related to the low involvement of the regional innovation stakeholders (SMEs, start-ups, academia and research institutions, industry, business support organizations and policymakers) into cooperation. In order to eliminate this problem, it is necessary to develop a common vision of the innovation ecosystem.

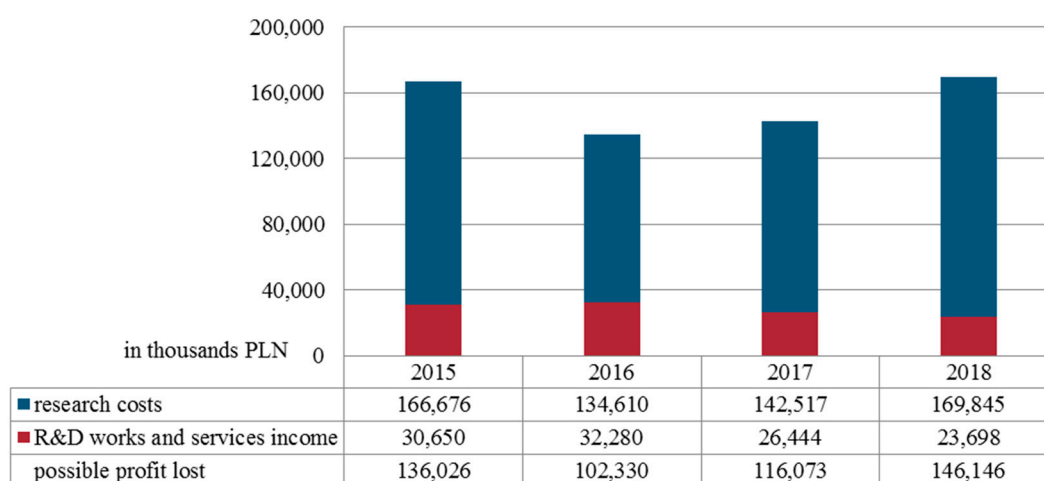


Figure 2. Research costs and yearly incomes from R&D activities at Wrocław University of Science and Technology. (In 2019, these indicators were not included in the university's financial statements).

The development of the theoretical concept of 'Wrocław Innovation Ecosystem' model might act as a tool for the evaluation of sustainable regional development based on the entrepreneurial-based innovation ecosystems exploitation. To the best of the author's knowledge, such research has never been done for the urban area of Wrocław, so the results will enable to hinder the gap in enhancing innovation systems for strengthening Wrocław's innovation capacity and regional development policy.

Based on that, this paper has three main objectives: (1) identify the local innovation and entrepreneurial community's opportunities, (2) analyze the current innovation system structure that will allow the promotion of broader sustainable regional development in terms of innovativeness, (3) the development of a community's ecosystem theoretical concept. To reach those objectives the paper is structured as follows: literature review on innovation systems, research methodology description, identification of the local innovation and entrepreneurial community's opportunities, presentation of the results of the current innovation system structure analysis, and the discussion on the development of the ecosystem model theoretical concept and conclusions.

2. Innovation Systems

An innovation system is 'a complex, dynamic, socio-technical, socio-economic and socio-political phenomenon which needs to be approached in a holistic way in order to assess and measure it properly' [12].

The innovation systems' model development has been adjusted to the market needs several times—it started from clusters, through networks, triple- and quadruple-helix model to finally reach the innovation ecosystem. That progress was connected with the possible growth of performance in the innovativeness of actors taking part in the innovation system, as well as the complexity of such a system (meaning the number of entities and their fields of operating). That progress is presented in Figure 3.

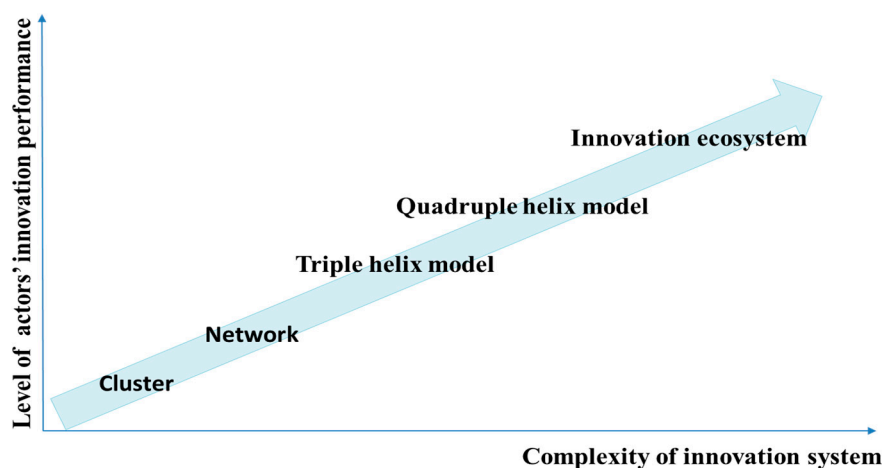


Figure 3. Innovation systems' models' development.

2.1. Cluster

Clusters are concentrations of interrelated companies. Firms linked in a cluster produce similar or related goods or services and are supported by some associated institutions from the same area, that provides business and technical support and assistance. Some dynamic clusters are connecting innovation-oriented firms that acquire the benefits of an integrated support system and dynamic business networks [13].

In terms of the level of actor's innovation performance this type of a system can be usually characterized by a low level of uptake of different technologies due to the limited contacts that actors have with industrial companies focusing mainly on the same areas of interests.

2.2. Network

Networks are alliances of companies whose aim is to grow and achieve an economic goal by mutual cooperation. They can be set between different firms within clusters as well as outside of clusters, sometimes connecting several clusters into one network. Networks can be built in two different dimensions-horizontal and vertical. Horizontal networks are established between companies that operate in the same market, with similar processes and similar resources. Vertical ones represent different levels of the value chain (suppliers, producers and customers). Some studies consider networks as a foundation in shaping the structure of innovation, recognizing that new technologies and products are rarely developed by one company [14,15]. It is also worth mentioning that a single network can have all the resources, skills and knowledge to develop innovation that can be spread across other firms [16].

In terms of the level of actor's innovation performance, this type of an innovation system can be characterized by a moderate level of uptake of different technologies. Based on the fact that entities in horizontal networks still cooperate with industrial companies focusing mainly on the same areas of interests, the growth of innovation capacities is not stimulated properly. However, vertical networks, thanks to increased connections with other firms focused on different operational aspects and business support organizations, can derive ideas and solutions from distinct fields, which can lead to increased innovation performance.

2.3. Triple Helix Model

The concept of a triple-helix of innovation was initiated in the 1990s by Etzkowitz and it has been described as a university-industry-government relations model [17]. It became a reference framework for analyzing innovation systems and delivered a background to describe the many interrelationships between the three main actors in the process of knowledge and innovation creation

and capitalization [18]. Unlike previous innovation models, where mainly industry and business support organizations and government were dealing with innovations, the triple-helix model assumes an important role to be played by the universities, since 'that innovation is being born at the intersection of industry, research and government' [19].

Thanks to the developed cooperation between science and business, the innovation performance can be assessed as high. The possibility of joint public-private research and development projects can lead to the development of many innovative products, technologies or processes. Companies that tightly cooperate with academia are usually more eager to test new solutions or to take an active part in their creation. What is more, such university-industry-government relations often lead to stronger competition in terms of new products or services creation, so more attention is being paid to develop and use modern technologies that lead to an increased level of innovation.

2.4. Quadruple Helix Model (Innovation System)

The efficacy of the Triple Helix Innovation Model has been doubted by some researchers due to the fact that some of the regions were not able to achieve the expected growth of indicators, like the level of innovation, employment rate or GDP development. [20,21]. It was proposed to include another helix in the existing triple helix model in order to improve it. Researches proposed 'Media and culture-based society' or 'civil society' as a new element [12]. The Quadruple Helix Innovation Model was created by the inclusion of another actor of innovation—society. The Quadruple Helix Innovation Model brings together four major stakeholders: university, industry, government and society.

In the Quadruple Helix model, innovation performance can be assessed as very high. The fourth actor—society (regardless of contacting through social media or 'in-person') can strongly influence the companies' needs to innovate and create disruptive technologies. Now, in the digital era, the interconnections within society, R&D and companies are very strong and dynamic. What is more, the awareness and requirements of the final customer are increasing. These aspects are strongly connected with the need for continuous development of the offered products and services to meet the expectations of customers.

2.5. Innovation Ecosystem

The 'innovation ecosystem' was mentioned for the first time in 2006 by Adner. He defines it as 'the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution' [22]. Research on the literature tackling the Innovation Ecosystem focuses on three main factors that correspond to the previously presented problems:

1. A common set of goals and objectives—designed to provide new products and services adapted to the market needs that are rapidly changing [23–26]
2. Relationships established among the members—productivity and profitability are closely related to the performance of the ecosystem itself [27–30];
3. Shared set of knowledge and skills—sharing and complementing each other's technologies and capabilities [31–34].

Innovation ecosystems are described as a network of interdependent and interconnected communities of stakeholders such as entrepreneurial organizations (e.g., companies, business support organizations, public institutions and sponsors like venture capitalists, business angels, banks), innovative organizations (e.g., universities, research centers, technology transfer offices), and entrepreneurial and innovative processes that build relationships to incorporate, create and mediate by the government initiatives oriented to conducting the performance of the local entrepreneurial environment [35–39].

The innovation performance of actors focused within the innovation ecosystem is extremely high. As the fourth industrial revolution progresses, companies face new perspectives and various challenges related not only to technological but also to organizational solutions. These challenges are

forced by the need for continuous improvement of the products and production processes that should meet specific expectations of customers. Companies, to be able to keep up with market needs and maintain the competitive edge, should use various types of tools and methods, enabling new product development and processes improvement in an innovative way. One of the more frequently discussed concepts of innovation in recent years is the concept of open innovation, which enables external entities to participate in the innovation process and benefit from innovation in exchange for sharing their knowledge and technology base. Relationships based on cooperation facilitate the sharing of resources and combining ‘multiple intelligences’ to generate new ideas and innovative solutions within the community. The usage of the paradigm allows enterprises to transfer innovative ideas, new products and services freely from the outside to the inside of the company and vice versa, to stay competitive. Such an approach can be established in innovation ecosystems.

3. Methodology

The purpose of this article is to answer the three main objectives stated in the introduction. The overall methodological approach for identifying, selecting and analyzing information can be divided into three groups that correspond to the main objectives. This approach is presented in Figure 4.

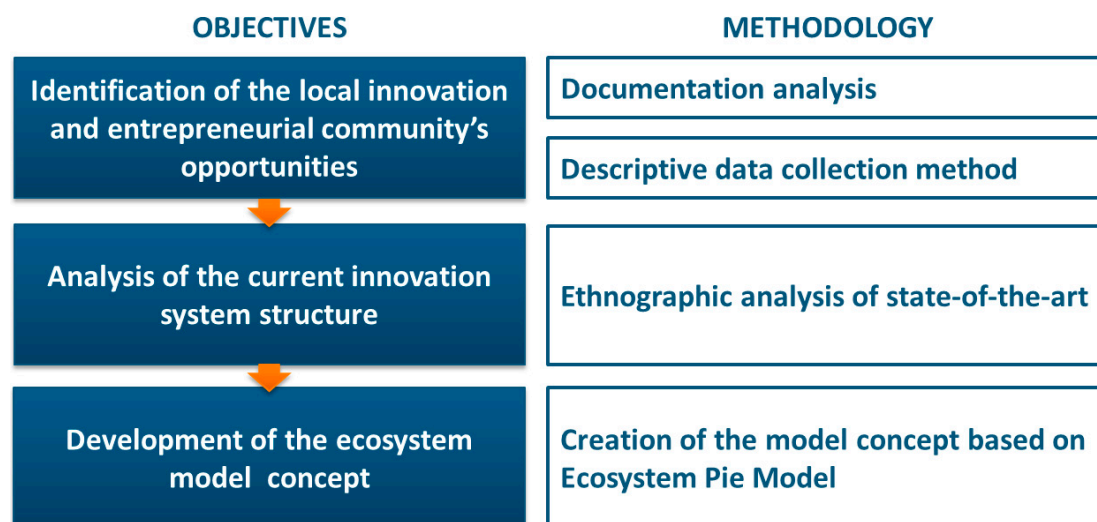


Figure 4. The overall methodological approach.

Current innovation ecosystem models still lack a clear method of creating a holistic collaborative environment [40,41]. Most of the models are focused on specific sectors of the economy [42–47] or stakeholder types [48–51].

To overcome the challenges in Polish innovation system in general it can be assumed that this also applies to the Wrocław innovation environment, and connected with the low early-stage innovator's performance, the lack of cooperation among different actors, as well as the low level of commercialization, a community innovation ecosystem should be created.

For the analysis of the current innovation structure, the Ecosystem Pie Model (EPM) tool was used. The EPM is a graphical modelling tool that enables mapping, designing and analyzing innovation ecosystems both for managerial and research purposes [52]. Although it is a new tool (developed in 2019), it might be foreseen as a universal one. As authors of the tool state, it has been developed within ‘seven iterations of testing, in which hundreds of participants mapped more than 250 different ecosystems’ [53]. It can be used to describe various ecosystems, which take into account the structural elements of ecosystems, making it possible to compare the research input and results [54]. Scholars used it to describe the ecosystem of start-ups in Espoo [55], demand-side management in district

heating and cooling in Finland [56], the ecosystem of Smart Energy Buildings in The Netherlands [57], the information system in the healthcare sector [58], and the Sustainable Self-supporting Urban Smart Grid [59].

The Ecosystem Pie Model tool is based on three main elements, as it can be seen on Figure 5. The first one, located in the center of the model represents the *Value Proposition* EVP. The second section is devoted to the *User segments*, which define the target market for the value created in the ecosystem. They are divided into several parts by radial lines. The third section represents *Actors* of the innovation ecosystem. The order of the analysis of the actors involved is related to the direction of value transfer in the ecosystem and should be described on the EPM clockwise [60].

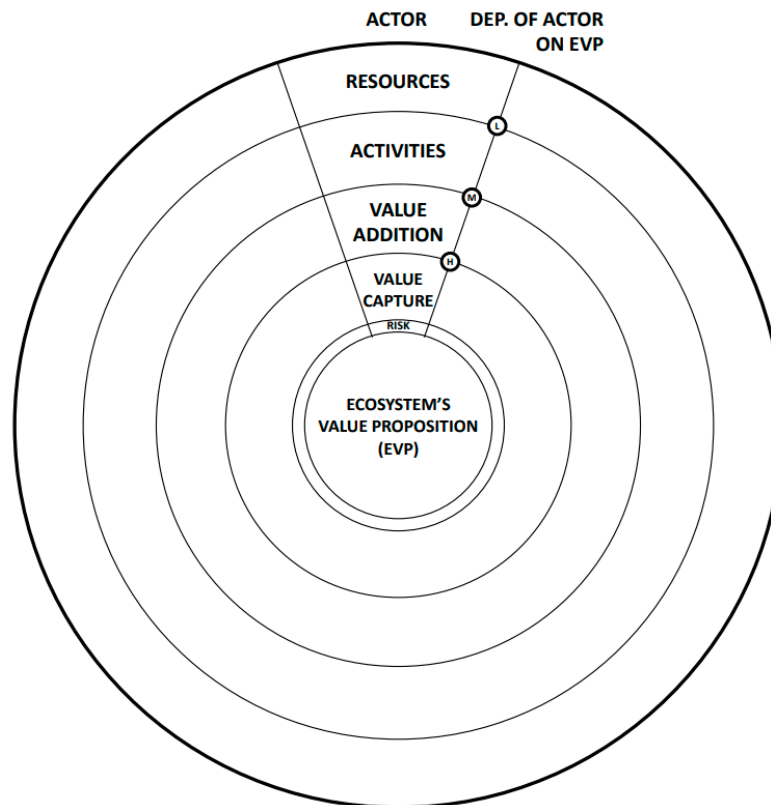


Figure 5. Template of the Ecosystem Pie Model [60].

Each of the user segment is analyzed based on five factors and later the dependence is determined. These factors are:

- *Resources*, that the actor can use to create the value in the ecosystem.
- *Activities*, which are actions by which the actor contributes to the ecosystem.
- *Value addition*, the result of activities that the actor brings to the ecosystem which is based on the user's competitive advantage.
- *Value capture*, represents the value created by the ecosystem that is captured by a particular actor [52].

4. Identification of the Local Innovation and Entrepreneurial Community's Opportunities

To be able to identify the entrepreneurial community's opportunities and anticipate further development, taking into account the resources of innovation stakeholders, it is necessary to understand emerging innovation ecosystems [36]. Wrocław is the most innovative city in Poland with the largest number of R&D centers, due to the cooperation between the municipality, business sector and numerous universities [61].

Currently, in Wrocław there are many organizations that are dealing with innovation–research institutions and technology transfer offices, incubators, technology and business parks, business support organizations, companies, start-ups and co-working spaces. The complex and varied infrastructure available in Wrocław facilitates the creation of innovative products and services and enables conducting research projects. The city has the biggest number of R&D centers in Poland, with many co-working spaces and business incubators offering great support to start a project fast and without high costs or too much paperwork. Moreover, in Wrocław, there is one of the most advanced technology parks in the country.

4.1. Research Institutions and Technology Transfer Offices

Some of the strongest assets of Wrocław, when it comes to innovations, are higher education and research organizations, consisting of the number of universities themselves, the quality of education and the quality of research. There are currently appx. 116,000 students in Wrocław [62]. In turn, almost 33 thousand students annually graduate from 25 universities (11 public and 15 private universities and colleges) [63].

The main research centers and their technology transfer offices are Wrocław University of Science and Technology, Wrocław University of Environmental and Life Sciences, University of Wrocław, Wrocław University of Economics, Wrocław Medical University, PORT Polish Centre for Technology Development, Institute of Low Temperature and Structural Research PAN, Hirszfeld’s Institute of Immunology and Experimental Therapy PAN, KGHM CUPRUM Research and Development Centre, as well as Wrocław Centre for Technology Transfer.

4.2. Incubators

Recent years have been an important and intense time for the development of start-ups in Wrocław. There are more and more places to start a business–incubator and new acceleration programs are being created, and the involvement of the universities in the promotion of entrepreneurship is becoming even more noticeable—the list of Wrocław’s incubators is quite long, including universities’ Academic Incubators of Entrepreneurship at the Wrocław University of Science and Technology, at the University of Economics, at the Wrocław University of Environmental and Life Sciences, at the Wrocław School of Banking, as well as the Lower Silesian Incubator of Entrepreneurship at the Wrocław Technology Park, Academic Incubator of Entrepreneurship at Bank Zachodni WBK, Incubator of Entrepreneurship at the Lower Silesian Agency for Economical Cooperation, AIP Business Link, MANUS Incubator and Preincubator of the Entrepreneurship and Incubator of Technology at the Lower Silesian Park of Innovation and Science [64].

4.3. Technology and Business Parks

Business and technology parks are areas where large numbers of companies (often related to one sector of the economy) are concentrated and can develop quickly thanks to the access to well-equipped research facilities. Such a model of supporting firms in their development is increasingly used in Poland. Currently, in Wrocław and Lower Silesia region, there are at least a dozen technology and business parks, including Wrocław Technology Park, Wrocław Industrial Park, Lower Silesian Park of Innovation and Science and Wrocław Business Parks (in three different locations: Bierutowska, Wołowska, Strzegomska) [65].

4.4. Business Support Organizations

There are several business support organizations in Wrocław supporting entrepreneurs in the process of creating, running and developing a company, training, consulting, assisting in the implementation of projects based on modern technologies, R&D, etc. The most important ones are Lower Silesia Marshal’s Office, Wrocław Agglomeration Development Agency, Wrocław Regional

Development Agency, Lower Silesian Chamber of Commerce, Lower Silesian Regional Development Agency [65].

4.5. Companies

As reported by PricewaterhouseCoopers, approximately 200,000 enterprises are operating in the Wrocław subregion, and their number grows by an average of 2.8% per year. A very high level of attractiveness of locating research and development projects in Wrocław and its vicinity is associated with the constantly growing number of investments intended for research and development centers and the high availability of highly qualified and skilled employees. Therefore, in Lower Silesia are successfully established research and development centers dedicated to many branches of industry which, based on the analyses carried out by PwC, include IT and business services, Automotive and construction machinery, Industrial automation, Chemistry, Medicine, biotechnology and pharmacy and Electronics and telecommunications [62].

4.6. Start-Ups

The start-up scene in Wrocław is constantly growing and their number is estimated at more than 250. The majority of start-ups create solutions in the areas of e-commerce (e.g., Divante, Shoptrotter), digital health (e.g., Infermedica, SensDx), software (e.g., Tooploox, Droids on Roids), analytics (e.g., Piwik Pro), edutech (e.g., Lerni, Flash Robotics). In Wrocław there are also young technological companies that achieved success in the field of Internet of Things (e.g., Blebox, OORT), nanotechnology (e.g., Nanoceramics), fintech (e.g., FriendlyScore), VR (e.g., Evryplace, VR Global), events (e.g., Meeting Application) or engineering (e.g., Scanway, SatRevolution). The city itself becomes a place of development for start-ups from other countries, among others: USA (Droplr), Germany (3YOURMIND) or Australia (Tigerspike) [64].

4.7. Co-Working Spaces

To boost creativeness and innovation in small firms, especially start-ups, sometimes offices are not necessary. Wrocław is a promising market in terms of co-working offices and serviced offices, which are a complementary offer for those who are looking for space that can be rented for a shorter period and which servicing will be provided, so they do not have to take care of them by themselves. In Wrocław there exists 15 co-working spaces, inter alia Business Link, Centre for Entrepreneurship Support, Centre of Business and Entrepreneurship 'Dąbie', IdeaPlace and Nokia Garage [66].

5. Analysis of the Current Innovation System Structure-Results

To assess the regional situation of the innovation system the ethnographic analysis of the state-of-the-art was conducted. The actors that are taking part in the innovation processes could be grouped into three general groups: *research institutions*, *technology institutions*, and *support institutions*. However, the author of the paper has decided to split *technology institutions* into two groups—*start-ups and companies* and *technology and business parks*, because their main role in the system is different. The same applies to *support institutions*—they were divided into *business support organizations* and *incubators and co-working spaces*.

To identify the local innovation and entrepreneurial community's opportunities, as the main actors to be analyzed, *research institutions*, *incubators and co-working spaces*, *technology and business parks*, *business support organizations*, as well as *start-ups and companies* were selected. The additional actor—the Wrocław municipality—has been added to the analysis due to the fact that the city itself is also a part of the ecosystem.

Each of the actor (user segment) was analyzed based on the *resources (R)*, *activities (A)*, *value addition (VA)* and *value capture (VC)* factors. As criteria to be analyzed, the main areas of the organization's operation activity were considered.

The main resources of Wrocław's research institutions are huge numbers of highly educated students, experienced employees and variety of infrastructure (*R*). This allows the conduction of innovative research and supports innovativeness and R&D activities (*A*). The biggest value added to the innovation ecosystem lies in the focus on innovation and technical and scientific advisory (*VA*). What those actors can capture is developing innovations (*VC*).

The greatest assets of Wrocław's incubators are resilient accelerators, favorable conditions to start a business, and experienced mentors (*R*) who can help firms to grow and develop (*A*). Incubators and co-working spaces provide a lot of financing opportunities and offer affordable office space rent (*VA*). In return, they would like to receive profits and shares based on innovative operations of start-ups they supported (*VC*).

When it comes to technology and business parks located in Wrocław, they offer their premises with access to specialized equipment as well as experienced employees that can provide support (*R*). Additionally, such institutions organize a lot of networking events that can help start-ups and SMEs expand their connections (*A*). Basically, the greatest value of such parks is that they enable to start an innovative project without high investments (*VA*) and in return increase income and participate in developing innovation (*VC*).

Wrocław's business support organizations in the scope of boosting innovativeness can provide skilled employees with good analytical, entrepreneurial and language skills, as well as a strong network of local and transnational companies, industrial clusters, universities, etc. (*R*). Their main activities are promoting cooperation and acquiring and serving investors (*A*). What they can offer to the innovation system is the professional advisory and support together with providing financial opportunities (*VA*). The value that business support organizations capture is promoting innovation and entrepreneurship (*VC*).

Another sector of innovative stakeholders in Wrocław is the companies and start-ups. They represent a strong start-up scene and a huge variety of firms that possess technological infrastructure (*R*). What can be observed since several years in Wrocław, is the phenomena of very strong employee uptake (the unemployment rate is appx. 1,1%) and focus on employee development, which can be reflected in employees' satisfaction and dedication to work. Wrocław's companies are strongly collaborating with global players so they are familiar with innovative processes and they know what innovation can bring to the firm (*A*). On the start-up market, the innovation can be boosted by the start-up hub that is strongly supporting growing firms and promoting entrepreneurship (*VA*). All these actions lead to increasing income (*VC*).

The last but not least actor considered in research is Wrocław as the municipality itself. It is providing a great marketplace and city infrastructure (*R*). Wrocław policy is strongly focused on promoting all innovative actions, as well as providing a space to make innovations by robust developer activities (*A*). Those actions are supported by the ability to attract new investors (both local and international) as well as supporting the international community (*VA*). This gives access to attract new inhabitants and grow the city strength, as well as allows the promotion of broader sustainable regional development (*VC*).

6. Development of the Ecosystem Model Concept-Discussion

Based on abovementioned research on Wrocław's innovation actors, the Ecosystem Pie Model has been created—it represents the theoretical concept of the 'Wrocław Innovation Ecosystem' model. Figure 6 presents this model concept with the results of the research on innovation actors analysis. Each color of 'post-it' corresponds to one actor. The radial areas correspond to *resources*, *activities*, *value addition* and *value capture* factors that were analyzed for each actor type in the previous chapter.

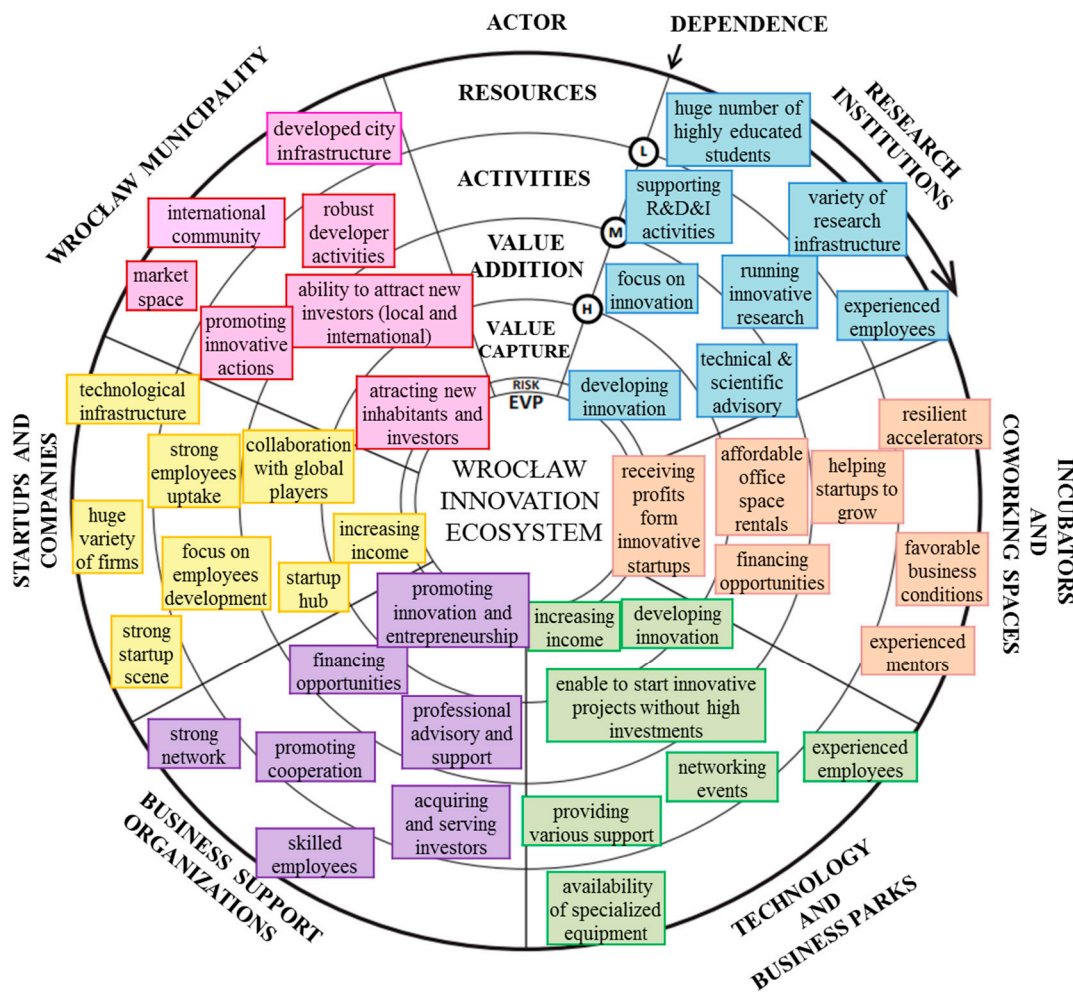


Figure 6. Wrocław Innovation Ecosystem Pie Model concept.

As can be seen from the developed Ecosystem Pie Model concept, each of the factors is fully covered by different types of actors, where 44 characteristics were identified. When it comes to the resources, at least two different (non-overlapping) characteristics per user segment are provided to the community system of innovation (in total 16). In terms of activities and value addition almost each user segment has two characteristics identified (in total 11 and 10 respectively). Seemingly obviously, each user segment contains one characteristic of the value capture (in total 7).

The research on innovation stakeholders shows a huge potential for creating an innovation ecosystem, however there is no common Innovation Ecosystem understood as “network of cooperating interdependent and interconnected communities of actors that build relationships to incorporate, create and perform initiatives oriented on innovation”, so the area of the EVP (ecosystem value proposition) is missing. This can be the result of several aspects and barriers.

No common approach to incorporate and create innovations: As it can be seen from the analysis of Wrocław’s local innovation structure there are many stakeholders in different actors’ sections that can have a big impact on Wrocław’s socio-innovation or socio-entrepreneurship development. However, almost all of them are using different approaches to deal with innovations, so a lack of mutual understanding and utilization of resources and results can be observed. One of the examples could be universities’ knowledge catalogues and databases that are basic inventive sources. There are no common repositories, each of the university has its own in different standard. The external entities don’t even know how to access them, or even if they can.

Low level of knowledge about performed initiatives: Sometimes stakeholders do exactly the same thing at the same time not knowing that others are doing the same (especially business support organizations), thus combining forces could bring more benefits with fewer organizational capacities. As an example, the organization of events for industrial representatives regarding crowdfunding for R&D topic within a few days difference can be mentioned.

Building relationships and organizational barriers: Many possibilities of collaboration between different stakeholders have been abandoned due to bureaucratic problems, which appeared before the start of work. Moreover, companies face many other problems related to building relationships and organizational barriers. On the one hand, there are problems with complex public procurement rules, the pricing of innovative products and services, and too much documentation. On the other hand, some relationships focus on competition rather than cooperation. As an example, the “Innovation Vouchers for SMEs” program can be mentioned—it is foreseen to support SMEs in developing innovative products of processes in a collaboration with research units, however the number of documents, agreements and regulations force some of the companies to resign.

Linguistic/semantic barrier: It can be said that representatives of two different sectors can speak the same language, but do not understand each other. Based on the various observations, particular attention should be paid to helping stakeholders build an “innovation-friendly ecosystem” which will provide mutual understanding. Using a language that others can understand can be a particular challenge for scientific organizations that are trained to use a specific language (sometimes too scientific). Research units must learn how to deliver to non-scientific entities, understandable state-of-the-art models, technologies and products, and how to effectively transfer technology and knowledge to enterprises and external industrial units. The same applies to the case of industry-academia collaboration on research and innovation projects.

Despite many attempts by the local policymakers to create a successful innovation or entrepreneurship ecosystem that will support sustainable regional development, none of the methods achieved the expected result. The provided analysis showed that the missing part of the local innovation system is the actor’s cooperation in creating and performing initiatives oriented on innovation – basically, each of the actors works based on its own rules and guidelines.

On this basis, it can be stated that there is a need to design mechanisms and adaptation plans that will allow the full use of the experience and achievements of various organizations that support innovation. These mechanisms should facilitate the development of new and innovative products, technologies and services, and enable the transfer of existing solutions to different sectors of industry.

Preparation of the regional development policy towards creating an innovation ecosystem will increase Wrocław’s actors’ capacities to support innovation systems for strengthening regional innovation. The collaborative approach to innovation, based on open innovation ecosystems, may be contrasted with the traditional ‘closed’ approach to innovation, where innovations are developed by companies themselves. This change of paradigm in how entities create innovation entails the complete integration of research and development within the boundaries of a regional innovation system.

To improve sustainable linkages among actors of the innovation systems that will allow the strengthening of regional innovation capacity, it is necessary to develop one holistic innovation ecosystem based on open innovation approach as a regional policy.

7. Limitations and Further Research

The author would like to acknowledge that this analysis has several limitations. First and foremost, this is due to the nature of the maturity of the research on the development of the ‘Wrocław Innovation Ecosystem’. Currently, it is in the initial phase and can be treated as an introduction to more extended research. In the next steps, the author of this article is planning to conduct the research on socio-entrepreneurial and socio-innovation ecosystem development and deliver an adaptation plan for the “Wrocław Innovation Ecosystem” based on the analysis of the US innovation ecosystems.

Secondly, the identification of actors of local innovation and entrepreneurial community descriptive data collection method has been adopted as a research method. This is why the paper is focused on the description of actors and does not present their in-depth analysis. However, the first phase of the future research will be devoted to creating a taxonomy of tools that are used to enhance innovativeness and cataloguing support schemes for local innovation ecosystems. The second phase research will include an ethnographic analysis (qualitative and quantitative) of Wrocław's current innovation systems and the development of an adaptation plan for the 'Wrocław Innovation Ecosystem' based on selected actions and support schemes that were identified during the research.

8. Conclusions

According to recent literature, it can be stated that the innovation systems' model development is currently facing a fundamental change. Within the way that the organizations cooperate and build innovation (eco)systems, the open innovation approach is used more and more often, but it is still in the phase of developing new models and schemes. This is the basis for further research and development to create a targeted ecosystem in which the community can take full advantage of new approaches to social innovation or social entrepreneurship.

The Polish innovation system in general, and thus it can be assumed the Wrocław local innovation environment, is having problems with low early-stage innovator's performance, the lack of cooperation among different actors, as well as low level of commercialization and a weak uptake of technologies. Based on that, the objectives of the paper were set on the identification of the local innovation and entrepreneurial opportunities, analysis of the current innovation system and the development of a community's ecosystem concept.

The conducted research on Wrocław's innovation system structure, based on documentation analysis and descriptive data collection, showed that there are many actors taking part in innovative actions and their range is very broad—research institutions and technology transfer offices, incubators, technology and business parks, business support organizations, companies, start-ups and co-working spaces.

To assess the regional situation of the innovation system, the ethnographic analysis of the state-of-the-art was conducted. Each of the previously introduced actors was analyzed based on the *resources, activities, value addition* and *value capture* factors. There are many stakeholders in different actors' sections that can have a big impact on Wrocław's socio-innovation or socio-entrepreneurship development. However, due to the variety of different resources, activities and values, there is no common Innovation Ecosystem understood as "network of cooperating interdependent and interconnected communities of actors that build relationships to incorporate, create and perform initiatives oriented on innovation".

Based on the analysis results, the Ecosystem Pie Model tool was used to create the ecosystem model concept. The analysis showed that the missing part of this system is the interconnection—basically, each of the actors works based on its own rules and guidelines. However, the research on innovation stakeholders shows a huge potential for creating an innovation ecosystem.

The Wrocław community, which has all the key elements, should focus even more on learning and innovating than ever before. Therefore, Wrocław should aim to create a development policy framework that favors entrepreneurial innovation and will allow sustainable regional development.

The presented research of the 'Wrocław Innovation Ecosystem' innovation actors is a basis for further research on the development of an action plan, common methods and tools that will allow creating a real Innovation Ecosystem and broader sustainable regional development. It will boost Wrocław's competitiveness, enhance its economic position and accelerate technology transfer from various research institutions and departments within industrial companies. Creating one holistic system of supporting innovation from dispersed entities focused on innovation located in various organizations will enable the hinderance of the gap in enhancing innovation systems for strengthening Wrocław's innovation capacity and regional development policy.

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