



Article

Bringing Digital Innovation Strategies and Entrepreneurship: The Business Model Canvas in Open Data Ecosystem and Startups

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Abstract: The aim of this paper is to examine and analyze how actors in an open data ecosystem collaborate, as well as their activities, to generate value. Thirteen interviews were conducted with actors in the open data network. The information gathered was used to estimate how the existing ecosystem provides new entrepreneurial opportunities for entities who provide data and for those who utilize data. The business model canvas was used to analyze the findings, and the outcomes are represented from the perspective of each entity in the network. For the purpose of increasing open data's value, a mind map was developed to show how the findings are connected in an attractive and easy-to-follow manner. Results show that even though there is a lot of interest in open data, a new type of business ecosystem is needed to make a win-win situation possible for everyone in the available data ecosystem. Many reasons and benefits were found in the interviews about why people want to be a part of the open data ecosystem. However, several obstacles must be thoroughly explored and overcome.



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Keywords: digital innovation; entrepreneurship; ecosystem; business model; open data

1. Introduction

Academics and practitioners alike are interested in open data, which is a significant topic. Open data are free, easy to find, and can be used without restrictions. There are two primary reasons for generating data. In the first instance, there is an economic reason; the amount of open data stored by public or by private organizations has economic gains for application developers, citizens, and other organizations in the private sector, among other benefits. Institutions in the public sector and firms supply up-to-date data to nascent entrepreneurs to develop new services and applications, as well as enhancing the efficiency and effectiveness of the ones that are already available. In the second type of motivation, governments give data to improve government transparency and accountability, as well as responsiveness and participation. This type of motivation is called “social motivation” [1–4]. As a result, more people can access the information, and it can also be used in innovative applications. The benefits for citizens were determined by Sieber and Johnson (2015) [5]. Transparency, accountability, and civil involvement are all enhanced due to these advantages. According to the authors, open data promotes accountability, increases trust, and increases citizens' satisfaction since it allows them to consider alternatives and make better decisions [6,7].

Besides the benefits that open data give to government, available data enhance the value of all actors that are part of a distributed open data system. Several actors include public administration, data analysts, commercial open-data publishers, communities that harvest and alter open data, customers, organizations, and user experience providers [8–11]. Existing studies have highlighted the advantages that entrepreneurs can gain from utilizing open data. Startups take advantage of open data to develop new business models, enhance profitability, and improve their overall competitive advantage. Open data also help in the

development of new services and products, which helps boost both the level of innovation and the profitability of businesses. Entrepreneurs that are just starting might utilize data visualization tools to make more effective decisions on the creation of new applications for citizens [12–16].

Many actions need to be taken to make it easier for governments and businesses to open data. There is not enough information about the benefits of opening up data, there are not enough viable business models, and there are not enough new operating models. They are divided into 10 categories, which are as follows: accessibility and findability of data; understandability of data; quality; compatibility; linking and merging data; metadata; contact with data providers; and, last but not least, openness and the uploading of data [1,17]. Obstacles, such as legislation, technology, use, information quality, and participation, are incorporated in these categories [12,18,19]. These obstacles describe why firms refuse to share data with developers.

However, even though applications developers could gain many benefits from the entrepreneurial opportunities presented by open data, the lack of a value ecosystem and business models has been identified as a crucial barrier to the widespread adoption of available data in services and applications [8,9]. It is hard for developers to use data to create applications, and they do not have the technical skills to utilize data sources that use complicated data formats or interfaces. This causes these problems and challenges [20]. In addition to these barriers, the difficulty in generating relevant data for the creation of applications, the ambiguous licensing of open data, the inadequate availability to regional data sources to develop applications or local services, legal issues, the inability to ensure the quality and reliability of data, and technical limitations associated with data publishing platforms, as well as the limited access to local data and the functionality of it, can all be attributed [21–23]. Existing studies have provided results about business models based on open data. Still, they have not focused on the interrelations among the actors of the open data ecosystem and the required building blocks of business models in open-data-based businesses to support the activities of these actors [8–10,24]. As a result, this article aims to analyze how actors in an open data network collaborate and their activities to generate value. Thirteen interviews were conducted with actors in the open data network to obtain the most up-to-date information and figure out how the current ecosystem can help both actors who give data and those who use data. The business model canvas was used to analyze the findings, and the findings are represented from the perspective of each entity in the network. For the purpose of increasing open data's value, a mind map was developed to show how the findings are connected in an attractive and easy-to-follow manner. Results show that even though there is a lot of interest in open data, a new type of business ecosystem is needed to make a win–win situation possible for everyone in the available data ecosystem. Many reasons and benefits were found in the interviews about why people want to be a part of the open data ecosystem. However, several obstacles must be thoroughly explored and overcome.

There are many practical implications for this study. Businesses, policymakers, citizens, and other organizations must work together to make data available and reuse it to gain access to digital services, platforms, and information from collaborative startups to achieve their goals. According to this viewpoint, developers play an essential role in the open data ecosystem, as do all other stakeholders. They are enthusiastic about developing applications and services based on open data, and they are frequently assisted by non-governmental organizations or corporations in their efforts. Engagement in the e-commerce initiative and its associated corporate platforms offers enterprises a substantial chance to strengthen cooperation across public sector agencies, companies, and local governments. Open data applications and services can help non-government organizations work together more effectively by allowing them to share their data. In addition, these organizations can use data analysis to build new ways of communicating with the public and the government. By creating open data platforms and services, organizations in the public and private sectors can better connect.

The remainder of the paper is organized as follows. Section 2 presents the existing work concerning the open data network and business models. The methodology for the study is described in Section 3. Section 4 examines the outcomes of the interviews, while the last section presents avenues for future researchers.

2. Theoretical Background

2.1. Open Data Value Network

Scholars in particular study service innovation from a systemic perspective. Such an understanding extends previous academics paying attention to innovation as an idea, product or service, created either by an individual actor or by a group of actors in service ecosystems. The interest of researchers focuses on how service innovation emerges in a service ecosystem [25]. There is a growing service ecosystems perspective that indicates a complex network of interrelationships and communications among different actors. Service innovation development, perceptions, and adoption processes that lead to value co-creation can be influenced by any of these actors [26]. According to Ferreira et al. (2019) [27], the profiles of entrepreneurs and managers and their adoption of innovative procedures contribute to the greater competitiveness of these organizations. New cooperation opportunities can lead to high innovation and entrepreneurial potentials in service ecosystems because of the inherent complexity of relationships and interdependencies [28]. It is also a huge problem for service ecosystems to effectively combine and align the various actors' innovation agendas to make the most of these opportunities [29].

Open data ecosystems foster the exchange of ideas for new products and services among a variety of stakeholders. An open data ecosystem comprises the people and businesses that work together to create new services. There are three types of entities involved: data and infrastructure providers, application developers, and end users. The first group in the data value network comprises institutions that give data to other organizations in the ecosystem. Data providers can be institutions that distribute it without cost, either without any restrictions or licenses restricting how the data can be used. In most cases, these institutions are public administration or other public organizations with access to a large amount of information. However, they do not have the skills or means to make use of them. As a result, they give them out so that citizens and businesses can use them to develop services and help the country's economy. Various public licenses exist under which a licensor might grant access and copyright authorization to allow free dissemination of data. Data distributors can also be institutions that generate profit by making data available [8,9,24,30].

Since service providers are unable to execute the data processing, they can buy the data that are processed directly from the data providers, saving cost in the process. So, service providers must first figure out what their consumers need, then make relevant data from input that is specific to a given manner, and then show the data in an easy-to-understand manner such that people can use it. Even though service providers do not provide end users with a complete service, they might offer them with an essential component of a service chain [8,9,24,30].

Infrastructure and tool providers provide the other entities in the value chain with the tools they need to work correctly. This group helps the value network entities and generates profit when people use the value network's services and applications. In addition, marketplace providers provide a place where applications and data-based services can be bought on a subscription basis. Tool providers are in charge of giving developers the tools they need to create applications that meet a wide range of user needs, as well as developing and testing the applications. In exchange for "rent," cloud service providers give physical facilities to organizations in the ecosystem and earn money from the "rent" of the facilities [8,9,24,30].

Developers of applications work with other parts of the ecosystem to develop innovative applications that use open data. End users can then give feedback to developers, which can then affect the application's continual development. Contrary to applications,

users consume data through the use of services that have been designed utilizing open data as a foundation. Consumers, citizens, and enterprise users are the three types of end users identified [8,9,24,30].

These entities, each of which plays a role in the ecosystem, are intimately linked to one another. The raw data provider, the application developer, the linked data provider, and the end user are the four roles described above. Essentially, what the raw data provider does is make raw data available to the linked data provider, who in turn uses it to supply linked data to the application provider. The latter then uses these linked data to develop applications for end users [10,31]. Simultaneously, the data service serves as a consultant by providing advisory services. There are a lot of ways that open data generate profit. Some include consulting, data transformation, and creating applications on top of available data [32]. They are shown in Figure 1 in the order that other researchers have already grouped them.

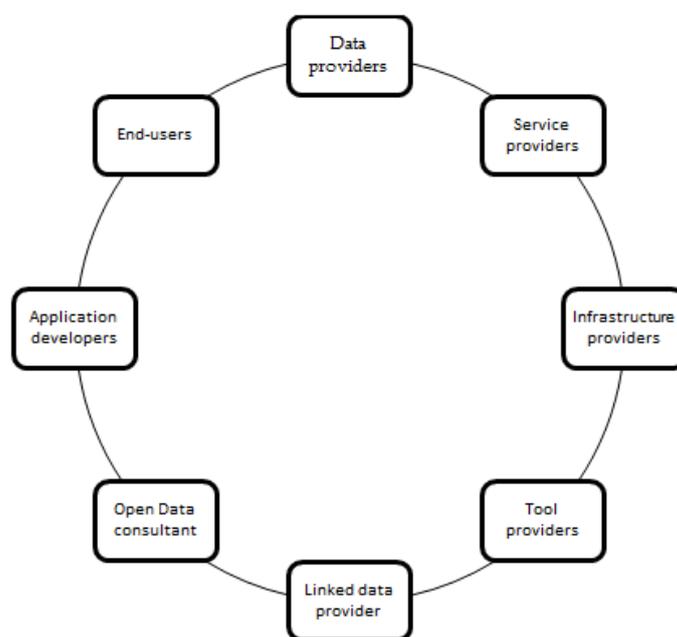


Figure 1. Actors of the open data value network.

2.2. Business Models of Open Data

A business model is an analytical tool that supports executives to gain a deeper understanding of their organizations. It comprises elements that are turned into value propositions and then made available to consumers. Business models also show how an organization makes money through the decisions made by its managers and the consequences of those decisions [10,19,33,34].

Lindman et al. (2014) [10] created a business model for open data that includes a product, a revenue model, resources, partnerships, and a mindset, among other components. To build and capture value in specific markets, these factors are incorporated into the business model. When a company makes an offer to its customers, it tells them what they will receive. This is called a value proposition. When a company offers a value proposition, the assets and skills are called resources. Resources that are not tangible, such as a company's brand name, can be used with substantial resources, such as staff and equipment. It is like they are a company's source of competitive advantage or its primary skill. Relationships describe the process by which external resources and competencies are evaluated. The revenue model involves such elements as pricing policies, revenue sources, cost structures, and revenue velocity, and these elements show how the company makes profit. Rather than using cerebral, objective thinking and planning, the management mindset presents the emotions, values, and attitudes of management that are incorporated into the business model.

Numerous academics have made use of the well-known business model canvas, which serves as a formal framework for the development of new business models. Authors have chosen to use the elements of the business model canvas because it is a well-known model and offers a structured framework for the development of new business models [24]. This explains how an organization delivers value to one or more consumer groups, the market model and its partner network to build and distribute that value to achieve revenue streams and maximize profitability. Similar to the existing business model, the business model canvas shows how businesses provide value to one or more groups of customers, as well as how the organization is built and how it works with other companies. All of this is done to increase revenue and profit margins. The business model canvas comprises the following: key partnerships, key activities, key resources, value proposition, relationships with customers, customers, channels, revenue stream, and cost structures [8,9,24]. The building blocks included in the business model canvas are depicted in Figure 2.

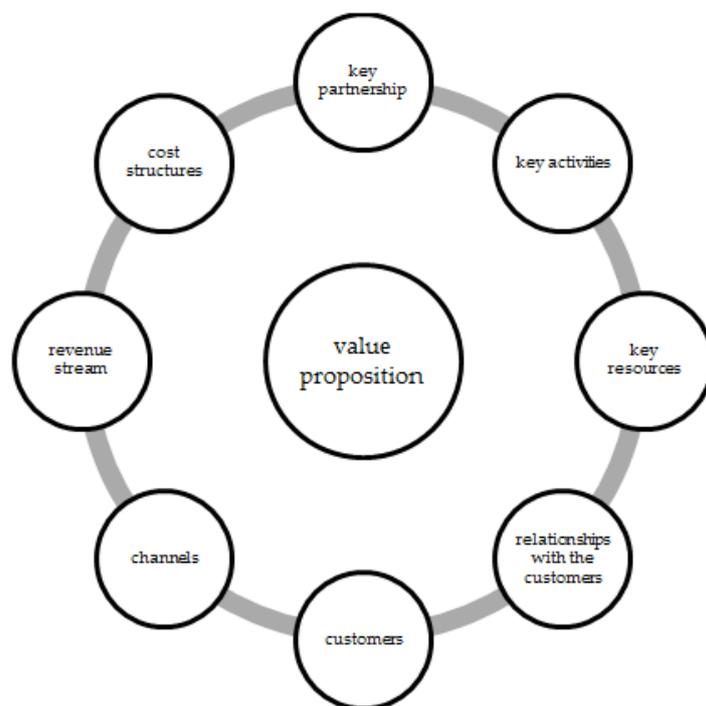


Figure 2. The building blocks including in business model canvas.

Each customer segment building block comprises a group of people or organizations that are clients of a company and whom the company seeks to reach and service. In the value proposition building block, products and services that add value to a given consumer segment are grouped. To convey a value proposition to customers, the channel building block explains how a firm interacts with consumers and reaches its target audience. Each of the numerous relationships between a company and distinct client groups is represented by a building block called “customer relationships”. When a corporation generates income from each client segment, the revenue stream building block describes how the organization generates those sales. Each of the crucial resources that are necessary to make a business model successful is represented by a building block called “resources”. The key activities building block describes the significant actions that an organization has to take to ensure that its business model is successful and profitable. In the key partnerships building block, the network of partners and suppliers with which the company works to create a successful business model is called the network of partners and suppliers. In the end, all expenditures incurred in operating a business model are reflected in the cost structure [18,33,34].

Some of the other academics were working with business models comparable to theirs, which included four elements: customer logic, strategy, resources, and network. The first building block is to categorize potential consumers into segments that an organization aims

to service, and the processes that enable an organization to provide value propositions to each component in accordance with the classification. The strategy building block comprises the strategies that a company needs to use if it wants to sell a different service or product to consumers than what is already out there. Among the crucial resources that are necessary to create a successful business model are those contained within the resource building blocks. The final building block outlines a corporation's network of partners and suppliers with whom it collaborates to ensure that the business model is successful [33,34].

The same features are involved in each type of business model, but they are divided into distinct building blocks for clarity. Successful businesses provide value by approaching problems in new and innovative ways. This is accomplished by developing specific core skills, capabilities, and strategic values that distinguish them from other businesses or competitors [33,34].

3. Methodology

The motives, opportunities, and barriers that are associated with open data have been examined in previous research, and they include the challenges that data and service providers, application developers, tool providers, and application users confront [8,9]. Canares (2014) [35] looked into the differences between people who give data and people who receive data. Many things can go wrong when it comes to how data are formatted, how people can access and use them, and how they can figure out how they affect them. Lee (2014) [36] looked at 11 features that help develop and keep a value network. These features refer to the classification of existing data, the types of licenses and privacy protections, the evaluation of the quality of data, the support of institutions that take part in the opening of data, how to find and track down data, and the involvement of users in open data and economic growth, as well as the evaluation of their impact. Lindman et al. (2014) [10] want to be informed about both the financial advantages of the enterprises and the broader ecosystem that is required for them to survive to succeed. Interviews were performed with organizations selected from a pool of competitors in Finland.

Due to a scarcity of surveys that investigate how actors in an open data ecosystem collaborate and their activities to generate value [2,6,24], the primary goal of this paper is to answer to the following questions: what are the different customer segments in the context of open data applications? What is the formal process for publishing open data from firms or public institutions? Is there a standard format for doing so? Are they willing to make their data available to the public? Are there any agreements or contracts amongst the entities that make up the open data network? Is there a legal framework that applies to the actors that make up the available data? Is there a way to make money from open data by utilizing different business models? What are the best tools for making use of available data? Is it possible to overestimate the importance of open data in enhancing a company's or organization's competitive advantage? Is there any form of collaboration amongst the entities that make up the open data ecosystem? What is the cost structure for each actor in the open data network?

To accomplish these objectives, a case study is a method that seeks to provide an understanding of the dynamics in one specific context. It is possible to use this strategy for a single case or a large number of them, and it can mix qualitative and quantitative data collection techniques. There is a lack of information about the layout of the open data network actors and interrelations as well as their motivations in order to enhance entrepreneurship and determine the building blocks of an enterprise model [37–39]. Thessaloniki's open data ecosystem was the focus of this paper's case study approach.

Following the completion of 13 interviews with representatives from the open data network (data providers, infrastructure and tool providers, service providers, and developers of applications), it was determined that a business model illustrating how value is generated from open data had been developed [10]. The interviews took place in the Greek capital of Thessaloniki. Based on earlier surveys [10,35,36], the entities interviewed were drawn from a single open data value network. A total of 53 min was spent on average in

each interview, from 45 to 60 min. In order to identify those who would be interviewed, we looked at their expertise of the open data ecosystem in which they operate [40,41]. As a result, these actors can give information about their relationships with one another as well as information about how they might use open data to develop their applications. In the interviews, there were two data providers, two service providers, two infrastructure and tool providers, three developers of applications, and four end users who took part.

In order to evaluate the comparability of data, a qualitative content analysis [42] was carried out, utilizing a bricolage of deductive concept-driven and inductive data-driven coding techniques. Its goal was to identify all components that could be considered relevant to the study's issue. These were divided into categories (the study's main thematic emphasis areas), dimensions (questions covered in the interviews), and themes (different themes arising as responses to the interview questions). The broad conceptual focus of the paper was the value generated by entities in an open data network. Dimensions were the business model canvas building blocks. The goal was to look at both the relationships between entities in an open data network and the building blocks of a business model that support the activities of these actors [8,9,24]. Then, combinations of themes for each research group (actors of the open data ecosystem) were developed. Finally, differences among research group (actors of the open data ecosystem) were identified [43].

A diagram for the categories of the business model canvas was created [42]. The mind mapping technique was adopted, presenting the main problem to visually express the categories that were developed through interviews [44]. When mind maps are used to capture entire concepts essential to a specific topic [45] and pay attention to relationships between concepts [46], the conceptual maps promote the formation of ideas, the production of quick outcomes, the visual portrayal of ideas in a graphic format, and the interrelationships between concepts [46]. Mind maps in digital form are often far more consistent in appearance than mind maps in paper form [47]. A digital mind map organizes information or thoughts in a subject tree that may be expanded and collapsed [48].

4. Results

4.1. Business Model Canvas

The results of interviews are categorized based on the main building blocks of the business model canvas, presented in Figure 3.

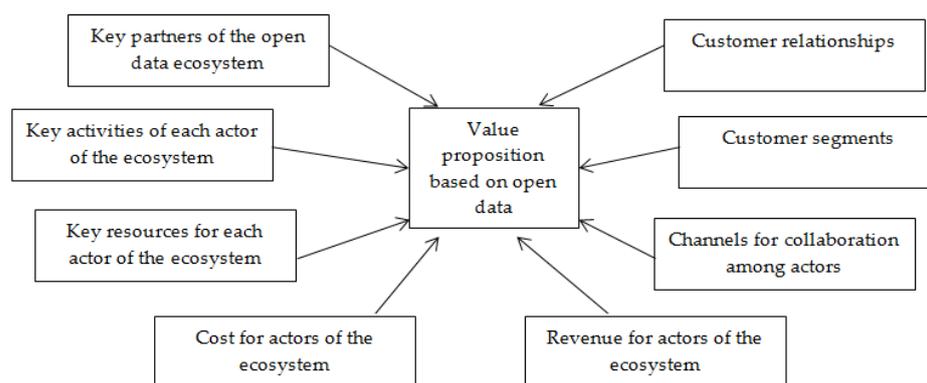


Figure 3. The categorization of the results.

4.1.1. Customer Segmentation

Application end users are referred to as customers. These applications are used by various customer sectors, including citizens, companies, and organizations. In the ecosystem, according to the data provider, there is room for new actors to enter. New companies, infrastructure providers, and intermediaries (such as mentors for developers of applications and startups) may boost entrepreneurship in the network. It was said by the service provider that “companies and intermediaries should engage in the network

because they can facilitate the launch of new applications, and developers can establish new enterprises (startups)''.

More entities could be added, but it would be difficult to identify them due to the low level of awareness and knowledge among citizens about the advantages of open data. Therefore, it is necessary to educate citizens about open data.

Several businesses have recognized the benefits of participating in the city's open data environment, and the incentives behind doing so. This participation may aid them in the development of new ideas, the visualization of products, and the provision of a novel type of fundamental function and data-based content. A rise in the value of products or services derived from open data occurs, and a network that encourages the development of these services or products that do not compete with the company's products appears. In this approach, open data is regarded as a highly successful method of enhancing competition. Open data enhances the extent of data consumption and makes them available to developers who can use them to create platforms for specific groups of people and particular goals.

Other than governments, the non-profit sector is a prominent participant in the open data ecosystem. Citizens, government agencies, developers, and other non-governmental organizations can benefit from the consultative and administrative services provided by this sector, which also offers numerous funding opportunities to develop applications or new services based on open data that will benefit both the local and national economies. This sector provides many funding options for developing applications or new services based on available data for the local and national economies. To assist developers in the creation of startups, and to improve networking and citizen engagement in associated decision-making processes, the social side of open data is being promoted and developed.

Increasing public awareness of the benefits of cooperating, publishing, and utilizing open data is a significant action for universities and research institutions. The available information and open-source software movements are gaining popularity among educational institutions, where they originated.

4.1.2. Customer Relationships

The service provider referred to the need to establish contractual agreements to share open data among entities without exposing them to privacy risks while enhancing entrepreneurship:

"It is crucial to develop contracts which will ensure the collaboration among entities because their collaboration and funding are not sustainable".

The data provider, on the other hand, stated that both the Hellenic and European legal frameworks are accountable for the distribution of data and that he is required to adhere to these requirements. Consequently, he opposes the creation of contracts in their current form.

"The legal framework limits the availability of open data in Greece in place. The directions in this framework must be followed to the letter, and we make every effort to share data in appropriate formats to improve transparency and entrepreneurship. We cannot benefit from the contracts because we have no intention of generating revenue from our activities. Individuals in the private sector would benefit from the contracts".

4.1.3. Communication Channels

In order to publish data, the data provider communicates with the municipality using the municipality's web portal. Even if this is a standard method, it can be enhanced because it is not evident in the portal where the data are available. In a similar vein, the service provider uploads data to the OKFN portal. Application developers can sell their applications through the Google Play Store, the Apple App Store, or other European platforms.

“We distribute our applications through the Google Play Store, the Apple App Store, and various other European platforms. New platforms for the deployment of our applications should be developed”.

All of the participants agreed that the creation of new websites is essential to supply sets of data and tools that application developers can use to develop their applications.

4.1.4. Value Proposition

The following format is used for data publication: .doc, .xls, .pdf and .jpeg. The data provider states:

“We make every effort to improve our data quality while also keeping it up-to-date. We are constantly updating our data. Unfortunately, we only supply a limited amount of data in static formats”.

The service provider creates tools for members in the ecosystem to share data. It does not impede entrepreneurship that data have certain technical qualities. The lack of user education in their utilization is a significant impediment. Application developers have stated that their applications are developed on unreliable data and that they are not kept up to date with the most recent information.

“The data that has been provided is not in a format that is acceptable for processing, and it has not been updated promptly”.

To summarize, all participants agreed that additional data could be published and that the data format might be improved.

4.1.5. Key Activities and Key Resources

The resources that service providers make use of are those that are associated with the collection, dissemination, and preservation of data. Aside from that, they require resources to educate data consumers. In the words of a service provider,

“It is critical to educate end-users about the relevance and value of leveraging open data. People and companies have already recognized the importance of data, but additional training about the usage of data is still required”.

Finally, providers stated that they intend to develop new tools for the statistical analysis of data. To develop their applications and enhance entrepreneurship, application developers have stated that they require more resources when participating in hackathons. They said the following:

“Hackathons do not assist developers in creating new applications because they lack valuable data. In addition, the technical infrastructure is lacking. There are also no businesses or consultants who will assist developers in expanding and launching their applications”.

4.1.6. Key Partners

For developers to have access to more data and for their platforms to have greater entrepreneurial potential, collaboration between municipalities, research institutions, academic institutions, laboratories, and private-sector organizations is vital. According to the data provider, the collaboration between municipalities and universities, laboratories, research facilities, and businesses is necessary to supply developers with additional data and expand the entrepreneurial potential of their platforms.

“We work with research institutions, universities, and other organizations in the public sector to get data that can be used by developers to create applications. When we host hackathons, we hope to encourage organizations and companies to make their data more accessible”.

Developers of applications asserted that the provider’s role can be supportive as well as technical, as they can help them commercialize their applications while also providing

technological tools to improve their overall quality. Unfortunately, even though numerous hackathons are organized throughout the city, corporations do not participate in assisting developers of applications in the early stages of their firms.

“Companies do not offer their data. Institutions in the private sector should collaborate with institutions in the public sector to provide data that will be valuable to developers who are developing new applications”.

4.1.7. Cost Structure and Revenue Streams

The data provider and the service provider both stated that the majority of the expenditures are associated with the publication of data:

“Revenues might be generated through the support of entities from public organizations or businesses, particularly developers”.

Application developers have stated that the majority of their costs are related to the infrastructure required to develop their applications and that the majority of their income is derived from the commercialization of their applications.

4.2. Mind Map

A mind map presenting the open data ecosystem business model canvas (Figure 4) was created using the free program mindmap.com (accessed on 28 March 2022). Creating a mind map is a visual representation of thoughts or concepts in order to better understand the connections between ideas and concepts. Every node in a mind map has the potential to become a new mind map. Building the mind map was based on the business model canvas for the open data ecosystem, which served as the starting point. The procedure was extended to link the thoughts together depending on their significance.

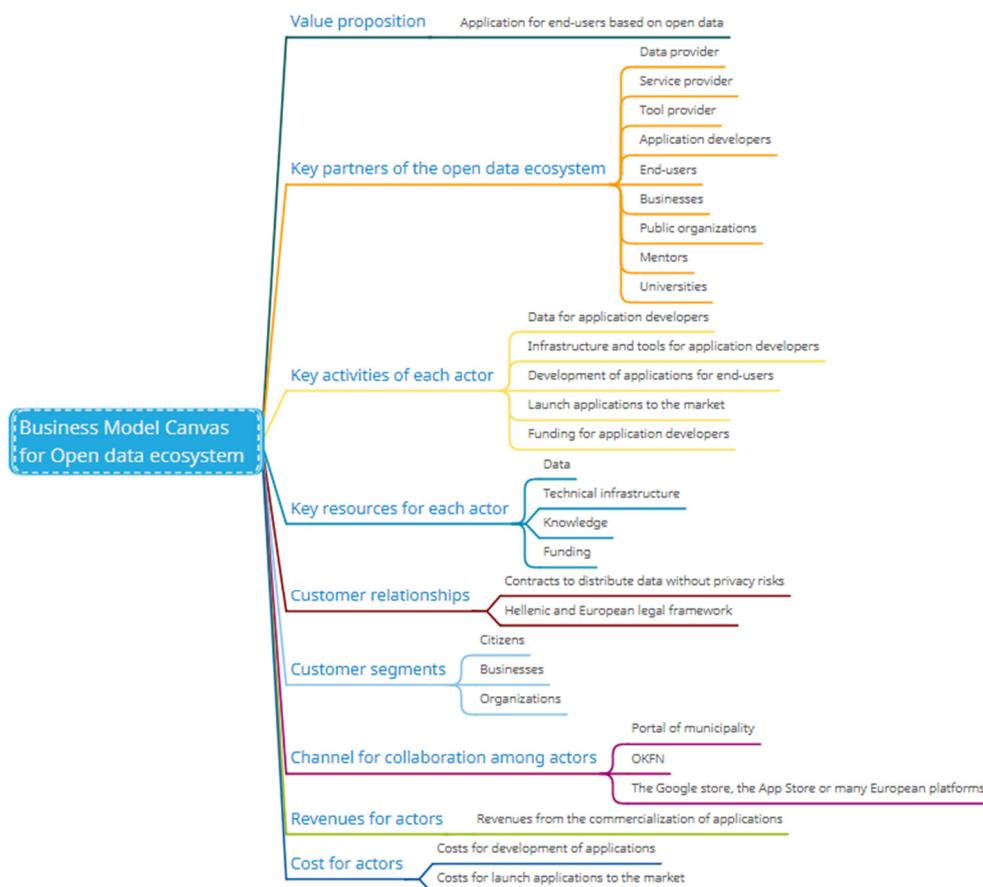


Figure 4. Mind map visualization for business model canvas for open data ecosystem.

5. Discussion

Skillful developers who are willing to engage in the network and contribute their knowledge, skills, and time are required for the development of open data applications. They must be willing to cooperate with other stakeholders in the network and develop applications or services on a no-cost basis because the public and non-government organizations do not always provide funding for the development of applications or services. For a group to be successful in developing an idea, developing it into an application, creating a prototype, and bringing it to market, they must work successfully and build a diverse set of abilities. When practitioners are competing for limited resources, such as national or local governments, development funds, non-governmental organizations, institutions in the private sector, and charities, a possible solution for encouraging innovation in the public sector and sharing new knowledge could be considered [2,4].

As mentioned before, the original form of the data is not available, and the data are not updated. To use data, developers must first evaluate their quality before using them. Despite technical problems, many organizations are not willing to share their data with developers, which prevents them from creating applications. Collaboration between universities, research institutions, and public-sector organizations must happen for valuable data to be published.

As previously stated in the literature, Immonen et al. (2014) [8] pointed out that while application developers could gain benefits from the entrepreneurial opportunities presented by open data, the lack of business models and value networks has been determined as a crucial barrier to use data in applications and services. Application developers cannot use data to start new businesses, and they do not have the technical skills to utilize data sources with complicated data formats or interfaces. These are the leading causes of the abovementioned problems [6,20,24]. Furthermore, Immonen et al. (2014) [9] stated that, in addition to these challenges, the complexity of opening data to develop applications, the unclear licensing of open data, the inadequate availability of regional data sources to develop applications or local services, legal issues, the assurance of data quality and reliability, and technical barriers about data publishing platforms, as well as the limited access and usefulness of local data, could all be attributed to the lack of available and valuable local data.

6. Conclusions

To achieve this goal, the researchers looked at the participants in the open data network and their relationships, as well as their activities, to generate value. To obtain the most accurate information possible from participants in the open data network, 13 interviews were conducted with them. The information gathered was used to estimate how the existing network creates entrepreneurial opportunities for entities who provide data and those who utilize data. It was used to organize and analyze the findings, and the outcomes are shown from the point of view of each entity in the ecosystem. Using a mind map shows the connections between the findings in a way that is both attractive and organized. This will help make open data more valuable to everyone in the ecosystem.

The findings of this article help practitioners who intend to change their business models to develop better applications that will help their businesses compete better. These businesses want to be the best in their field by coming up with new IT-based service models for their customers, such as software. Open data is essential to the supply of these applications through these new business models, which have ramifications for the structure and culture of organizations and the activities of those organizations. Practitioners can learn how to make and sell products and services with open data if they grasp the subject.

There are many practical implications for this study. Businesses, policymakers, citizens, and other organizations must work together to make data available and reuse them to gain access to digital services, platforms, and information from collaborative startups to achieve their goals. According to this viewpoint, developers play an essential role in the open data ecosystem, as do all other stakeholders. They are enthusiastic about developing services

and applications based on open data, and they are frequently assisted by non-governmental organizations or corporations in their efforts. Engagement in the e-commerce initiative and its associated corporate platforms offers enterprises a substantial chance to strengthen cooperation across public sector agencies, companies, and local governments. Open data applications and services can help non-government organizations work together more effectively by allowing them to share their data. In addition, these organizations can use data analysis to build new ways of communicating with the public and the government. By creating open data platforms and services, organizations in the public and private sectors can better connect.

Another practical implication concerns that consumers' and other stakeholders' willingness to engage in innovation processes is greatly affected by data privacy and security concerns, which organizations should keep in mind. Companies should design, use, and deliver open data-based products that are modular, flexible, scalable, and integrated so that more open data can be generated from the places where people buy and use products and services.

A limitation of this paper is the analysis of one ecosystem, which is still in its infancy. The interviews, on the other hand, helped to figure out what each of the network's different groups did. As a result of the interviews, it is possible that the value network could open up chances for open data. As a result, more research is needed to find out what the network's entities face and why they do what they do. The types of datasets that can capture developer interest and alleviate ecosystem conflicts, particularly between the data publisher and the service provider, need to be studied in the future. Eventually, it might be interesting to compare the following issues in different types of open data networks and widen the survey. What are the interrelations among the actors of the open data network? Is there a way in which open-data-based businesses might benefit from the features of their business model?

As a result, several research areas have emerged as important parts of a future open data value network research agenda. As a first step, it is vital to identify new forms of collaboration between developers and the public administration to better understand what developers want from the public sector and how they may obtain it. To get the most out of the network, it is important to figure out social and material architectures for publishing, managing, and distributing data. Finally, open data should be documented and measured in terms of who gains and how value is created.

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