

THE IDEA OF A SMART CITY ON THE EXAMPLE OF THE CITY OF GLIWICE

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Purpose: The reason for writing the article was the desire to learn about the recently popular topic of smart city and the activities undertaken by cities that strive to become a modern city.

Design/methodology/approach: The article reviews the theoretical literature on the concept of a smart city. The diagnosis was based on available articles, literature and other sources. The main topic of the article was to present the concept of a smart city and examples of activities implemented in this area.

Findings: The concept of a smart city is currently one of the key aspect implemented as part of the city's strategy. The idea is related to improving the lives of the inhabitants of a given local community by carrying out many innovative activities aimed at the continuous development of the city. Technological development causes, that local governments effectively carry out public utility tasks. The idea of a smart city fits perfectly with the concept of sustainable development, because it aims to maintain a balance between economic, ecological and social aspects, and also helps to improve the quality of life of the inhabitants of local communities. The idea of a smart city brings benefits such as economic and technological development. It also brings risks such as a cyber attack. One of the examples of cities that have been successfully implementing tasks in line with the smart city concept is Gliwice.

Originality/value: The idea of a smart city is based on a modern approach to city management. It also allows for the effective use of available technical resources, which contribute to the improvement of the quality of life of the inhabitants.

Keywords: smart city, sustainable development, innovation, quality of life, technology, Gliwice.

Category of the paper: Literature review.

1. Introduction

The concept of a smart city assumes the development of a given city using the latest available technological resources – most often from the ICT industry. Starting with activities in the field of water management optimization and energy, to the constant development of urban

infrastructure, the idea of a smart city is one of the key elements of the city's strategy, the main goal of which is to improve the living conditions of the inhabitants of the local community (Brdulak, 2017).

The idea of a smart city appeared for the first time at the beginning of the 21st century. According to many experts, the process of implementing the concept itself is already at such an advanced level that we can now distinguish 3 phases of the smart city idea development, i.e. (Smart City 3.0, czyli idea..., 2020):

- Smart City 1.0 – the initiators of all changes and development were representatives of the ICT services sector, who largely based their actions on ready-made solutions.
- Smart City 2.0 – the initiators of the changes were local self-government authorities striving to improve the quality of life of their inhabitants. This phase is currently dominant. Local administration focuses primarily on implementing projects and solutions based on diverse technological potential.
- Smart City 3.0 – the latest phase, in which the initiators of changes are the inhabitants of the city themselves. It is their appropriate attitude, combined with cooperation with local authorities, that is crucial in the development of a given region, which in turn results in an increase in the standard of living of the inhabitants and faster implementation of innovative activities.

The aim of the article is to present the concept of a smart city and to indicate innovative activities aimed at improving the quality of life of a given local community. Later in the publication, specific activities implemented by the city of Gliwice as part of the idea of a smart city were presented. All information in this regard comes from publicly available data.

2. Reasons and directions of development of the smart city concept

One of the main reasons for the development of the smart city concept is the improvement of the quality of life of residents by introducing various types of innovative solutions. An appropriate approach to the subject also results in efficient management of cities, which may be heavily overloaded in the coming years. Due to the progressive urbanization, urban agglomerations will have the highest percentage of population in the future. Another aspect is the progressive climate change. At present, we observe many cases of degradation and pollution of the natural environment. It is caused by enormous human interference in the natural environment. In this case, the reorganization of the energy sector may favour the development of the idea of a smart city (e.g. use of renewable energy sources). Digital development can also support the concept itself, as it enables us to reach a larger audience and educate them throughout their lives (Smart city: jak inteligentne..., 2017-2019). It can be assumed that the

concept of a smart city is not only a temporary trend that prevailed in society. Actions taken in accordance with the discussed concept will largely improve life – they will also allow for its huge reorganization in terms of the upcoming social, ecological and technological changes. The idea of a smart city is also part of the concept of sustainable development.

By the concept of sustainable development, we understand socio-economic growth, which consists in constantly meeting the needs of society in such a way as not to limit the possibility of meeting these needs for future generations. According to the definition, the idea of sustainable development aims to protect the natural environment, promote the principles of international solidarity, and treat as interdependent factors such as: ecological, economic and socio-political factors (Encyklopedia PWN). In order to achieve sustainable development, cities decide to use modern technologies that not only provide them with a balance in the above-mentioned aspects, but also improve the quality of their lives – which is in line with the idea of a smart city (Korenik, 2017).

In the context of smart cities, it is often the case that local government units include the concept of sustainable development in their investment plans and budget expenditures. At this point, not only the concept itself is extremely important, but also the conscious approach of employees and their views, which translates into the appropriate implementation of the idea of sustainable development (Brdulak, 2017). Measuring the achieved goals is based on the adopted evaluation criteria, developed indicators or other planning documents. Usually, local government units include specific measures in their strategic plans, which depend on the goals adopted for implementation. One of such measures are indicators of sustainable development. They are the main source used to monitor ongoing activities. The principles of selecting the discussed indicators are carried out through appropriate identification (Wskaźniki zrównoważonego rozwoju..., 2011):

- development principles that are the basis for the selection of indicators,
- target development goals,
- accepted social, economic, environmental and political orders.

The above criteria are only a benchmark that helps to verify whether the accepted measures are actually implemented in terms of sustainable development. For this purpose, it would also be necessary to develop specific measurable strategic goals that we are able to verify with the help of correctly matched indicators (Wskaźniki zrównoważonego rozwoju..., 2011). The next part of the article will discuss the strategic goals of the city of Gliwice in the context of integrated and sustainable development until 2022.

The concept of a smart city focuses on many innovative activities that can significantly improve the life of the local community. Depending on the accepted strategic plans, local authorities strive to improve the city management system, as well as to constantly modernize public services by introducing solutions such as:

- modern energy networks,
- intelligent sewage management systems,
- waste management systems,
- modernization of the lighting system,
- improvement of public transport, etc.

These activities allow not only to reduce the costs related to the implementation of public utility tasks, but also have a positive effect on the image of the city itself, which in the context of innovative activities is perceived as a modern city (Czupich, Kola-Bezka, Ignasiak-Szulc, 2016).

The implementation of the smart city concept involves the necessity to invest an appropriate amount of financial resources, which are not always available to local government units. Local authorities now often use various grants and forms of assistance in the form of regional programs. Another solution is also a public-private partnership, where innovative activities are implemented and financed by representatives of the private sector. Such a division of duties means that local authorities are only responsible for maintaining the investment at an appropriate level (Smart City 3.0..., 2020).

Of course, the concept of a smart city is not without certain risks. As a result of the technological development of the city, there is a risk related to the possibility of a cyber attack. As a result, the operation of the systems may be disrupted, which may result in difficulties in city management. Another example is the fear of theft of personal data that may be used by unauthorized persons (Smart city: jak...). Yet another example is the risk related to the exclusion of certain social groups (i.e. the elderly, the poor, etc.) who do not have the appropriate knowledge, skills or technological resources allowing them to use modern public services (Czupich, Kola-Bezka, Ignasiak-Szulc, 2016).

3. The concept of a smart city on the example of activities carried out by the city of Gliwice

As mentioned earlier, the idea of a smart city focuses primarily on improving people's quality of life. Introducing innovative activities through the use of modern technologies greatly facilitates the life of the local community. Additionally, the activities discussed above take into account the progressive climate change.

In recent years, there has been a significant development of the idea of a smart city, which is reflected in many parts of the world. The conducted research shows that the adopted solutions generate not only enormous profit, but also contribute to the introduction of modern technological solutions. Patterns of innovative solutions on the example of leaders among smart cities (Smart City 3.0..., 2020):

- Barcelona (Spain) – the city has introduced a modern waste management system that allows you to store garbage in special containers that neutralize unpleasant odours and enable easier and more efficient waste collection. Another convenience is a modern travel system, which ensures faster transport between locations.
- Kalasatama (Finland) – this small town on the outskirts of Helsinki has been included in a pilot program implementing an intelligent traffic management project.

Also in our country, you can find examples of smart cities that focus on the development of modern technologies. One of the examples is Warsaw, where it is planned to create the largest project in Europe that allows testing and introducing innovative activities in the environment of residents – including intelligent lighting, parking sensors, etc. (W Warszawie powstaje..., 2016).

There are many more examples of smart cities. The city of Gliwice is one of them that has proudly fit into the concept in question for several years. According to local authorities, the city is introducing modern solutions aimed at making life easier for residents, whose population in urban areas may exceed 60% by 2030 (Smart rozwiązania klimatyczne?..., 2019).

How to check if the city of Gliwice fits in with the smart city concept? One of the key aspects was the selection of an appropriate research method that allowed for a better understanding of the real activities of the city. The appropriate selection of the research method allows for the verification of the accepted goal and enriched the knowledge about the activities carried out by the city. The research method should be clear and understandable for the reader who wants to find out why the city of Gliwice fits into the discussed concept. For this purpose, the focus was on a method that allows for the examination and verification of documents – in this case, publicly available articles. The analysis of these documents allows to get acquainted with the mission, achievements and the way of operation of a given entity (Encyklopedia PWN), which in this case is the city of Gliwice. Another source of information is the Strategy for the Integrated and Sustainable Development of the City of Gliwice until 2022 (Update 2014), which is attached to the to the Resolution No. XLII/880/2014 of the City Council in Gliwice of March 20, 2014. The document is available to the public on the website of the Public Information Bulletin of the City of Gliwice (tab: *Resolutions of the City Council*). The publication is one of the main planning documents that focuses on the local development of the city. The strategy also includes improving people's quality of life. According to the provisions that can be found in the document in question, one of the strategic goals of the city is to increase the satisfaction of residents by improving their quality of life. Building coherence and cooperation between individual city entities also gives an opportunity to coordinate many activities and maintain synergy between implemented projects. The accepted strategy also puts emphasis on cooperation in the economic aspect of the city, which will translate into development opportunities and an increase in the city's competitiveness. The authorities of Gliwice put emphasis on improving the living conditions of the inhabitants and streamlining the city's organizational system. The degree of achievement of these goals can be seen in the annual

reports on the city's condition. The reports contain information such as on activities undertaken for the purpose of cooperation between research units and enterprises, and activities aimed at in order to improve the quality of life of residents. The city of Gliwice, as one of the key members of the Upper Silesian Agglomeration, also focuses on the development of its teaching potential and scientific, which should be one of the main factors of innovative development. Strategic plans also assume cooperation of local authorities with neighboring cities and communes in the context of development activities, such as, for example, preparation of investment projects, use of renewable energy sources, implementation of activities in the context of intelligent transport or waste management system. The vision of the city's development is largely based on (Strategia Zintegrowanego..., 2014):

- economic development,
- development of new technologies,
- the potential of residents who are involved in the city's life,
- increase in the city's competitiveness,
- development of scientific and research potential,
- cooperation of local authorities with residents and the private sector,
- acting in accordance with the principles of sustainable development,
- visible and perceptible changes that are noticeable to residents.

Activities in line with the smart city concept have been implemented by the city of Gliwice for many years – information can be found in the online articles. One example is the construction of an intelligent traffic management system. The investment carried out in 2011-2013 consumed a total of approximately PLN 29 million (85% co-financed by the European Union). The introduced solution enables smooth and faster city driving. It also allows to find a parking space. For this purpose, it is necessary to run the application, available at the link: <https://its.gliwice.eu>. The data in the system is processed on the basis of information obtained from sensors located in the region (including at crossroads). The accepted solution serves to improve the safety condition thanks to efficient traffic management (Gliwice wdrażają inteligentny..., 2019).

Another example of innovative activities is the introduction from 2009 of a modern alarm and warning system against threats, managed by Centrum Ratownictwa Gliwice (CRG)¹. The introduced system replaced the obsolete alarm sirens operating on the basis of rotor motors. Modern alarm systems make it possible to transmit verbal messages using radio technology. The earlier solution allowed for the alarm to be triggered only in the place where the event occurred. Currently, it is possible at the CRG headquarters. The investment cost was approximately PLN 900,000. The financial resources came from the city budget (W Gliwicach powstał..., 2010).

¹ Centrum Ratownictwa Gliwice (CRG) is a municipal organizational unit established to carry out the city's own tasks in the field of rescue and crisis response. The unit is supervised by the President of the City of Gliwice.

Another investment is the expansion of the city monitoring system. This task has been carried out for several years by the Śląska Sieć Metropolitalna Sp. z o.o. (ŚSM)². An extensive city monitoring system helps to ensure the safety of residents, as well as to determine the circumstances of various events (such as: hooliganism, accidents, etc.). The cameras can be observed, among others, at Piłsudski Square. It is an investment positively received by the residents (further collection points are constantly added as part of the civic budget) and widely recognized as one of the most innovative in the whole country (Oko na Gliwice..., 2016). The image from the surveillance cameras is stored on a special server for 30 days. Only the representatives of the police and municipal police have access to the source materials (Nowe kamery na..., 2016).

Another example is the intelligent lighting system that has been regularly implemented since 2012. The discussed solution based on LED lamps enables constant management and monitoring of electricity consumption. The electronic lighting control system means that individual lamps can be turned on/off at different times and freely control the level of their exposure. Constant monitoring of the entire system also allows for more efficient localization of possible faults and their quick repair. The City of Gliwice is also planning to implement tasks aimed at responding to the needs of climate change. Work is currently underway to develop an effective system for water status monitoring (Inteligentne rozwiązania ułatwiają..., 2019).

In view of the examples cited, it is clear that the city of Gliwice fits perfectly into the concept of a smart city. The implemented investment activities contribute to the improvement of the inhabitants' quality of life, which results in an increase in their satisfaction. The city is developing, providing the local community with access to the latest innovative solutions. Local authorities strive to ensure safety for residents. into account the progressive climate change. The development strategy of the city of Gliwice is also based on the principles of sustainable development.

4. Summary

The concept of a smart city is now becoming one of the key strategic aspects of a given local community. Innovation and conscious, uninterrupted education of the inhabitants allows not only for a better implementation of modern solutions, but also helps to reorganize the city management system, which results in an increase in satisfaction and improvement in the quality of life of the local community. Compliance of the discussed concept with the principle of sustainable development ensures harmony between various aspects of life and does not limit

² Śląska Sieć Metropolitalna Sp. z o.o. (ŚSM) is a company wholly owned by the local government of Gliwice. It carries out tasks related to the development of telecommunications infrastructure and broadband Internet in the area of the Silesian metropolis.

the chances of future generations to benefit from the currently developed solutions. Effective implementation of the idea of a smart city raises the living standards of its inhabitants and affects the economic development of the region. Threats may only result from the imperfections of systems or poor education of the inhabitants, who may not have the appropriate means or resources to learn about new technological trends. Innovative activities should not be based only on modern technologies. To a large extent, it is people who should be the driving force behind the upcoming changes, because it is thanks to their involvement that all innovative activities make sense and contribute to improving the quality of life of the local community.

Conclusion – it can be concluded that the city of Gliwice fits perfectly into the concept of a smart city. The examples perfectly show that local authorities effectively carry out their mission and strive for continuous development of the city. Future research may be conducted in the direction of strategic changes planned for implementation by 2022. After this time, it will be possible to determine which planned activities have been successfully implemented, which should be improved, and which will be implemented in the future. In the coming years, it will also be possible to verify which of the planned new innovative activities have been implemented and how they will contribute to the improvement of the quality of life of the city's inhabitants.

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