



HAL
open science

Crowdsourcing and Sharing Economic in the Smart City Concept. Influence of the Idea on Development and Urban Resources

Łukasz Przysucha

► **To cite this version:**

Łukasz Przysucha. Crowdsourcing and Sharing Economic in the Smart City Concept. Influence of the Idea on Development and Urban Resources. IFIP International Workshop on Artificial Intelligence for Knowledge Management (AI4KMES), Aug 2021, Montreal, QC, Canada. pp.19-31, 10.1007/978-3-030-96592-1_2 . hal-04120826

HAL Id: hal-04120826

<https://inria.hal.science/hal-04120826v1>

Submitted on 7 Jun 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License



This document is the original author manuscript of a paper submitted to an IFIP conference proceedings or other IFIP publication by Springer Nature. As such, there may be some differences in the official published version of the paper. Such differences, if any, are usually due to reformatting during preparation for publication or minor corrections made by the author(s) during final proofreading of the publication manuscript.

Crowdsourcing and Sharing Economy in the Smart City concept. Influence of the idea on development and urban resources.

Łukasz Przysucha^[0000-0002-1644-1121]

Wroclaw University of Economics and Business
Komandorska 118/120 53-345 Wroclaw, Poland
lukasz.przysucha@ue.wroc.pl

Abstract. The sharing economy is a relatively new trend that occurs practically all over the world. It involves a complete change of organizational and distribution models. The main structure focuses on a distributed network of people and communities. This includes mutual service provision, sharing. This is definitely to use resources more efficiently. In recent years, we have seen a great popularity of systems based on the idea of the sharing economy. Crowdsourcing is a process related to the sharing economy in terms of obtaining information / knowledge. It is a process in which a given organization, a public entity, or a company performs outsourcing of tasks. The inquiry is usually directed to an unidentified, usually very wide group of people in the form of an open call. In the article, the author wonders if the sharing economy is the new economy? What is the impact of the sharing economy on Smart City? Is Crowdsourcing part of the sharing economy or is it the reverse? Will the sharing economy and crowdsourcing be the future of Smart City and what motivates residents to share together? There is a correlation between the development of the idea of the sharing economy and crowdsourcing and the development of Smart City. The article analyzes the relationship between these two trends and their impact on Smart City. The verification is carried out on the example of the city-state of Singapore, which has been occupying leading places in the Smart City rankings in recent years. An interesting aspect discussed in the article is also the exchange of knowledge in Smart City and the cycle of information between residents, decision-makers, and stakeholders and third parties, such as education or business.

Keywords: sharing economy, crowdsourcing, smart city, knowledge acquisition, Singapore

1 Introduction

From year to year, we observe an increasing development of globalization around the world. This is largely due to the mass media, the development of the Internet and electronics, as well as easier transport and popularization of travel.

Every now and then we learn about new trends in the world, as well as social development, which has an impact on the standardization of certain behaviors, especially in already developed countries. It can be observed that thanks to the facilitated means of communication and communication, it has become popular to share with the closest environment. In everyday life, we can see people streaming videos to friends and family, and photos presenting everyday activities, for example at home or work, while on the road, people willingly share cars, on the one hand caring for the environment, but also on the sociological side - the will to share information with other people as well as being together with them. We also travel and use shared services more and more often. Accommodation in hotels is as popular as platforms for spending the night together, for example renting rooms in one apartment with other, previously unknown people. Purchases of second-hand goods have also become popular, as well as the sharing of other people's goods for payment. People also use shared office spaces by renting them out by the hour. The sharing model has gained importance and is now expanding rapidly. Sharing knowledge and information has become equally popular [1]. People want to inform the environment what they think about a given topic, what their beliefs and opinions are, and they want to influence the immediate environment around them. As it can be seen, nowadays in every aspect of life, people share both their intellect and material goods, and this model is gaining popularity every year. The aspect of sharing from the Smart City perspective is also interesting. In this article, the author examines the impact of sharing trends on urban development and innovation in technology and intra-city communication, and tries to discuss how ideas will develop in the future. The phenomena of crowdsourcing and the sharing economy are analyzed on the example of Singapore, a city-state located in the center of Asia, a model Smart City, mentioned in many rankings.

2 Crowdsourcing in Smart City

Interaction between people is ubiquitous all over the world. Recently, it can be observed that more urbanized areas within agglomerations rely on innovative solutions that will develop better communication and information flow between their inhabitants. The attitude of the authorities is focused on the development of an intelligent society, i.e. one in which many factors interact [2][3][4]:

A. Technologies

This is an area that supports intelligent society in terms of quick access to data, ensures data security and integrates many systems and tele-information planes in the city. It serves better communication and, indirectly, democracy in a given area through the possibility of publishing public data on, for example, administrative expenses and the possibility of aggregating these data by all residents in the city. Thanks to the latest technologies, it is also possible to analyze the past, Business Intelligence data support the city's development on the basis of archival data, and the authorities can estimate the future based on historical conclusions.

B. Ecology

Sustainable development and protection of natural resources and nature, it is necessary in many respects, mainly this aspect concerns ensuring good living conditions for future generations, but also adequate comfort for the current inhabitants of the city, e.g. anti-smog programs, appropriate fuel standards for cars moving in a given agglomeration training for young residents in the area of ecology, Smart Ecology solutions, installation of photovoltaic panels and heat pumps that do not affect the consumption of fossil fuels and do not produce carbon dioxide, there are emission-free.

C. Sociology

Coexistence in a very diverse society, full acceptance of various religions, sexual orientations, acceptance of a different worldview. Exchange of thoughts on neutral ground and with respect for other residents. Respect for tradition.

D. Administration

Intelligent management of society, interaction between residents, decision-makers and stakeholders such as universities, private companies. In Smart Society, it is necessary to obtain information from residents about their needs and beliefs, as well as to provide them with a partial possibility to decide about the immediate environment. Power is for the people and is involved in the development of the city, mainly with the residents in mind.

In the area of the aforementioned city administration, it is necessary to properly aggregate information from residents and stakeholders in order to know what are the expectations of other groups in the city. It comes to mind what tools can be effective in transmitting such data, what algorithms to use and how to collect them. Crowdsourcing is a process [5] in which, for example, a company, public institution, but also recently city administrations outsource tasks performed by employees to an unidentified, wide group of people in the form of an open call. A tool used by local administration can be modern means of communication such as social media, the Internet, mobile phones and others. The discussed processes mainly take place in Smart Cities.

There are many definitions of Smart City depending on the perspective and aspects we consider. Some focus on defining a modern city as a whole of technology that favors the development of agglomeration, others on interpersonal aspects and human capital, which, when developed, gives its participants greater awareness of being in an intelligent society. Considering these definitions [6][7][8], it can be concluded that Smart City is a city that uses communication and information technologies [9] in order to increase the interactivity between users of the implemented systems, also increase the urban infrastructure, optimize processes between all areas in the agglomeration, syn-

chronize city components, and also raising the awareness of residents of being an element of Smart Society, and thus activation in various aspects of life, e.g. active participation in the civic budget created by residents, impact on the immediate environment, as well as creating a profile of the resident and the consequences resulting from this fact.

Crowdsourcing is present in many cities in various forms. Recently, popular in Smart Cities is the civic budget (participatory budget), which takes into account the investment propositions of residents and is aimed strictly at citizens. It consists in submitting proposals and investment needs in a given agglomeration. Residents directly decide what they need and local authorities interact with them [10]. In this case, city decision-makers only support the process from the technical side and verify the submitted proposals in terms of compliance with the regulations (e.g. whether the tasks fall within the previously indicated financial pool intended for all investments in the city). A simplified diagram of the citizens' budget is presented below.

Web platform

- The city provides a platform where residents can submit proposals to the civic budget

Proposals of investment plans

- Residents submit their proposals which, in their opinion, deserve to be implemented within the allocated funds by the local administration

Verification of applications

- The city administration verifies the submitted proposals. In case of exceeding the assumed budget or non-compliance with the regulations, some proposals are removed from the list

Voting

- Residents can log in to the user panel on the city portal in the place where voting takes place. The administration sets a time interval when it will be possible to vote for investments

Final announcement of results

- After the deadline, the city administration announces the final list of tasks that will be implemented within the budget

Realization of investments

- In the last step, investments are in the process of implementation

Fig 1. The mechanism of the civic budget.

3 Sharing Economy

The sharing economy [11][12] is primarily a social phenomenon involving a fundamental change in both distributional and organizational models. It focuses mainly on the direct provision of services between people, as well as sharing and co-creating many aspects of life. Recently, there has been a lot of interest in this trend. In the past, this form of cooperation referred only to the immediate family and circle of friends [13][14].

Table 1. Advantages and disadvantages of Sharing Economy.

Advantages	Disadvantages
Increasing social ties between people - thanks to the sharing economy, a large part of society opens up to other people and meets new people. It definitely increases the sense of belonging from a psychological point of view.	The threat to traditional business models, such as cars that are rented to residents to ultimately provide taxi services, may displace traditional taxi services in a given location.
Positive impact on the environment - thanks to many solutions, incl. car sharing between cities or within agglomerations can reduce exhaust emissions, which translates into a cleaner environment.	Too much data sharing can compromise privacy. It is uncertain whether the person who obtains the data is trusted and whether he will not use it for a wrong purpose.
Effective management of available resources - by implementing some solutions associated with the sharing economy, it is possible to save time or money. Renting, for example, a bicycle or a car, optimizes reaching the destination, as well as does not require a financial contribution to the purchase of equipment.	The lack of clear legislation on some aspects of the sharing economy means that a country can suffer less tax payments, and the processes are often unclear and inadequately defined.
Increasing the possibility of finding a job - by providing services directly, you can bypass the monopolies of large companies and reduce the costs of providing services. This makes the data of the person more competitive.	Lack of an unambiguous and independent reputation rating system for given individuals - people can often lose their entire career and business due to one negative comment in the Internet. All principles are based on social trust and represent an ideal model that does not assume many negative variants of behavior.

Relationships between strangers are most often associated in the initial phase with a lack of trust, the need to obtain more information about the other person, and often protect themselves. Thanks to modern technologies, communication between users on both sides is much simpler and easier. Technologies overcome the obstacles before getting to know the other side, users can be in a safe area for them and communicate with others, transfer information and exchange knowledge. In the sharing economy, the field for sharing is much wider.

Table 2. Comparison of the most important systems based on the sharing economy.

System name	System description	Share analysis
Uber	An application supporting the use of carpooling. Thanks to the system, users can be taxi drivers and drive other people in their cars, as well as use other residents' journeys.	At first, users were afraid to drive their cars with strangers, but the system quickly became popular. Thanks to the registration of trips and the general database of drivers, journeys have become safer than regular taxis and the application has gained a large crowd of fans
Airbnb	System supporting short-term rental of apartments and rooms. The system works all over the world, often recommended during vacation trips. Each resident can rent their house / flat. On the other side, there are strangers who are renting out places.	People break the barrier of sleeping in someone's home, often with the owners in the other room. The system is becoming more and more popular. Another system that works in a similar system is Couchsurfing, which connects people who want to rent their home for free and tourists who want to stay without paying for the night.
Wikipedia	Wikipedia is the largest encyclopedia on the Internet. It has 285 languages and nearly 300,000 editors. Each user can add their own content, and after moderation, it can be shared.	The willingness to share knowledge is very high, especially in developed countries. Users very often use Wikipedia as the first source of finding knowledge, and search engine algorithms give it a significant advantage due to the large amount of original content.

Ebay	Online shopping system. Used items can be sold. A very large proportion of Internet users use this system.	Contrary to appearances, Internet users do not mind the fact that items are used or purchased as new from a foreign store without physically visiting it.
Car Share Companies	Online shopping system. Used items can be sold. A very large proportion of Internet users use this system.	Thanks to the application, the user can rent a car for minutes. Many smart cities have introduced this system to reduce the number of cars on the streets, and thus eliminate some exhaust fumes and pollution.

Analyzing the above examples, one can see a great willingness to share people. There is a noticeable trend in the sharing economy. It is a socio-economic system built around the division of human and material resources. It includes the joint creation, production, distribution, trade and consumption of goods and services by different people as well as organizations.

On July 16-17, 2021, the Author conducted a study in the city of Wrocław, Poland in the field of the sharing economy and crowdsourcing. 200 residents in the city were asked. These were three open-ended questions. They are presented below with an illustration of the answers given.

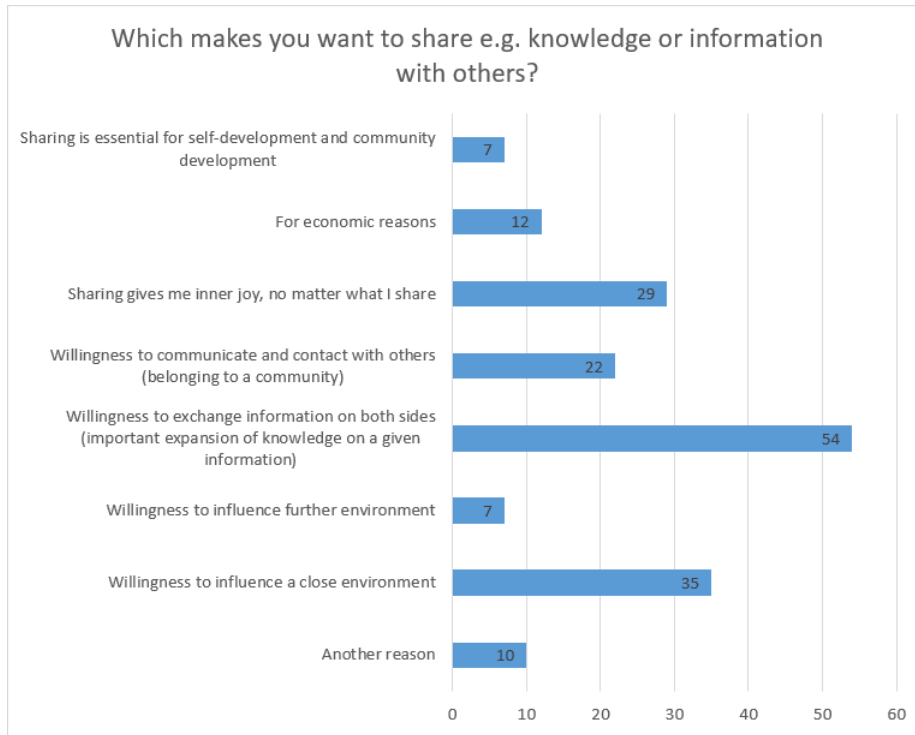


Fig 2. Knowledge sharing survey - first question.

In the study, this question was asked to the inhabitants of the city of Wrocław to verify the reasons for wanting to share with others. Sharing can cover both tangible items as well as human capital, information and intangible items. The main aspect for which residents share is to make something available to get something. The questionnaire mainly provided answers in the field of information and knowledge exchange. Residents are curious about the information and knowledge possessed by other residents and by providing their resources they count on feedback. This is the most important reason for 27% of respondents. Another important aspect is the desire to influence the environment. Almost 18% want to influence the closer environment, while almost 4% want to influence further environment, which in total gives one in four respondents. A good example for smart cities are civic and participatory budgets, in which residents have a real say in matters of investment in the immediate vicinity as well as decisions made by local administration. In the case of Wrocław, according to data provided by the City Hall, 92,000 residents took part in 2020. Assuming that 80% of the inhabitants may be eligible to vote, for an urban population of 650,000, this is 520,000 inhabitants, which gives an interest of 17%, speaking of the local budget, which is consistent with the survey. The human factor is also an important element, which makes sharing between two or more people a joy. It is also consistent with wanting to belong to a group

and community. A large proportion of the respondents marked this answer. The exchange also takes place for economic reasons, e.g. in the case of a desire to obtain material goods on the basis of barter exchange, participation in lotteries organized on the occasion of civic budgets aimed at mobilizing the society, and others.

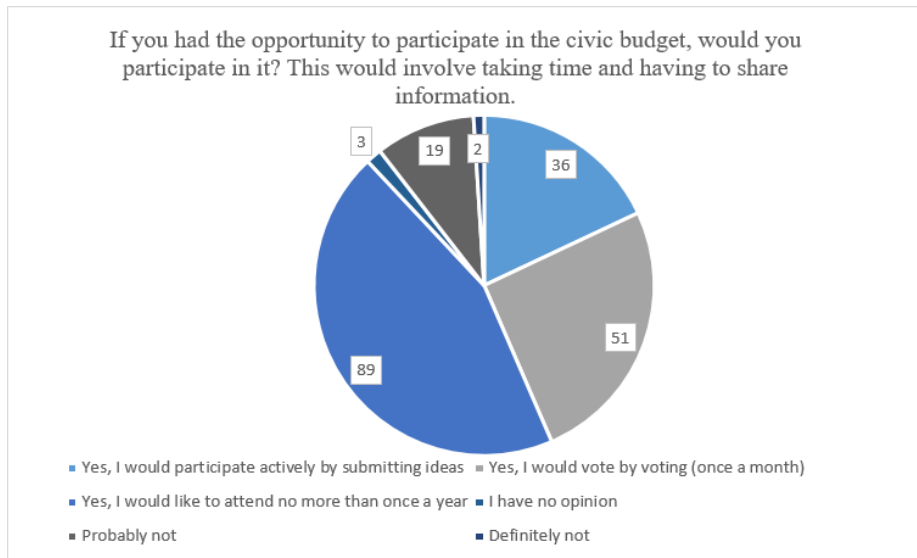


Fig 3. Knowledge sharing survey - second question.

Another aspect raised is the question of the willingness to participate in the civic budget. A very large proportion of the respondents were not aware of this form of decision-making in the field of local investments. Only every fourth respondent knew this mechanism. Ultimately, 88% of residents (176 people) expressed their willingness to participate in this initiative. It is interesting because in the previous question only 17% decided that the will to share is the most important for them. It can therefore be concluded that some residents put this goal in the next place for sharing knowledge and information, while others were encouraged and motivated only after presenting the entire voting platform. 18% of all respondents expressed a willingness to actively participate in the civic budget, and therefore a willingness to present their ideas to others. This group puts the issues of the local environment first. Over 44% of residents would like to participate in the project only once a year in a passive form by only voting for the best ideas in their opinion. On the other hand, 25% would like to participate once a month. Only 10% of the respondents are against participation in the citizenship project, which is a small percentage of the total.

Summing up, the civic budget enjoys great interest. Despite the fact that it is not well-publicized yet, many people participate both actively and passively in voting. The study shows that when the message is clear, participants overwhelmingly have an interest in

participating in this initiative. People both share their knowledge, information and possessed material goods due to the hunger for knowledge of the other party, the desire to gain knowledge in a conversation as well as the desire to influence the close and further environment surrounding them. Many people share because they feel an inner belief that is not definable.

The sharing economy is a global trend and we are seeing a significant development in this aspect. Some scientists already define it as a type of economy. Interestingly, the sharing economy is present on many levels and everywhere in the world. It manifests itself in the will to share apartments and cars, but also knowledge and information. The latter can be associated with crowdsourcing, which supports the acquisition of knowledge from other people. The use of Crowdsourcing is becoming more and more popular. The author draws attention to the dynamic development of crowdsourcing processes in the area of Smart City and agglomerations in developing and already developed countries.

4 Analysis of Crowdsourcing and the Sharing Economy processes on the example of Singapore

Singapore is a city-state located in Southeast Asia. Thanks to its location and history, it is one of the richest countries in the world and the financial center of the region. The city is also very developed in terms of being Smart. The most popular ranking positioning Smart City in the world - Smart City Index [15], created by the Institute for Management Development, has awarded Singapore the highest places in the ranking for many years (in the previous edition, Singapore, Helsinki and Zurich were the most intelligent cities). Singapore has been building an intelligent nation for many years, taking full advantage of the latest technology to improve citizens' lives, create more opportunities and build stronger communities. The city announced its strategy for the development of artificial intelligence: "Singapore National Artificial Intelligence Strategy" [16]. The document defines three strategic goals for the government:

1. Identify areas of focus and resources at the national level to find niches in which Singapore could become a world leader.
2. Develop the best model of cooperation between the government, companies and science in order to best realize the positive potential of artificial intelligence.
3. Identify the areas of "special concern" where, with the spread of artificial intelligence, change and risk management will be needed (eg labor market, decisions made by machines).

The entire strategy is developed in the time frame until 2030. This is another element in the implementation of the "Smart Nation" project. Smart Nation is an initiative of the Singapore government aimed at using information technology, networks and big data to create technological solutions. The key pillars supporting Singapore's Smart Nation goals are: digital economy, digital government and digital society.

1. Digital economy - The Singaporean government is trying to adapt digitization - its pace and size to the business activities of companies and the development of industry

structures so that the work of companies is not disrupted and it does not adversely affect the development of society. Firms and businesses play a key role in the digital economy. The government wants excellent infrastructure and connectivity with major Asian economies, as well as investment availability and well-developed technology to help attract businesses and talent. They have a vision of building a dynamic economy that will remain attractive to foreign investment, with good opportunities for Singaporeans. Digitization of industries increases business efficiency and creates new jobs and opportunities.

2. Digital Government - The Digital Government Plan (DGB) was launched on June 5, 2018, setting out the vision and strategies for achieving Digital Government. 14 key performance indicators (KPIs) have been set to measure the progress of digitization. Policies and strategies, processes and organizational structures have also been introduced; talents were also recruited and trained to systematically use digital technologies and maintain the pace of development in the long term. Together, these efforts will get the government to digitization to the heart.

Below is a Smart Nation Framework diagram showing the implementation of a strategy for government digitization.

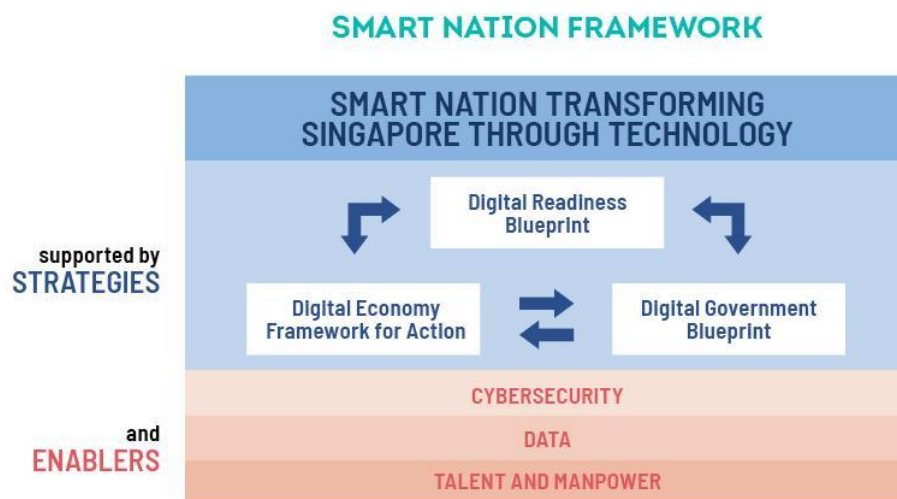


Fig 4. Smart Nation Framework – Singapore. [17]

3. Digital Society - Digital inclusion aims to ensure that all Singaporeans have access to technology that can improve everyday life, and equip people with the skills and knowledge to use technology safely and confidently. To enable Singaporeans to maximize the opportunities of a digital society, improve their lives, connect with the world and have a level playing field for success, a Digital Readiness Plan has been issued. The Government of Singapore is very involved in the development of digital society, but also Smart Nation, which is a key element for the further development of Smart City. Communication between public administration and residents, education and the

business sector is extremely important. The government aggregates and processes data obtained from its stakeholders.

They are organizing crowdsourcing activities in the form of challenges such as idea generation contests, application development, and hackathons to address issues that Singaporeans may face.

All government agencies can effortlessly engage citizens and solicit ideas with Ideas!, Singapore's first government crowdsourcing portal. The portal, owned by the Chancellor of the Prime Minister (PMO) of Singapore, redefines citizen engagement by incorporating citizens' ideas and engaging with citizens to meet the nation's challenges. Ideas! is deployed on a government platform as a service (PaaS), also known as Nectar. Nectar was recently launched by the Singapore Government Technology Agency (GovTech) as a platform for hosting government digital services. With Nectar, government agencies can quickly develop, deploy, and scale applications. This application is a centralized platform for government administration activities. It enables all Singapore government agencies to use the collective wisdom of their citizens to aggregate a cost-effective way to generate and develop good ideas. Through the portal, each government agency can independently organize and manage crowdsourcing activities such as application development competitions, hackathons and campaigns. The audience can access the ideas! submit, comment and vote on the best ideas as well as share them on social networks.

Besides giving citizens a voice, Ideas! it encourages citizens to participate directly. Communities are empowered to lead the development process that shapes their lives. Ideas contributed by citizens can be selected as pilot projects for building citizenship and ownership.

Path to citizen participation in cities



Fig 5. Path to citizen participation in cities – Singapore. [18]

Singapore is a very developed and wealthy city, so it can invest and develop the subject of Smart City in its various aspects. The above-mentioned applications and platforms support the possibility of interaction between city decision-makers and residents. Users often use the mentioned programs for sharing and exchanging information / knowledge as well as material resources. The implemented ideas have the right resonance in the whole society and the government uses appropriate marketing to promote the implemented solutions. Properly prepared and implemented strategies are aimed at building a Smart Society, which is used, among others, by with the sharing economy and crowdsourcing as elements that expand and support its development.

5 Conclusions

From year to year, we observe an increasing development of civilization. The population is shifting from rural to urban areas. In connection with migration, problems arise in relation to communication, technological solutions and everyday life in large urban centers. Policy makers are informed about the needs of their residents and interact with them. Crowdsourcing presented in the article is an ideal tool for acquiring knowledge from residents and stakeholders. The author indicated the civic budget as an example of crowdsourcing. Attention should also be paid to a related phenomenon, sometimes referred to as the new economy - the sharing economy. It is thanks to him that we can observe the willingness of people around the world to share. These may be tangible goods, but the focus was on the analysis of information and knowledge transfer and sharing. The article shows that people want to share their knowledge in order to develop it and exchange news on a given topic. It is also important for them to develop the close and further environment that is directly related to them. On the example of cities and local communities, these can be civic (participatory) budgets, which are precisely a form of crowdsourcing. The article analyzes, on the example of Singapore, the mechanisms that auctioneer Smart Society and are closely related to crowdsourcing and sharing economy. The diagram below shows the role of crowdsourcing in the flow of knowledge.

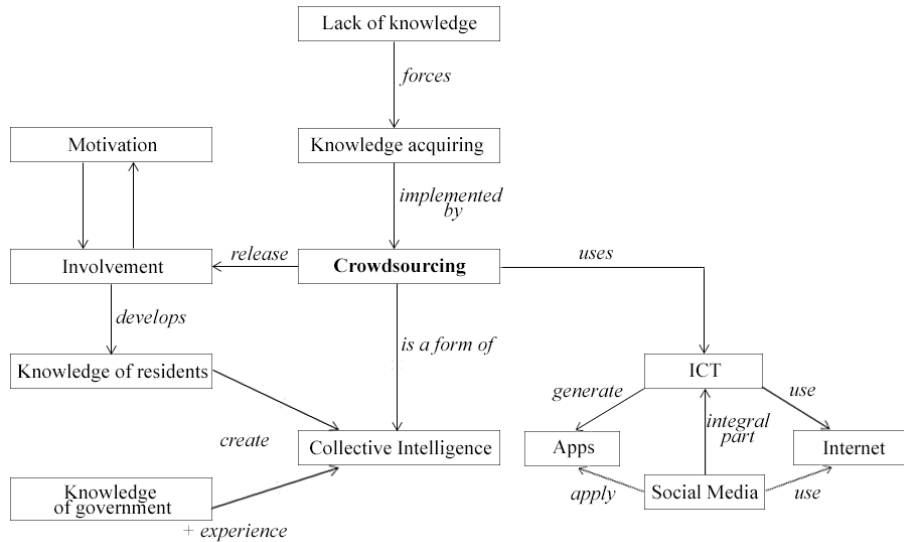


Fig 5. The role of Crowdsourcing in the knowledge management and information processes.

References

1. Owoc M., Marciniak K.: Usability of Knowledge Grid in Smart City Concepts. In: ICEIS, pp. 341-346. (2013).
2. Owoc M., Weichbroth P.: University Students' Research on Artificial Intelligence and Knowledge Management. A Review and Report of Multi-case Studies. In: IFIP International Workshop on Artificial Intelligence for Knowledge Management, pp. 66-81, Springer, Yokohama, Japan (2021).
3. M. Manda, Backhouse J.: Towards a "Smart Society" Through a Connected and Smart Citizenry in South Africa: A Review of the National Broadband Strategy and Policy. In: International Conference on Electronic Government, pp. 228-240. (2016).
4. Albino V., Berardi U.: Smart Cities: Definitions, Dimensions, Performance, and Initiatives. In: Journal of Urban Technology, vol. 22 issue 1 (2015).
5. Przysucha Ł.: The Concept of Crowdsourcing in Knowledge Management in Smart Cities. In: Artificial Intelligence for Knowledge Management, Springer, Macao. (2019)
6. Dameri R.: Smart City Definition, Goals and Performance. In: Smart City Implementation, pp. 1-22, Springer (2017).
7. Gołuchowski J., Korzeb M., Weichbroth P.: Perspektywy wykorzystania architektury korporacyjnej w tworzeniu rozwiązań smart city. In: Roczniki Kolegium Analiz Ekonomicznych, pp. 85-98, Springer (2015)
8. Nam T., Pardo T.: Conceptualizing smart city with dimensions of technology, people, and institutions. In: Proceedings of the 12th Annual International Digital Government Research Conference: Digital Government Innovation in Challenging Times, pp. 282-291. (2011)

9. Domagała P.: Internet of Things and Big Data technologiises as an opportunity for organizations based on Knowledge Management. In: 2019 IEEE 10th International Conference on Mechanical and Intelligent Manufacturing Technologies (ICMIMT), South Africa, (2019)
10. Adamiczka, H.: Civic Budget as an Instrument for Meeting the Needs of the Citizens on the Example of Wrocław. In: Architektura Krajobrazu vol 2, pp. 100-115. (2017)
11. Allen D.: The sharing economy. In: Institute of Public Affairs Review: A Quarterly Review of Politics and Public Affairs, vol. 67, pp. 24-27 (2015)
12. Hossain M.: Sharing economy: A comprehensive literature review. In:International Journal of Hospitality Management. vol 87. (2020)
13. Mercier-Laurent E.: Innovation Ecosystems. John Wiley & Sons (2011)
14. Özkuran M., Kayakutlu G.: Segmentation of Social Network Users in Turkey. In: IFIP International Workshop on Artificial Intelligence for Knowledge Management. Springer (2016)
15. Smart City Index by The Institute for Management Development
16. <https://www.smartnation.gov.sg/why-Smart-Nation/NationalAISstrategy>
17. <https://www.tech.gov.sg/>
18. <https://www.tech.gov.sg/>