Grażyna OSIKA[1]

4. AMBIENT DESIGN AS A SOCIAL INNOVATION FOR SMART CITIES OF SOCIETY 5.0

4.1. Introduction

If we wanted to predict how human civilization will develop in the future, considering technological and social issues, the most obvious solution would be cities, managed in the spirit of social concepts, which are currently referred to as Society 5.0. Why cities? Because the accumulation of people in one place gives birth to a huge potential for action. We discovered this truth in the history of mankind quite early; some even believe that cities are the greatest technical invention of human being[2], which became possible thanks to the increase of the organizational capacity of man. The tasks of the system, which is the city, are to ensure safety and prosperity of its inhabitants. The condition for the realization of this assumption is to maintain the balance of the system. It is not surprising that, in view of the growth of the world population, this invention is considered the best solution, making urbanization one of the dominant social trends[3]. The city as a system allows for easier access to resources, health care, education, cultural goods, and also offers greater opportunities to obtain work than rural areas. Today, cities are seen as an opportunity to create a more sustainable environment in which, thanks to human cooperation and advanced technologies, it will be possible to increase harmony

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[2] Rose J.F.P.: Dobrze nastrojone miasto. Czego współczesna nauka, pradawne cywilizacje i ludzka natura mogą nas nauczyć o przyszłości życia w mieście Krakter. Kraków 2019.
[3] See: Weizsäcker E.U. von, Wijkman A.: Ejże! Kapitalizm, krótkowzroczność, populacja i zniszczenie planety. Raport Klubu Rzymskiego, Instytut Badań Stosowanych Politechniki Warszawskiej, Warszawa 2018; Osika G. Connexity jako element koncepcji Smart City – analiza wybranych aspektów na przykładzie polskich miast. [In:] Jonek-Kowalska I, Kaźmierczak J. (eds): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 123–136; Kowalska-Styczeń A.: Badanie złożoności zjawisk społecznych w kontekście inteligentnego miasta. [In:] Jonek-Kowalska I., Kaźmierczak I. (eds): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 137–146.

between man and nature[4]. We are talking about a specific concept of the city, the so--called Smart City (SC). In this vision of the future, humanity lives mainly in cities where a large part of the processes involved in its functioning are automated, and thus a high level of optimization of management is achieved. But managing is, above all, to follow some general plan, to direct activities according to a previously adopted development strategy. Why is it assumed that this vision should be the concept of Society 5.0? Because in this social concept there is a broader view of the human being, the social environment, and the directions of development to which we can aspire thanks to technology, which, as it is assumed in this vision, will make it possible to experience universal well-being to a greater extent. As defined, "Society 5.0 attempts to balance economic development with the resolution of social and environmental problems. […] is a society in which advanced IT technologies, Internet of Things, robots, artificial intelligence, and augmented reality are actively used in everyday life, industry, healthcare, and others spheres of activity, not primarily for economic advantage but for the benefit and convenience of each citizen"[5], each resident of the SC.

If the concept of Society 5.0, assumes that the society is to be a cyber-physical system in which advanced IT technologies are actively used on a daily basis to improve the quality of life, hence the term human-centered society[6], and urbanization as a social megatrend means that it is in cities that the assumptions of the Society 5.0 concept will be realized, so SC is an integral part of the vision of a human-centered society, it is its specification. But it is necessary to be more specific: how do we plan to do it, what methodology can we adopt?

It is well known that living in a city generates several negative psychological effects which, in consequence, may result in social instability, reducing the quality of life of the city inhabitants. That is why it is so important to also include this aspect in the realization of the SC and Society 5.0 assumptions. Therefore, we can say that we are currently in the brainstorming phase, that is, generating ideas on what concrete steps can serve the implementation of the visions described above. The present discussion should be treated as one of the conceptual sketches in this brainstorming, which in the future will require a deeper analysis and critical reflection, but for now, using conceptual analysis[7], it is only

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[4]Rose J.F.P.: Dobrze nastrojone miasto. Czego współczesna nauka, pradawne cywilizacje i ludzka natura mogą nas nauczyć o przyszłości życia w mieście Krakter. Kraków 2019.

[5]Breque M., Nul De L., Petridis A.: Industry 5.0, Towards a sustainable, human-centric and resilient European industry. Policy brief, European Commission, Brussels 2021.

[6] Skobelev, P. O., & Borovik, S.: On the Way From Industry 4.0 to Industry 5.0: From Digital Manufacturing to Digital Society. Industry 4.0. Vol. 2, No. 6, 2017, pp. 307–311. Available on-line: https://pdfs.semanticscholar.org/dd06/76ec0c1f225900fff0729b516a075e195d8a.pdf?_ga=2.83915353.1395171908.1591124780-70997457.1591124780 [accessed on: 22 April 2022].

[7] Conceptual analysis is a scientific method that seeks to combine existing theoretical approaches in order to develop new insights from them, which can then be empirically verified, see:

about outlining the general assumptions of the proposal. The idea suggested for consideration is to use ambient design, understood as social innovation, to design an optimal urban environment, within SC, taking into account the concept of Society 5.0. The description will include the key definition and the relationship between them to understand the essence of the proposal.

4.2. Society 5.0, Smart city, ambient design – key definitions

Outlining the essence of the concept proposed herein requires an initial definition and a preliminary definition of the main concepts through which the main problem area will be delineated. According to the assumptions contained in the "Introduction", first the idea of Society 5.0 and SC should be presented, then the denotation ranges for the notion of ambient design should be described in order to finally show what theoretical and practical meaning may result from the realization of the concept of Society 5.0 and SC.

4.2.1. Society 5.0 – Definition

The prototype of the Society 5.0 concept was Japan's strategy for the development of technology and innovation announced in 2016 entitled "Comprehensive Strategy on Science, Technology and Innovation for 2016"[8], at which time the crucial assumptions mentioned earlier were established. "The basic schema of Society 5.0 is that data are collected from «real world» and processed by computer, with the results being applied in the real world. […] Society 5.0 will feature an interactive cycle in which data are gathered, analyzed, and then converted into meaningful information, which is then applied in the real world: moreover, this cycle

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Furner J.: Conceptual Analysis: A Method for Understanding Information as Evidence, and Evidence as Information. Archival Science, Vol. 4, 2004, pp. 233–265; Gilson L.L., Goldberg C.B.: Editor's comment: So, what is a conceptual paper?. Group & Organization Management, Vol. 40. No. 2, 2015, pp. 127–130; Jaakkola, E.: Designing conceptual articles: four approaches. AMS Rev, Vol. 10, 2020, pp. 18–26 . Available on-line: https://doi.org/10.1007/s13162-020-00161-0, [accessed on: 12 March 2022]; Stuart M.T.: Philosophical Conceptual Analysis as an Experimental Method. [In:] T. Gamerschlag, D. Gerland, R. Osswald&W. Petersen (eds): Meaning, Frames and Conceptual Representation. Dűsseldorf: Dűsseldorf University Press, 2015, pp. 267–292; Dickson A., Hussein E.K., Adu-Agyem J.: Theoretical and Conceptual Framework: Mandatory Ingredients of A Quality Research, "International Journal of Scientific Research", Vol. 7, 2018, pp. 438–441.

[8] See: Society 5.0. A People-centric Super-smart Society, Hitachi-UTokyo Laboratory Springer, Tokyo 2018. Arsovski S.: Quality of Life and Society 5.0, International Quality Conference 13 IQC Quality Research, 2019. Available on-line: http://www.cqm.rs/2019/papers_iqc/81.pdf [accessed: on 22 March 2022]. Gladden M.: Who will Be the Memebers of Society 5.0? Towards an Anthropology of Technologically Posthumanized Future Societies. Social Science. Vol. 148, No. 8(5), 2019, pp. 1–39.

operates at society-wide level"[9]. This conception of society is often defined as "a human-centred society that balance economic advancement with the resolution of social problems by a system that highly integrates cyberspace and physical space"[10]. It is also sometimes referred to as "supersmart society" or "human-driven society"[11], pointing to a strong technological orientation on the one hand, but also aiming at social well-being. As emphasized in the introduction, the technological feature of society 5.0 is very important because in this vision, society is to be a cyber-physical system, it is the society "where the advanced IT technologies, IoT, robots, an artificial intelligence, augmented reality (AR) are actively used in people common life, in the industry, health care and other spheres of activity"[12] but not only for the progress, rather for the benefit and well-being of each person. Matthew E. Gladden makes us aware that "the human being who are members of Society 5.0 will also find their bodies, mind, and daily life experience transformed through the application of futuristic technologies. New types of medical devices, […] robotics, AI, and the Internet of Things will have a great impact on not only people's lifestyle and on their way of being but also on the foundation of its existence"[13]. Carolin Narvaez Rojas and others call this type of society a 'system of systems' [14], based on a complex information infrastructure made up of leading technologies such as IoT, Big Data, and AI linked together, while the primary source of information is a network of sensors used to compile large amounts of data-aggregated, these are then processed by artificial intelligence algorithms and serve as 'tools' to diagnose the state of things and then as a resource of information and knowledge, up to predictions and design of specific social changes. The technologically established process of moving from the knowledge of "what is" to "how it happened that it is" and "what can happen in the future", and finally "how to precisely program the change" is to become, according to the assumptions of the

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[9] Deguchi A., Hirai Ch., Matsuoka H., Nakano T., Oshima K., Tai M., Tani Sh.: What is Society 5.0?. [In:] Hitachi-UTokyo Laboratory(H-UTokyo Lab.) (eds.): Society 5.0. Springer, Singapore 2020. Available on-line: https://doi.org/10.1007/978-981-15-2989-4_1, [accessed: on 17 April 2022].

[10] Society 5.0. Overcoming Societal Challenges and Co-creating the Future Though Digitalisation and Unity in Diversity, Breda University, SAP, Breda 2020. Society 5.0. A People-centric Super-smart Society, Hitachi--UTokyo Laboratory Springer, Tokyo 2018.

[11] See: Society 5.0. A People-centric Super-smart Society, Hitachi-UTokyo Laboratory Springer, Tokyo 2018. Onday O.: Japan's Society 5.0: Going Beyond Industry 4.0. Bus Eco J, Vol. 10, 2019, pp. 1–6.

[12] Skobelev, P. O., & Borovik, S.: On the Way From Industry 4.0 to Industry 5.0: From Digital Manufacturing to Digital Society. Industry 4.0. Vol. 2, No. 6, 2017, pp. 307–311. Available on-line: https://pdfs.semanticscholar. org/dd06/76ec0c1f225900fff0729b516a075e195d8a.pdf?_ga=2.83915353.1395171908.1591124780-70997457. 1591124780 [accessed: on 22 April 2022].

[13] Gladden M.: Who will Be the Memebers of Society 5.0? Towards an Anthropology of Technologically Posthumanized Future Societies. Social Science. Vol. 148, No. 8(5), 2019, pp. 1–39.

[14] Rojas C.N.; Penafiel G.A.A.; Buitrago D.F.L.; Romero C.A.T.: Society 5.0: A Japanese Concept for a Superintelligent Society, "Sustainability", No. 13/6567, 2021. Available on-line: file:///Users/gra/Downloads/sustainability-13-06567.pdf. [accessed: on 29 April 2022].

concept of Society 5.0, a basic form of social activity allowing, on the grounds of accumulated data, to work out optimal solutions from the point of view of possibilities of improving the quality of life. This principle applies both to the physical infrastructure but also to social activities. In this sense the technological potential becomes the foundation of society's flexibility and the measure of its adaptability. This applies to every type of environment in which human beings function, from urban infrastructure with intelligent processes of energy, water, and transport networks, through the organization of production processes, agriculture, to the organization of leisure and emergency response. This digital transformation is expected to change many aspects of society, including private life, public administration, industrial structure, and employment, through the use of cyberspace and their integration with physical spaces. Therefore, the Society 5.0 model brings with it a number of changes that open up opportunities to create new systems and processes. These changes are technological, but also economic, geopolitical, social, and mental. The focus on the human being as the central element of change allows us to combine technological development with economic growth while giving hope for a sustainable future. This new concept of society aims to focus on the human to balance the deployment of Big Data Technologies, the Internet of Things, and Artificial Intelligence with the resolution of major problems of society such as: competitiveness, productivity, connection, and wellbeing – all these on the basis of achieving the maximization of human use of the ongoing technological transformation, digitization.

4.2.2. Smart City – Definition

In its broadest sense, Smart City is associated with the use of digital technologies such as the Internet of Things (IoT), cloud-based analytical and calculation systems based on Big Data, the application of solutions based on artificial intelligence (AI), and deep machine learning enabling the automation of all processes related to the functioning of the city[15]. SC researchers point to a lack of unanimity as to how the term itself should

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[15] See: Ahvenniemi H., Huovila A., Pinto-Seppä I., Airaksinen M.: What are the differences between sustainable and smart cities?. Cities, Vol. 60, 2017, p. 234–245; Appio F.P., Lima M., Paroutis S.: Understanding Smart Cities: Innovation ecosystems, technological advancements, and societal challenges. Technological Forecasting & Social Change, Vol. 142, 2019, pp. 1–14; Jonek-Kowalska I.: Zrównoważony rozwój inteligentnych miast. Dotychczasowe osiągnięcia i nowe wyzwania. Zeszyty Naukowe Politechniki Śląskiej, seria: Organizacja i Zarządzanie, Vol. 118, 2017, pp. 237–246; Jonek-Kowalska I., Kaźmierczak J., Kramarz M., Hilarowicz A., Wolny M.: Introduction To The Research Project Smart City: A Holistic Approach. 2018. Available on-line https://www.sgemsocial.org/index.php/jresearch-article?citekey=Jonek-Kowalska201819101112 [accessed on: 28 January 2022); Kaźmierczak J.: SMART CITY jako obszar wyzwań edukacyjnych, [w:] Wyzwania

be defined[16], but this helps to realize that the concept of smart city itself is not homogeneous. The formerly dominant approach strongly emphasized the technological aspect and is now increasingly complemented by social elements[17]. However, considering a number of definitions, it is possible to identify some common significant aspects that allow us to grasp the most crucial points for the concept itself, such as efficiency, environmental considerations and innovation[18]. Efficiency can be understood as the ability of a city to provide effective public and private services to all actors of urban life, such as citizens, businesses, non-profit organizations, etc. In this context, the main function of a smart city is to create public value for its inhabitants. In the case of environmental considerations, it is about protecting it and preventing its degradation mainly in areas such as energy consumption, water and air pollution, traffic congestion, rapid urban sprawl reducing the amount of green space. In this context, a smart city is a city that cares about the quality of its environment, including that of future generations. Therefore, the definition of SC should take into account integrative approaches reaching a compromise between the needs of all city stakeholders and taking the improvement of the quality of life in a city, including environmental factors understood in a broader

i uwarunkowania zarządzania inteligentnych miast, Wydawnictwo Politechniki Śląskiej, Gliwice, 2020. Available on-line: https://www.researchgate.net/publication/339285514_Chapter_SMART_CITY_jako_obszar_ wyzwan_edukacyjnych [accessed on: 28 January 2022]; Kidyba M., Makowski Ł.: Smart City. Innowacyjne rozwiązania w administracji publicznej a zarządzanie inteligentnym miastem, Wydawnictwo Wyższej Szkoły Bankowej w Poznaniu, Poznań 2018; Kummitha R.K.R., Crutzen N.: How do we understand smart cities? An evolutionary perspective. Cities. Vol. 67, 2017, pp. 43–52; Patel Y., Doshi N.: Social implication of smart city. Procedia Computer Science. Vol. 155, 2019, pp. 692–697.

[16] See: Kuzior A.: Zastosowanie modelu Quintuple Helix w projektowaniu Smart Sustainable City. [In:] Jonek--Kowalska I, Kaźmierczak J. (eds): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp.15–26; Kummitha R.K.R., Crutzen N.: How do we understand smart cities? An evolutionary perspective. Cities. Vol. 67, 2017, pp. 43-52; Kummitha R.K.R.: Smart cities and entrepreneurship: An agenda for future research, "Technological Forecasting & Social Change", 149, 2019, pp. 1–10; Patel Y., Doshi N.: Social implication of smart city. Procedia Computer Science. Vol. 155, 2019, pp. 692–697; Preharaj S., Han H.: Cutting through the clutter of smart city definition: A reading into the smart city perceptions in India. City Culture and Society. Vol. 18, 2019, pp. 1–10; Sojda A., Owczarek T., Wolny M.: Smart City w ujęciu zorientowanym na dane – Polska w bazie Eurostat. Zeszyty Naukowe Politechniki Śląskiej, seria: Organizacja i Zarządzanie. Vol. 30, 2018, pp. 557–566; Calzada I., Cowie P.: Beyond Smart and Data-Driven City-Regions? Rethinking Stakeholder-Helixes Strategies, Regions. The Voice of The Membership, Vol. 308, No. 4, 2017, pp. 25–28.

[17] See: Rożałowska B., Macełko M.: Miasto jako organizacja ucząca się. O znaczeniu idei inteligentnego miasta (obywatela) w społeczeństwie informacyjnym. Zeszyty Naukowe Politechniki Śląskiej, seria: Organizacja i Zarządzanie, Vol. 79, 2015, pp. 279–283; Rożałowska B.: Smart Citizen – społeczności miejskie w procesie budowania „inteligencji" miasta. Zeszyty Naukowe Politechniki Śląskiej, seria: Organizacja i Zarządzanie. Vol. 95, 2016, pp. 430–440; Rożałowska B.: The Functioning of Smart City in the Context of Global City Ranking, Zeszyty Naukowe Politechniki Śląskiej, seria: Organizacja i Zarządzanie, Vol. 146, 2020, pp. 413–425; Osika G. Connexity jako element koncepcji Smart City – analiza wybranych aspektów na przykładzie polskich miast. [In:] Jonek-Kowalska I, Kaźmierczak J. (eds): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 123–136; Kowalska-Styczeń A.: Badanie złożoności zjawisk społecznych w kontekście inteligentnego miasta. [In:] Jonek_Kowalska I., Kaźmierczak I. (eds): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 137–146.

[18] Dameri R.P., Rosenthal-Sabroux C. (eds.): Smart City: How to Create Public and Economic Value with a High Technology in Urban Space. Springer, Cham-Heidelberg-New York–Dordrecht–London 2014.

perspective, as the goal of its activities[19]. In the conception of SC, technology inevitably takes a central place as it provides the tools for realization of the previous assumptions, but the innovations that arise from it also have a social character, and they are social innovations[20]. The areas that are emphasized in the context of applying technological solutions are: smart administration, smart energy, smart buildings, smart transport solutions, smart urban infrastructure, smart healthcare and smart citizens[21]. Technology infrastructure, on the other hand, includes: Internet of Things (IoT), which allows to make contact "anytime", "anywhere", "with everything" through technical identification and high performance mobile technology (5G), using among others systems such as GSM, WiFi, Bluetooth, ZigBee, Z-Wave, beacons, femtocells, wireless sensor networks, etc. It becomes possible to continuously transfer data on the Internet[22]. The acquired data is then aggregated in databases and constitutes a valuable resource that enables its further processing depending on the needs, i.e., the so-called Big Data (BD). BD analyses play a key role in SC management, because they create new decision-making potential, and the choices made in management actions with a high level of risk are supported by information derived from data provided and processed in real time. In addition, these processes allow us to develop procedures of action, algorithms, which can be successfully used in analogous situations. A great advantage of tools based on Big Data is their universal application within all functions typical for the management process, i.e. planning, organizing, directing, and controlling, whose effectiveness increases with the application of the so-called artificial intelligence (AI), another key SC technology. AI solutions are important from the point of view of being able to use the acquired data and transform it into meaningful information allowing one to manage the entire city infrastructure in a coordinated way[23]. Taking into account the above findings, we can assume that the concept of SC fits into the general assumptions of Society 5.0, as indicated both by its goal, i.e. building an environment focused on the well-being of its members/citizens, and in terms of the tools that are planned to be used for this purpose. But the realization of these intentions requires the consideration of concrete ideas, in this

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[19] Patel Y., Doshi N.: Social implication of smart city. Procedia Computer Science. Vol. 155, 2019, pp. 692–697; Osika G. Connexity jako element koncepcji Smart City – analiza wybranych aspektów na przykładzie polskich miast. [In:] Jonek-Kowalska I, Kaźmierczak J. (eds): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 123–136.

[20] See: Osika G. Connexity jako element koncepcji Smart City – analiza wybranych aspektów na przykładzie polskich miast. [In:] Jonek-Kowalska I, Kaźmierczak J. (eds): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 123-136; Osika G.: Social Innovation as a Support for Industry 4.0. Scientific Papers of Silesian University of Technology, Organization and Management Series. Vol. 141, 2019, pp. 289–301.

[21] Patel Y., Doshi N.: Social implication of smart city. Procedia Computer Science. Vol. 155, 2019, pp. 692–697.

[22] See: Patel Y., Doshi N.: Social implication of smart city. Procedia Computer Science. Vol. 155, 2019, pp. 692–697; Kidyba M., Makowski Ł.: Smart City. Innowacyjne rozwiązania w administracji publicznej a zarządzanie inteligentnym miastem, Wydawnictwo Wyższej Szkoły Bankowej w Poznaniu, Poznań 2018.

[23] Patel Y., Doshi N.: Social implication of smart city. Procedia Computer Science. Vol. 155, 2019, pp. 692–697.

discussion it is proposed to pay attention to the potential inherent in ambient design, as a form of, as Karl R. Popper called it "piecemeal social engineering"[24] allowing one to improve reality in small steps, using "tailor-made" solutions.

4.2.3. Ambient Design as Social Innovation

Implementation of the Smart City idea within Society 5.0 and determining the optimal way of solutions based on their assumptions require a series of technical but also social innovations, because the latter are the condition for widespread adoption of technology underlying the planned changes. While innovation is proposed to be understood as a purposely designed change which has the characteristics of novelty[25], this novelty may relate to products, manufacturing methods, management methods, etc. From the point of view of these considerations, social innovations are of key importance, because this is how we can treat the necessary transformations of cities and society that can serve the implementation of the visions described above. It is widely accepted that social innovations include social transformations; new forms of organizational management; new forms of entrepreneurship; new products, services, and programs aimed at satisfying social needs, as well as activities that strengthen the position and improve the efficiency of social institutions[26]. The cited classification, on the one hand, shows how wide the scope of this concept is, and, on the other hand, very concretely locates the object of innovation, because each time the emerging novelty concerns the community and the realization of the needs of its members[27]. As Rabeh Morrar and others point out, "the concept of social innovation denotes the processes and factors that lead to a sustained positive transformation to the [...] society [...]. It is defined as an innovative solution to the increasing challenges facing society, one that is more effective, more efficient, more sustainable, or more equitable than existing practices"[28]. Hence, "innovation is every novel change, while social innovation is such an novel change, that remodels the manner of community functioning, that is, it establishes a new manner of relations, new structure, it reconfigures the course of social processes, it creates new

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[24] Popper K.R. and Gombrich, E.H.: The Open Society and Its Enemies, Princeton University Press, Princeton, New Jersey 2013.

[25] Baruk J.: Zarządzanie wiedzą i innowacjami, Wyd. Adam Marszałek, Toruń 2006.

[26] Wronka-Pośpiech, M.: Innowacje społeczne. Pojęcie i znaczenie. Studia Ekonomiczne. Zeszyty Naukowe, Vol. 212, 2015, pp. 124–136.

[27] Osika, G.: Social Innovation as a Support for Industry 4.0. Scientific Papers of Silesian University of Technology, Organization and Management Series. Vol. 141, 2019, pp. 289–301.

[28] Morrar, R., Arman H., Mousa S. : The Fourth Industrial Revolution (Industry 4.0): A Social Innovation Perspective. Technology Innovation Management Review, Vol. 7, No. 11, 2017, pp. 12–20.

behavior patterns etc."[29]. At the core of social innovation is the knowledge potential and cultural capital of a community[30], and the essence of these is to improve the quality of life of community members. Such controlled changes can only occur through conscious design, so the design process itself seems crucial to the results obtained, which we can define as planning, shaping the course of performance of some activity with the intention of realizing wanted, anticipated goal; thus, it is a conscious effort made to establish a meaningful order[31]. But if we want to design according to the vision contained in the SC and Society 5.0 concepts described above, we cannot focus on single solutions, rather we should take a comprehensive approach in the spirit of 'ambient design', according to Latin etymology – ambient means to surround, encompassing[32]. Developing this concept, we can define ambient design as the conscious shaping of elements of the environment in order to achieve the most optimal, quality of life, experience of 'being in a certain environment', and similarly, of 'being in a certain city', 'being in a certain society'.

4.3. Ambient design – Efficiency Ranges

Researchers studying the determinants of well-being in cities point to the need for a holistic approach to the problem and the remedial actions applied[33], thinking in terms of the overall environment rather than intervening in the form of separate solutions. Therefore, the transformation of cities in the spirit of ambient design seems promising, as it takes into account a holistic perspective. In design processes, incorporate everything that surrounds me, that makes up the way I experience a place, a neighborhood, a city. Jonathan F.P. Rose proposes to call this experience a 'cognitive ecosystem', which, according to the research he cites, is a prerequisite for both mental and physical health. He defines it as "the mental landscape in which people think, feel, and interact with the

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[29] Osika, G.: Innowacje społeczne jako wsparcie dla inteligentnych specjalizacji – uwarunkowania komunikacyjne. Zeszyty Naukowe. Organizacja i Zarządzanie/Politechnika Śląska, Vol. 95, 2016, pp. 369–38.

[30] Nicholls, A., Murdoch, A.: Social Innovation. Blurring Boundaries for Reconfigure Markets, PLAGRAVE &MACMILLAN, New York 2012.

[31] Papanek V.: Design For The Real World. Human Ecology and Social Change, Thames &Hudson, London 2006.

[32] Latinitum. Latin dictionary, https://latinitium.com/latin-dictionaries/?t=lsn2163,do31 [accessed on: 4 May 2022].

[33] See: Montgomery Ch.: Happy city. Transforming our lives through urban design, Farrar, Straus, and Giroux, New York 2013; Rose J.F.P.: Dobrze nastrojone miasto. Czego współczesna nauka, pradawne cywilizacje i ludzka natura mogą nas nauczyć o przyszłości życia w mieście Krakter. Kraków 2019; Whyte W.H.: The Social Live of Small Urban Spaces, Project for Public Space, New York 1980; Romice O., Thwaites K., Porta S., Greaves M., Barbour G., Pasino P.Urban Design and Quality of Life, [In:] G. Fleury-Bahi, E. Pol, O. Navarro (eds.): The Handbook of Environmental Psychology and Quality of Life, Springer 2016 (e-book), pp. 241–271.

world," as he further states, "it interacts with and is itself modified by social networks"[34]. In turn, as Montgomery's research shows, it is well-established social networks that form the basis of experienced well-being in a city, which is why urban management should focus on building social capital[35]. In the design process, then, ambient design takes an ecosystem perspective, where it is about creating a symbiotic place that works and is tailored to its inhabitants, rather than one-size-fits-all solutions that are for everyone, and therefore for no one. We are talking, of course, about technical innovation, which is the core of SC, but also about social innovation, which is even asking to incorporate existing cultural context. This is the first reason why there are grounds for recognizing its usefulness in the urban design process, SC uses digital technology, but its application should be focused on human wellbeing.

And while 'ambient' itself points to the content of the design, helping to realize the idea of a human-centered living environment. The second part of the phrase reveals the method that should be used to do so. As indicated earlier, to design is to consciously shape, to attempt to bring about order with the hope that the project will be successful, but these actions do not take place in a vacuum. In this case we are given methods that have been already developed. First, as Victor Papanek points out, design should be "an innovative, hugely creative, cross-disciplinary tool responsive to the true needs of men[36]. The essence of good design is functionality, which, while being a direct response to needs, is also a complex of factors such as method includes tools, materials, processes; association means family & early environment, education, and culture; aesthetics i.e. gestalt, perception, eidetic & biosocial 'givens'; need namely survival, identity, goal formation; telesis means nature, society, technological bias; use understanding as tool, as communication, as symbol. "The function complex […] appears at each of the six aspects, indicating the soft-hard, feeling-thinking, intuitive-intellectual mix, which determines each of these six evaluative criteria"[37]. Using Papanek's proposed approach in urban design processes, we gain:

- the possibility of applying a very specific methodology of action from the field of design processes;
- possibility of choosing the scale of social action from micro- through meso- to macro-;

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[34] Rose J.F.P.: Dobrze nastrojone miasto. Czego współczesna nauka, pradawne cywilizacje i ludzka natura mogą nas nauczyć o przyszłości życia w mieście Krakter. Kraków 2019.

[35] Rose J.F.P.: Dobrze nastrojone miasto. Czego współczesna nauka, pradawne cywilizacje i ludzka natura mogą nas nauczyć o przyszłości życia w mieście Krakter. Kraków 2019.

[36] Papanek V.: Design For The Real World. Human Ecology and Social Change, Thames &Hudson, London 2006.

[37] Papanek V.: Design For The Real World. Human Ecology and Social Change, Thames &Hudson, London 2006.

– change of the action formula from general strategies to the so-called "piecemeal social engineering", i.e., creation of "tailor-made" environmental, social innovations;

– maximization of adaptation activities – thanks to the adjustment of the scale, methods, and assumed effects;

– high probability of optimization of action.

4.4. Conclusions

As was pointed out in the introduction, the realization of the assumptions of Society 5.0, which involves a very specific way of designing future cities, must not only concern a series of technical innovations, but also include social innovations allowing to ensure a high quality of life of citizens. That is why it was considered so important to take this aspect into account in the implementation of both the SC and Society 5.0 assumptions. The present discussion should be treated as a conceptual sketch, as evidenced by the research method used conceptual analysis. Obviously, this sketch will require deeper analysis and critical reflection in the future, but also extensive development in relation to methodological approaches and their further application. The idea proposed to be considered was the use of ambient design, understood as social innovation, to design an optimal urban environment, within the SC framework, taking into account the concept of Society 5.0. In the description, the key definitions and the relations existing between them were taken into attention, which allowed one to understand the essence of the proposal and its validity in the discussed context. It seems that the presented treatment of social innovation as an environmental project is supported both for conceptual reasons and indications of a pragmatic nature.