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Digital Literacy in Digital Society 5.0: Some Challenges

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Abstract

In today's world, digitalization, the virtual and being permanently online become normality, corresponding to individuals' current and future expectations, with an increasing impact, without forgetting those excluded from this reality (digital divide). Society 5.0 seeks to foster this reality. As a concept initially political-ideological, Society 5.0 currently allows for the development of various analyses on this process of shaping a society where the digital is increasingly present at the service of sustainable social and economic development – a super-smart society. This paper aims to develop an analysis of the challenges that old and new potential social inequalities pose to social inclusion in this super-smart society. The methodology used in this study is qualitative. The authors carried out a search for publications in the field under study in several international databases and used the technique of content analysis. The results allow concluding that, while it is certain that the concept of Society 5.0 initially had a Japanese national dimension, it tends, with modifications considering the distinct features of several countries, to be applied by those regions of the globe that seek future sustainable development (economic, social and environmental).

Keywords: Industry 4.0, Society 5.0, digital literacy, digital society, smart factory, super-smart society, cyberspace and physical space

1.   Introduction and Theoretical Underpinnings

The contemporary world is heavily characterized by the digital, in its most diverse forms, contexts and uses. In this "new" world, digitalization, the virtual and being permanently online become, for a substantial part of the world's population, normality, which corresponds to its current and future expectations, with a growing impact, without forgetting those excluded from this reality (digital divide) (Serpa & Ferreira, 2019; Hitachi-UTokyo Laboratory (H-UTokyo Lab.), 2020; Santos & Serpa, 2017, 2020). According to Saraceni (2020), this reality "indicates the uneven diffusion of the skills needed to obtain a benefit from the use of digital tools" (p. 66).

Society 5.0 is one of the notions that seek to foster and account for this digitally shaped society but it also – to some extent – shapes this digital reality, by "proposing to further the potential of the individual-technology relationship in fostering the enhancement of the quality of life of all people through a super smart society" (Serpa & Ferreira, 2018, para. 1). The authors state, concerning Society 5.0, that,

> [...] proposing a deepening of the potential of the individual-technology relationship in fostering the improvement of the quality of life of all people through a super-intelligent society, Society 5.0 is an extremely recent concept as a guide for social development and that can have a profound impact on societies at all levels, such as in terms of the quality of life and sustainability (Ferreira & Serpa, 2018, p. 26).

As an initially political-ideological concept, Society 5.0 makes it possible, therefore, to develop various analyses on this process of shaping a society where the digital is increasingly present at the service of sustainable social and economic development – a super-smart society.

This paper carries out an analysis of the challenges that old and new potential social inequalities pose to social inclusion in the contemporary super-smart society, characterized by the increasing presence of the digital at the service of sustainable social and economic development. The paper is structured as follows: next section puts forth a review of the existing literature on the topic under analysis. Section 3 describes the methodology used and the reasons for its choice. Section 4 focuses on the relationship between the concept of Industry 4.0 (smart industry) and Society 5.0 (super-smart society). Subsequently, the paper offers a discussion on social inclusion in the super-smart society and ends with the presentation of the main conclusions from the research carried out.

2.   Methods

To analyze the challenges that old and new potential social inequalities pose to social inclusion, in this digital super-smart society, the authors privileged a qualitative approach, specifically via the use of the document analysis method. Bearing in mind the purpose of the study, the authors carried out a bibliographic search in international reference databases, such as Scopus, Scielo and Web of Knowledge, as well as institutional repositories. This research was carried out from 7 to 14 September 2020, based on the search for the following terms in the articles' title and abstract: "Society 5.0" and "Social inclusion". After this collection, the authors selected the relevant documentation through a preliminary reading, resulting in 27 workable documents within the scope of this research study. A detailed analysis was then carried out using the content analysis technique.

3.   From Industry 4.0 to Society 5.0: From Smart Industry to Super-Smart Society

3.1   Industry 4.0

The concept of Industry 4.0 was created in Germany in 2011. It is generally defined as the fourth industrial revolution and has already brought about profound changes in the paradigm of the form of

production, particularly the industrial one (Ferreira & Serpa, 2018). It involves applying digital technologies to production (Ferreira & Serpa, 2018), in digitalization of economy through the industry (Salimova, Guskova, Krakovskaya, & Sirota, 2019; Salimova, Vatolkina, Makolov, & Anikina, 2020; Deguchi et al., 2020). According to Ferreira and Serpa (2018),

> *Industry 4.0 seeks an integration between technology, virtual space and the human being, between the real world and the virtual world, resulting in a true collaborative network [...] that articulates: intelligent robots; automated simulations; Internet of Things; cloud computing; additive manufacture; and big data analytics (p. 27).*

To put it simply, it is about shaping a "smart factory". Lin, Shyu, and Ding (2017) characterize this concept of "smart factory" as follows:

> *The smart factory is a core concept of Industry 4.0, which employs cyber-physical systems to monitor the physical production processes of the factory and make decentralized decision-making possible. Then the physical systems become the Internet of Things, communicating and cooperating both with each other and with humans in real-time via the wireless web (p. 4).*

While Industry 4.0 is a concept that invests in digital technology to foster constant innovation in the form of production and services, with the resulting economic effects (Androniceanu, Georgescu, Tvaronavičienė, & Androniceanu, 2020; Berawi, 2019; Trstenjak, Opetuk, Cajner, & Tosanovic, 2020) through the "digitalization of production and digitalization of consumption" (Salimova, Vatolkina, Makolov, & Anikina, 2020, p. 486), its implementation and application have social consequences. Table 1 offers some of the most relevant impacts of digitalization on the workforce.

Table 1. Some impacts of digitalization on the workforce

1	The increasing computing power of computer systems that allows the analysis of data in real time, in the context of large volumes of data
2	Continuous improvement of the methods of processing and use of large volumes of data, crucial for markets and innovation
3	The creation of new products and services
4	Accelerating the speed of innovation
5	New models of artificial intelligence, possible due to the growth in computing power, which will support harmonious cooperation between humans and robots. The physical world and the digital world are getting closer, resulting in the fusion of physical-cybernetic systems
6	The role of human intervention changes from a skilled worker to a supervisor of services available in the network
7	The augmentation in connectivity, determined by the enormous boost in the volume of data of the last decade
8	A new class of suppliers will intensify their competition in the future. It is necessary to adapt the workforce to the new specific requirements of knowledge-based management and innovation in the context of digitalization: Labor, Creativity and innovation

Source: Androniceanu et al. (2020).

Several authors place Industry 4.0 as a precursor of Society 5.0 (Ferreira & Serpa, 2018; Gladden, 2019). Salimova et al. (2019) advocate that

> *Society 5.0 is the development of the Industry 4.0 concept with due account of relevant social and man-induced challenges in the direction of its humanization extending beyond the boundaries of technological and organizational-and-economic transformation of industrial production based on the cutting-edge development projects (p. 2).*

3.2 Society 5.0

The concept of Society 5.0 emerged in 2015 in Japan, in a strategic national political initiative (Ferreira & Serpa, 2018; Gladden, 2019). Salimova et al. (2019) define and characterize Society 5.0 as

> *[...] a social-and-economic and cultural system developing in a sustainable way in the direction, which is optimal for the mankind on the basis of processing the 'big data' results, where a physical- and cyber-space are becoming an integral whole for solving the social problems, providing security and eco-friendliness of innovations and sustainable economic growth. The concept of the Society 5.0 is focused on attaining such goals specified by the United Nations Organization in the field of sustainable development up to 2030 (p. 2).*

Society 5.0 is a super-smart society, embodied in a cyber-physical-social relationship that seeks, above all, to improve the quality of life (Sharp, 2020; Gladden, 2019; Potočan, Mulej, & Nedelko, 2020; Roblek, Mensko, Bach, Thorpe, & Šprajc, 2020; Deguchi et al., 2020). Keidanren (Japan Business Federation) (2016, cit. in Ferreira & Serpa, 2018) maintains that

> *Every individual including elderly people and women can live safe and secured comfortable and healthy life and each and every individual can realize his/her desired lifestyle. [...] Improvement of productivity through digitization and reform of business models are promoted, and at the same time, the new economy and society will be realized by promoting innovation and globalization. [...] Efforts are made to solve a pile of issues of our country such as falling population, super aging society and natural disasters so that rich and vigorous future will be realized. Through overseas expansion of new businesses and services, we can contribute to solving global scale issues as well (pp. 27 e 28).*

In turn, Sharp (2020) characterizes the relationship between Society 5.0 and super-smart society and justifies the relationship between them as follows:

> *Society 5.0 can be referred to as a Super Smart Society due to its inextricable links with technology; think of it as a digitisation of society. But human control will retain centre stage. In addition to AI, the technologies that will take centre stage in Society 5.0 are the Internet of Things (IoT), big data, robots and the sharing economy. The idea is that big data collected by IoT will be converted into a new type of intelligence by AI and will provide solutions for improved human lives (p. 1).*

Several researchers consider that Society 5.0 is a "Japan's futuristic concept" (Sharp, 2020, p. 1), initially of a political nature, which emerged in Japan in 2015 (Alvarez-Cedillo, Aguilar-Fernandez, Sandoval-Gomez, & Alvarez-Sanchez, 2019; Deguchi et al., 2020). These researchers argue that the concept of Society 5.0 emerged under the influence of Industry 4.0 (Salimova et al., 2019, 2020; Ferreira & Serpa, 2018; Sharp, 2020; Gladden, 2019). Berawi (2019) makes the distinction between the two concepts, stating that "Industry 4.0 emerged from innovative digital technology to create value creation, whilst Society 5.0 is argued as a human-centered society that balances economic advancement with Industry 4.0" (p. 222). Gladden (2019) also delimits the two concepts, arguing that "Society 5.0 seeks to take the rapidly evolving technologies that Industry 4.0 employs for production within businesses and to integrate them more deeply into the everyday lives of ordinary people" (p. 2). Table 2 depicts the differences between Industry 4.0 and Society 5.0.

Table 2. Industry 4.0 vs Society 5.0

Industry 4.0	Society 5.0
Economy and digital society	Integration of cyberspace information and physical space (real world)
Economy and sustainable energy	Society as a whole
Focuses on manufacturing	Resolution of social issues
Germany	Japan
Smart factory	Super smart society
Industrial revolution	Public impact of technology

Source: Alvarez-Cedillo et al. (2019); Deguchi et al. (2020).

In this process, shaped by the cyber-physical (Alvarez-Cedillo et al., 2019), digital literacy takes on a critical role (Santos & Serpa, 2017; Deguchi et al., 2020). Several of these technologies do not yet exist in an effective and efficient way for the full implementation of Society 5.0, which will raise several challenges (Gladden, 2019; Alvarez-Cedillo et al., 2019). One such challenge is mentioned by Deguchi et al. (2020) when the authors state that

> *When the computer systems of Society 5.0 analyze raw real-world data, they must do so using a structure that mirrors the real, physical world. [...] The ultimate objective of Society 5.0 is to incorporate real-world models into cyberspace such that they can deliver highly nuanced solutions to real-life problems (p. 3).*

There is the expectation that this Society 5.0 will provide potentially strong contributions to social inclusion (Deguchi et al., 2020; Potočan et al., 2020; Salimova et al., 2019). According to Potočan et al. (2020),

> *Vision of Society 5.0 offered a new understanding of the role and importance of technological development for solving of current social problems in modern society, initiatives and actions for further development of the known social concepts of sustainable society and expose decisive importance of innovations for humankind's and society's survival (p. 12).*

However, the implementation of Society 5.0 entails three major changes at the levels of "a. Technological change; b. Economic and geopolitical change; c. Change of mind" (Alvarez-Cedillo et al., 2019, p. 696).

4. Some Challenges in Social Inclusion in the Super-Smart Society: The Criticality of Digital Literacy

As Yousefikhah (2017) rightly reminds, for development to take place, it does not depend solely on the existence of functional infrastructures. It is crucial to mobilize the following elements in this process: (i) innovation policy (from the government's side); (ii) entrepreneurial spirit (from the society's side); and (iii) entrepreneurial skills (from the civil society and institutions' side).

The idea of Society 5.0 has paradoxes in its definition, as well as the need for technology to be further developed and in an articulated and coordinated way, respecting the objectives and societal and individual needs (Deguchi et al., 2020) (such as robotics, AI [Artificial Intelligence], intelligent robots, nanotechnology, biotechnology, cloud computing, Internet of Things, automated simulations, Big Data analysis and Blockchain, among others). Additionally, it also faces ethical, legal and social challenges related to the place in society (in terms of social representation, rights and duties) of beings with artificial intelligence and cybersecurity. Thus, Society 5.0 poses profound challenges, with both positive and negative implications, which must be considered (Ferreira & Serpa, 2018; Gladden, 2019; Alvarez-Cedillo et al., 2019; Sharp, 2020). According to Deguchi et al. (2020), one of these implications or challenges of Society 5.0 is to know

> *[...] how to optimally balance the needs of society with the needs of the individual. We cannot achieve progress until we solve this problem. The actors involved in policy and technology must coordinate with each other so that everyone understands how each policy proposal or technological development fits into and contributes toward Society 5.0. Otherwise, these actors will pursue their own particular technologies or policies in an uncoordinated fashion without understanding how they fit into the larger picture of Society 5.0 (p. 21).*

Following Gladden's (2019) remarkable analysis, with an enticing heuristic potential – articulated with information already worked on earlier – of Society 5.0, this technologically posthumanized Society 5.0 is expected to incorporate six categories of participants whose analogues existed in earlier non-technologically posthumanized societies and which are not necessarily mutually exclusive (for further details, see Gladden, 2019) (Table 3).

Table 3. Six types of potential entities that may come to be participants in or members of Society 5.0

1.	"Natural" biological human beings	Possess an ontic fundament, sensory-emotional "soul", and intentional «I» whose structures and dynamics are considered unextraordinary for human being: are those that have not been qualitatively transformed by posthumanization.
2.	Artificially augmented human beings	Have been granted non-human additions to their ontic fundament or extraordinary powers over their environment: is still a true human being; however, it has undergone some significant alteration or enhancement in its capacities.
3.	Metahuman beings	Possess a qualitatively transformed ontic fundament: One whose entire body has been transformed in a way that gives it a diŌerent quality from the body of a natural biological human being.
4.	Epihuman beings	Built on multiple linked human ontic fundaments: to describe an entity that is somehow "built" or "rests" upon ordinary human beings.
5.	Parahuman beings	Possess a non-human ontic fundament but some human-like characteristics: an entity that possesses an ontic fundament whose materials, structures, processes, or systems are not directly dependent on the sort of ontic fundament associated with a natural biological human body but which nonetheless displays significant human-like characteristics.
6.	Nonhuman beings	Do not possess a sensory-emotional system or intentional system that gives the impression of being significantly human-like: an entity that does not possess a sensory-emotional system or intentional system that gives the impression of being significantly human-like.

Source: Adapter from Gladden (2019).

Still according to Gladden (2019), "The human beings who are members of Society 5.0 will also find their bodies, minds, and daily life experiences transformed through the application of futuristic technologies" (p. 5).

In this process of shaping Society 5.0 as a digital society, digital literacy is vital to foster involvement and stimulate social equity (Santos & Serpa, 2017; Rodriguez-Hevía, Navío-Marco, & Ruiz-Gómez, 2020; Tran et al., 2020; Gustiana, Wahyuni, & Hasti, 2019) (Figure 1).
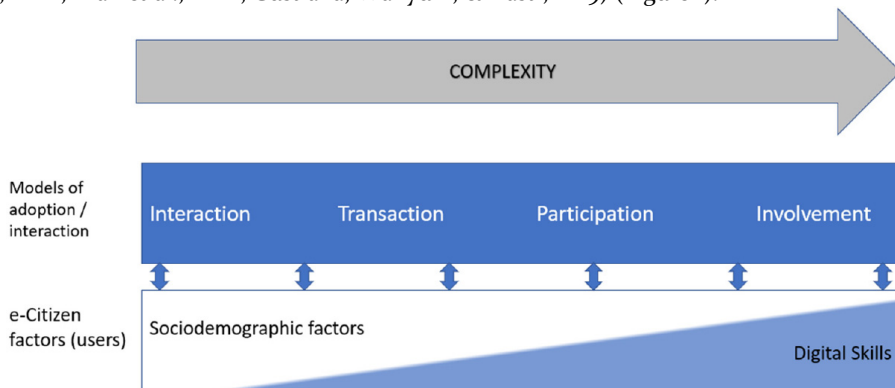

Figure 1. Growing importance of digital skills in complex models of adoption
Source: Rodriguez-Hevía et al. (2020, p. 4).

Yashalovaa, Shreidera, and Yakovlevab (2019) offer a systematic overview of the components of digital literacy regarding (i) digital consumption; (ii) digital competencies; and (iii) digital security. This overview is depicted in Table 4.

Table 4. The components of digital literacy

Component	Examples
Digital consumption (use of online services for life, educational and professional activities)	Desktop and mobile Internet; online media; online stores; remote banking services; email; online voting; social networks; public and entertainment services
Digital competencies (effective use of digital technology)	Searching for information and its critical perception; creating content and its placement in the global network; financial transactions based on online services; using the functionality of social networks
Digital security (Internet security at the technical and socio-economic levels)	Reliable protection of personal data; legal content; compliance with ethical and legal standards; data storage; backup

Source: Yashalova et al. (2019, p. 215).

According to Saraceni (2020), there is a danger of a digital divide. The author clarifies the term 'digital divide' as concerning the many – and often severe – inequalities in contemporary society in terms of access to and use of ICT (Information and Communication Technologies). These inequalities are transversal to any society and cause the divide of citizens in terms of gender, age, professional status, individuals with and without disabilities, socio-economic status, social class and cultural capital, among several other variables. Thus, this type of discrimination that leads to a digital divide is, in addition to the already traditional forms of discrimination, causing its aggravation and the widening of the gap between individuals with different features. Saraceni (2020) argues that the "digital divide represents the last and most important wall we have to break down, if we want to create a free, democratic, completely and peacefully interconnected world" (p. 67). This will hopefully be possible through collaborations between various disciplines of the social sciences and between them and the natural sciences, joint to create synergies in a fruitful collaboration in new situations (Sharp, 2020; Serpa, Ferreira, & Santos, 2017).

5. Conclusions

This paper aimed to develop an analysis of the challenges that old and new potential social inequalities pose to social inclusion in this super-smart society. The results of the documentary analysis carried out show that this (possible and potential) society, together with the COVID-19 pandemic, contributed to promoting and accelerating the process of digitalization (Androniceanu et al., 2020; Buchholz, DeHart, & Moorman, 2020; Jormand et al., 2020).

The COVID-19 pandemic has led to the need for a physical/social distancing behavior among citizens at the global level. Workplaces and leisure facilities were closed down or had their functioning conditioned. On the other hand, teachers from all educational levels were forced, with the closing of educational establishments, to almost immediately attain digital competencies or develop those they had to enable the success of the online teaching and learning process. Many of these professionals were not familiar with distance learning tools, which presented them with increased difficulties in an already challenging situation and led to increased equity and access problems (Buchholz et al., 2020). In the authors' view, the transition from face-to-face to distance learning could shape a form of crisis management, which allows, despite all the difficulties, to "re-create and reimagine a more expansive and experiential view of the critical literacy practices necessitated for digital citizenship in the post-COVID-19 world" (Buchholz et al., 2020, p. 12). The "new normality", characterized by the very high use of digital technologies, has required that citizens "of all ages use digital literacy practices to learn, stay informed, and care for and connect with family, friends, and communities near and far" (Buchholz et al., 2020, p. 12).

While the concept of Society 5.0 initially emerged with a Japanese national dimension, in an always bold position, it seems that it will tend – with adjustments given the different features of various

countries (Ferreira & Serpa, 2018; Gladden, 2019) – to be applied by those regions of the globe that seek future (economic, social and environmental) sustainable development (Potočan et al., 2020). However, not everything is easy, and it is important to be alert to the worrying behaviors caused by the whole of the situation described, such as the so-called "cyberchondria" and "digital syndrome", which need to be carefully analyzed and prevented in today's societies (Jormand et al., 2020).

In conclusion, and summarizing the discussion on Society 5.0 and the role that digital literacy plays in contemporary society,

> [...] in a reality where the digital involves many of the life dimensions for example in the form of Industry 4.0 and Society 5.0, the role of literacy and in particular digital literacy, are critical in the development of sustainability literacy. For this to be possible, significant training work must be carried out. [...] It is not possible to assume that the access, the skills in its use and the benefits of this wonderful digital world will automatically be grasped and felt by all citizens in an ideology that must be fought (Santos & Serpa, 2020, p. 1).

6. Acknowledgement

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