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The Theoretical Quadruple Helix Model for Digital Inclusion Increase

The aim of this paper is to conceptualize the theoretical quadruple helix model in the field of digital inclusion. It explores the literature on digital inclusion issues, stakeholder's roles and investigates the main features of the quadruple helix model and its application possibilities in the digital inclusion context. Building on the findings of this literature review, the theoretical quadruple helix model for digital inclusion is proposed. This paper contributes to the literature on digital inclusion and lays a conceptual basis for further theoretical and empirical research in this field.

Keywords: digital inclusion, stakeholders, the quadruple helix model.

Šio straipsnio tikslas yra konceptualizuoti teorinį keturgubos spiralės modelį skaitmeninės įtraukties didinimo srityje. Nagrinėjant mokslinę literatūrą straipsnyje atskleidžiama skaitmeninės įtraukties problematika, identifikuojamos šioje srityje veikiančių socialinių dalininkų funkcijos ir apibrėžiami esminiai keturgubos spiralės modelio aspektai bei jo taikymo galimybės. Remiantis mokslinės literatūros analize, straipsnyje konceptualizuojamas teorinis keturgubos spiralės modelis skaitmeninei įtraukčiai didinti. Šis straipsnis papildo skaitmeninės įtraukties tyrimų lauką ir padeda konceptualų pagrindą tolesniems teoriniams ir empiriniams šios srities tyrimams.

Raktiniai žodžiai: skaitmeninė įtrauktis, socialiniai dalininkai, keturgubos spiralės modelis.

Introduction

Today the usage of information and communication technologies (further – ICT) and the Internet has become a ubiquitous necessity. It is closely related to the involvement in civic, economic, cultural, and social life. These trends define a changed lifestyle, new types of products and services, new forms of work, learning and new communication practices (Williams, Philip, Fairhurst, 2016; Gann, 2019; Ragnedda, Ruiu, Addeo, 2020; Gallardo, Beaulieu, Geideman, 2020; Johnston, 2020). The global COVID–19 pandemics has highlighted the urgency to increase *digital inclusion*, because of the need to have access to the Internet and ICT and to be capable to use digital services and products effectively, to find relevant information, to learn, work and communicate remotely, has grown as never before (Gann, 2019; Gallardo et al., 2020; Johnston, 2020). The pandemic context has increased the need to use the Internet and ICT in various areas of life and transformed society, while digital inclusion has become an integral component of equality

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and social justice (Helsper 2012; Ragnedda, Ruiu, 2017; Beyne, 2018; Al-Muwil et al., 2019; Bonina, López-Berzosa, Scarlata, 2020). In general, digital inclusion can be conceptualized as the provision of equal opportunities of access to the Internet and ICT for all people without exception, focusing on the development of digital literacy skills and the efficient usage of digital technologies (Bertot, 2016; Gallardo et al., 2020; Strover, 2019; Strover et al., 2020). The digital inclusion goals are related to the expanded accessibility of digital services and products, extended civic, cultural, and social participation, increased involvement in the labour market and lifelong learning activities, improved health and better quality of life in general (Real et al., 2015; Bertot, 2016; Borg, Smith, 2018, Gallardo et al., 2020). Such diversity of digital inclusion goals calls for the involvement of various *stakeholders* who are interested in digital inclusion issues. These stakeholders include national policy-making institutions, local authorities, public libraries, other public organizations (employment, education organizations, social service, health care institutions, etc.), non-governmental organizations, businesses, higher education institutions, research institutes and society as a whole and its individual members (Noh, 2019; Strover et al., 2020; Gallardo et al., 2020). These stakeholders are unified by the common goal – to increase digital inclusion. This goal encourages individual organizations to collaborate, to pool their expertise and resources in order to deal with the digital inclusion challenges (Ilse, Leo, 2012; Damodaran et al., 2015; Bertot, 2016; Graves, German, 2018; Holgersson, Söderström, Rose, 2019).

However, the analysis of scientific literature in the field of digital inclusion (Ilse, Leo, 2012; Real et al., 2015; Bertot, 2016; Borg, Smith, 2018; Damodaran et al., 2015; Holgersson et al., 2019; Manžuch, Macevičiūtė, 2020; Gallardo et al., 2020, etc.) shows, that recent studies are mainly focused on the examination of the digital inclusion concept, society needs and activities of individual organizations, or in other words stakeholders, operating in this field. Very often the possibilities of digital inclusion increase are analysed from the perspective of separate organizations, but the research on conceptual models that would allow to point out all pertinent stakeholders, to analyse their functions, and to investigate their interrelations is fragmented and scarce. Therefore, this analysis allows to define a scientific ***problem***, that research in the digital inclusion field still lacks a common understanding of the roles of stakeholders, also there is a lack of common concepts and models that would allow to identify relevant stakeholders, to define their functions and to investigate their relationships.

To fill this gap, the theoretical *quadruple helix model* (Carayannis, Campbell, 2009) of stakeholder collaboration in the field of digital inclusion is proposed in this paper. C. Kaletka and B. Pelka (2015), O. Hernández-Pérez, F. Vilariño and M. Domènech (2020) found the links between digital social innovations and digital inclusion and stated, that these areas are closely interlinked. According to the authors, the quadruple helix model, which is used for the analysis of digital social innovation processes can be applied in the broader context of digital inclusion issues. In the quadruple helix

model, the collaboration between the four spheres (stakeholders from government and the public sector, industry/business, academia, and society) generates opportunities for the development and delivery of innovative services and products that meet the needs of society. In this model, the biggest focus is on the fourth sphere – community, non-governmental organizations, and society. These stakeholders are perceived as consumers and developers of innovative services and products at the same time (Carayannis, Campbell, 2009, Carayannis et al., 2018, Marques et al., 2020; Makkonen, Kahila, 2020; Bokolo, 2021). These features of the quadruple helix model actualize its applicability in the field of digital inclusion. In this field the key stakeholder groups are governmental, public sector organizations, business enterprises, higher education institutions, community-based organizations, NGO's, society and its individual members (Ilse, Leo, 2012; Damodaran et al., 2015; Holgersson et al., 2019; Strover et al., 2020). These groups represent the four spheres of the quadruple helix model. Through the engagement in collaboration activities, these stakeholders can pool existing knowledge, expertise and resources and contribute to digital inclusion increase (Ilse, Leo, 2012; Damodaran et al., 2015; Holgersson et al., 2019; Strover et al., 2020).

The object of this paper is the quadruple helix model in the field of digital inclusion. The application of the quadruple helix model allows to reveal the diversity of stakeholders, which are interested in increasing digital inclusion, to define their functions and contribution to the solution of this problem. This model lays a conceptual framework for further research: it lays the theoretical basis for deeper empirical investigation of the roles and functions of digital inclusion stakeholders and examination of the interrelationships between stakeholders (e.g., interorganizational collaboration), enables to analyse the success factors of collaboration and to investigate the limits and barriers to successful collaboration. The need for stakeholder collaboration in solving digital inclusion problems is grounded on the issue-focused stakeholder theory perspective (Rolof, 2008; Mahon, Heugens, McGowan, 2016; Towner, 2018).

The aim of this paper is to conceptualize the theoretical quadruple helix model for digital inclusion.

To achieve the aim, **the following objectives** are set: 1) to analyse the main issues of digital inclusion and reveal the need for its increase; 2) on the grounds of issue-focused stakeholder theory perspective, to identify the key stakeholder groups, operating in the field of digital inclusion; 3) by employing the conceptual quadruple helix model, to identify the functions of key stakeholders and define their interrelationships in solving digital inclusion issues.

To achieve the aim of this paper, **the methods** of overview, analysis and synthesis of scientific literature are applied. These methods allow to investigate digital inclusion issues, to define the main stakeholders, to describe their functions, interrelations and to ground the application of the quadruple helix model in the field of digital inclusion. Based on scientific literature analysis and synthesis, the theoretical quadruple helix model for digital inclusion is proposed.

Digital inclusion challenges and the need for its increase in today's world

This section presents the main concepts related to digital inclusion, discusses the most important issues and challenges, and reveals the need for digital inclusion increase in the contemporary world. In the context of today's global challenges, such as poverty, inequality, economic and social exclusion, the issue of digital inclusion increase is evident (Gann, 2019; Aslam, Naveed, Shabbir, 2020). Recent studies (Helsper, 2012; Aslam et al., 2020; Andrade, Techatassanasoontorn, 2020) indicate a strong correlation between social and digital inclusion and emphasize the necessity to exploit the potential of ICT and the Internet while increasing social inclusion. M. Manzoor and V. Vimarlund (2018), A. Aslam et al. (2020), A. D. Andrade and A. A. Techatassanasoontorn (2020) notice, that ICT and the Internet can be seen as important tools for increasing social inclusion, because they provide access to various digital services and products, enable individuals to learn, work and communicate despite physical limitations. According to C. López, D. Bonina-Berzosa and M. Scarlata (2020), digital technologies can be employed to reduce existing social disparities and contribute to the well-being of society. In the author's opinion, the well-being of society is an umbrella term, that encompasses such issues as political, cultural, and social participation, economic equality, social and digital inclusion. The term *digital inclusion* can be defined as the possibility to access the Internet and ICT and the ability to exploit digital technologies and digital competences for social, economic, cultural, educational, health care and other benefits (Real et al., 2015; Bertot, 2016; Wood, Grace, 2017; Ragnedda, Ruiu, 2017; Rutherford et al., 2018; Gallardo et al., 2020; Strover et al., 2020). The concept of digital inclusion emphasizes equality and access for all, regardless of their social, economic, health status, age, etc. (Real et al., 2015; Bertot, 2016; Borg, Smith, 2018). In other words, digital inclusion is a necessary imperative in seeking to ensure that all people, without exception, have access to and can use the Internet and ICT effectively and efficiently (Beyne, 2018; Gallardo, 2019; Noh, 2019; Andrade, Techatassanasoontorn, 2020; Gallardo et al., 2020). In this context, the need to ensure *digital equality*, which is the final goal of digital inclusion, is highlighted (Gallardo et al., 2020). Today, the growing importance of digital technologies urges the need to ensure equal access to the Internet and ICT for all, especially those individuals, who belong to socially excluded groups (Manzoor, Vimarlund, 2018; Aslam et al., 2020; Andrade, Techatassanasoontorn, 2020). In the broadest sense, digital equality involves a commitment to meet the needs of the most vulnerable groups and communities. The goal of digital equality is by increasing digital inclusion to minimize the existing disparities between different groups in society (Gallardo et al., 2020). According to E. J. Helsper (2012), E. J. Helsper and B. C. Reisdorf (2017), individuals, who experience difficulties in the economic, social, cultural, and personal life, often face digital inclusion problems. Authors emphasize that socially excluded groups are at the margins of digital inclusion because very often they do not have ICT or

internet connection, they do not participate in digital literacy training activities and do not use digital services and products. S. P. Gangadharan (2017), M. Manzoor and V. Vimarlund, (2018), B. Gann (2019) notice, that the following groups tend to lack digital inclusion the most: seniors, people with disabilities, people with lower income, lower education, unemployed people, residents living in remote rural areas, immigrants, etc. Today, as more and more activities and services are moved to the digital space and the Internet and digital technologies is the only way to reach them, those who are unable to do so, are at risk of experiencing exclusion in various fields (e.g., digital, social, economic, political, etc.). They cannot work remotely, use digital services and products, participate in lifelong learning activities, their communication, socialization, and health care opportunities are reduced (Gann, 2019). In today's global pandemic context this is particularly relevant, as the need to use digital services and products, work remotely and communicate virtually has increased as never before (Gann, 2019; Gallardo, 2019; Gallardo et al., 2020). It can be stated that these challenges highlight the need for digital inclusion increase and call for a response from all stakeholders, which are interested in solving digital inclusion issues. Stakeholders are supposed to engage in collaborative activities, to unify their potential and offer integrated solutions, that enable all individuals, including those belonging to the most vulnerable groups, to take the most advantage of the Internet and ICT and to access digital services and products without barriers (Gann, 2019; Gallardo, 2019).

The key stakeholders operating in the field of digital inclusion

In this section, the main concepts and approaches of issue-focused stakeholder theory are presented. On the grounds of this theory, the key stakeholder groups, operating in the field of digital inclusion are identified. Authors, representing traditional or, in other words, the organizational approach of stakeholder theory (Freeman, 1984, Clarkson 1995; Mitchell et al., 1997; Winn, 2001; Harrison et al. kt. 2015; Chandler, Werther, 2014; Tomaževič et al., 2017; Dangi, Gribb, 2018) define stakeholders as individuals or groups of individuals who may affect or are affected by the activities of an organization. According to the organizational approach of stakeholder theory, the following categories of the organization's stakeholders may be identified: employees, customers, service users, shareholders, suppliers, other organizations, public interest groups, public authorities, local communities, NGOs, etc. In recent decades stakeholder theory has evolved from an orientation towards one organization and its relationships with stakeholders to the analysis of an organization's relationships with the environment (other organizations, society, and its individual members). R. Steurer (2006), A. Khazaei, S. Elliot and M. Joppe (2015), J. F. Mahon et al. (2016) emphasize, that in recent years stakeholder theory has expanded, the definition of traditional groups of stakeholders become broader, the theory focus becomes oriented towards examination of relationships between stakeholders in different contexts. The object of stakeholder theory also has expanded,

as it has been recognized that not only organizations, but complex problems can have stakeholders as well. J. F. Mahon et al. (2016) states, that if an individual, a group of individuals, or an organization can affect or is affected by a particular problem (e. g. in the field of health, social services, education, digital inclusion, etc.), they can be defined as *issue stakeholders*. According to J. Rolof (2008), J. F. Mahon et al. (2016), N. Towner (2018), complex problems, which solution requires input and resources from multiple organizations, can have stakeholders. J. Rolof (2008) calls attention to the fact, that traditional organization-focused stakeholder theory mainly focuses on those stakeholders who are affected by the organization and does not fully reflect the position of those stakeholders which can influence the organization or the problem, that is being addressed. Therefore, the definition of *issue-focused stakeholders* can be considered as an alternative to the concept of traditional organizational stakeholders. This approach emphasizes the collaboration of equally important stakeholders, focused on solving common problems. According to J. Rolof (2008), stakeholders such as public, business and non-governmental organizations engage in collaboration to solve relevant problems. The author states that if to paraphrase R. E. Freeman's (1984) traditional definition of stakeholders in the context of complex problem solving, stakeholders can be described as *individuals, groups, or organizations that can affect or are themselves affected by a particular problem or its solution.* The main difference between these perspectives can be defined as follows: the organization and its goals are at the heart of the organization-focused perspective of stakeholder theory. While the issue-focused stakeholder theory is oriented towards the problems, that are relevant to stakeholders. This approach emphasizes the collaboration of stakeholders, which can help to achieve common goals and find solutions to complex problems. Stakeholder collaboration is inspired by the need to address urgent issues that affect all stakeholders. Following J. Rolof (2008), J. F. Mahon et al. (2016), N. Towner (2018) it can be stated, that *stakeholders, operating in the field of digital inclusion*, can be defined as *issue-focused stakeholders*. According to M. Ragnedda (2017), Y. Noh (2019), S. Strover et al. (2020), R. Gallardo (2019), J. Holgersson et al., (2019), R. Gallardo et al. (2020) the following are the key stakeholders, interested in solving digital inclusion issues: *governmental, municipal, public sector organizations*, especially *public libraries*, *business organizations, higher education* and *research institutions*, *local communities*, *NGO's*, *society*, and *individuals*. Authors state that governmental and municipal organizations are mainly focused on digital inclusion policy formation, implementation, and funding of various initiatives. Public sector organizations, especially public libraries, are the main providers and implementers of digital inclusion activities: they provide free access to ICT and the Internet, offer digital services and contribute to digital competences development. Other public sector organizations (such as schools, employment agencies, social service centers, etc.) are mainly interested in the digital inclusion of their service users and through collaborative activities engage in digital inclusion

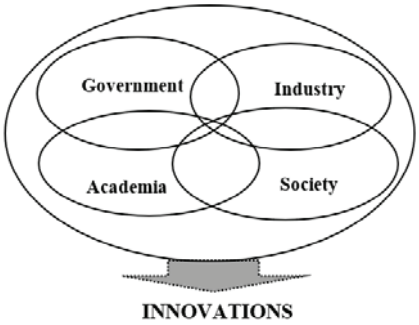


Fig. 1. **Quadruple Helix model**

Source: the author's own compilation, based on E. G. Carayannis and D. F. J. Campbell (2009), E. G. Carayannis et al. (2018).

activities. Business organizations are generally involved in the implementation of digital inclusion initiatives, but the intensity of their participation depends on their organizational goals in this field. Higher education and research institutions are oriented towards an investigation of society's needs but are usually not involved in digital inclusion initiatives directly. Local communities, NGOs, society, and its individual members are the main beneficiaries of digital inclusion initiatives and the main users of digital services and products. C. Kaletka and B. Pelka (2015), A. Mehmood and M. Imran (2021) notice, that in seeking to increase digital inclusion, these stakeholders involve in interorganizational collaboration processes and carry out various initiatives aimed at dealing with digital inclusion challenges. To sum up it can be stated, that despite the fact, that these stakeholders have different roles and functions, but by engaging in collaborative activities, they can pool experience, resources and solve digital inclusion issues more efficiently.

The quadruple helix model as a conceptual framework for innovations, digital inclusion and stakeholder collaboration

This section presents the conception of the quadruple helix model, discusses its application in innovation processes and investigates its usage possibilities as a conceptual framework for digital inclusion and stakeholder collaboration. The quadruple helix model, which can be described as an extension of the triple helix model (Etzkowitz, Leydesdorff, 2000) was proposed by E. G. Carayannis and D. F. J. Campbell (2009). The triple helix model is commonly used in the analysis of innovation processes and involves three collaborating spheres: universities (higher education and research institutions), industry (business organizations) and government organizations (Etzkowitz, Leydesdorff, 2000). E. G. Carayannis and D. F. J. Campbell (2009) added the fourth sphere – society (see Fig. 1). In the quadruple helix model, society is perceived as consumers and as developers of innovative

services and products (innovations) at the same time. In the fourth sphere such stakeholders as media, local communities and non-governmental organizations are important as well (Makkonen, Kahila, 2020; Bokolo, 2021).

This model conceptualizes the stakeholders which are involved in the innovation process and represent the four spheres of the helix: government, industry, academia (universities and other research institutions) and society and its individual members, who are considered as the end-users of innovations (Carayannis et al., 2018; Kriz, Bankins, Molloy, 2017; Kang, Jiang, 2020). N. Hasche, L. Höglund and G. Linton (2020), A. Bokolo (2021) notice that this model can be used in innovation creation and development processes where society and its needs are the central axis, e.g., is such fields as health care, public services, social and digital inclusion. Authors state that insufficient involvement of society in the innovation process can cause the following problems: new products and services are not being used; innovation process lacks transparency; innovators and end-user users do not understand each other (e.g., innovation creators do not know the needs of society); innovations are not effective; technological, but not social innovations are created. C. Marques et al. (2020), A. Bokolo (2021) underline that in the quadruple helix model the fourth helix represents the tendencies of 21st century innovations and defines the relevance of society needs in innovation creation processes. A. Kriz, S. Bankins and C. Molloy (2017) Y. Kang and J. Jiang (2020) emphasize that the quadruple helix model is often used in Regional Innovation Systems (further – RIS) analysis in seeking to reveal the input of such stakeholders as governmental, higher education institutions, business organizations and society and to define their interrelations and collaborative processes.

However, in recent studies (Kaletka, Pelka, 2015; Domanski, Kaletka, 2017; Carayannis et al., 2018; Terstriep, Rehfeld, Kleverbeck, 2020; Hernández-Pérez et al., 2020) the quadruple helix model is successfully applied in the fields of Social Innovations (further – SI) and Digital Social Innovations (further – DSI). In RIS the key stakeholders are the following: business organizations that use the innovations; universities and private research centres which generate knowledge, create innovations and governmental organizations, regional development agencies which promote the innovation process, e. g. by funding some activities. Meanwhile, in SI and DSI, the most important stakeholders are local governments, public sector organizations, businesses, community and non-governmental organizations, individuals and their groups, but research institutions play a less significant role (Domanski, Kaletka, 2017; Terstriep et al., 2020). While analysing the possibilities of digital inclusion increase C. Kaletka and B. Pelka (2015, 2017), O. Hernández-Pérez et al. (2020) observe, that the quadruple helix model can be applied not only in the field of DSI, but also in the broader context of *digital inclusion*. M. McAdam, K. Miller and R. McAdam (2018), C. Marques et al. (2020), A. Bokolo (2021) emphasize the *collaboration* and dynamic interrelations between stakeholders, representing the four spheres of the quadruple helix. According to the authors, the quadruple helix model can be described as a stakeholder collaboration model, oriented towards society and its needs. To summarize this, it can be stated that the quadruple helix model can be used in various

fields, such as regional, social, digital innovations and the broader context of digital inclusion issues. This model lays a conceptual basis for the identification of the key stakeholders, operating in different spheres of the helix, and for deeper investigation of their roles, functions, and emerging collaborative processes.

The proposed theoretical quadruple helix model for digital inclusion increase

The results of the literature reviewed above suggest that today the need for digital inclusion is higher than ever before. This situation calls for a response from all stakeholders, operating in the field of digital inclusion. They are supposed to engage in collaborative activities, to unify their resources, knowledge, expertise and potential and offer integrated solutions, aimed at solving digital inclusion issues (Gann, 2019; Gallardo, 2019). In this section, the theoretical quadruple helix model for digital inclusion increase is presented. By employing the quadruple helix model, the key stakeholders, operating in the digital inclusion field are identified, their functions, interrelations, and input into solving digital inclusion issues are described and possibilities for digital inclusions increase are proposed. C. Kaletka and B. Pelka (2015, 2017), D. Domanski and C. Kaletka (2017), O. Hernández-Pérez et al. (2020) state that stakeholders, operating in the field of digital inclusion, represent all four spheres of the quadruple helix model (Carayannis, Campbell, 2009): governmental, municipal and public sector organizations (1st sphere), business organizations (2nd sphere), higher education and research institutions (3rd sphere), and community organizations, NGOs, society and its individual members (4th sphere). According to the authors, digital inclusion is increased through the interaction and collaborative processes between different spheres or, in other words, through the interorganizational collaboration of stakeholders, which are interested in digital inclusion increase (*see* Figure 2).

This figure shows that the solution of digital inclusion problems starts in the first sphere of the helix, from the formation of policy focused on this problem at the international, national, regional, and municipal levels and its further implementation through the activities of public organizations. This sphere is one of the largest spheres, as it consists of three types of organizations: governmental, municipal, and public sector organizations, which implement different activities in the field of digital inclusion (Damodaran et al., 2015; Gangadharan, 2017; Gallardo, 2019). At the international and national level, *governmental organizations* create strategies and/or frameworks for digital inclusion, form guidelines for their implementation, prepare long-term strategic development documents, provide funding for various initiatives, projects, etc. (Ilse, Leo, 2012; Gallardo, 2019; Noh, 2019). In these programs and strategies, digital inclusion activities are usually related to the principles of sustainable development and the promotion of social inclusion in general (Ilse, Leo, 2012).

The second group of stakeholders in this sphere are *local government* (or municipal) *organizations*, which implement governmental policies, coordinate and

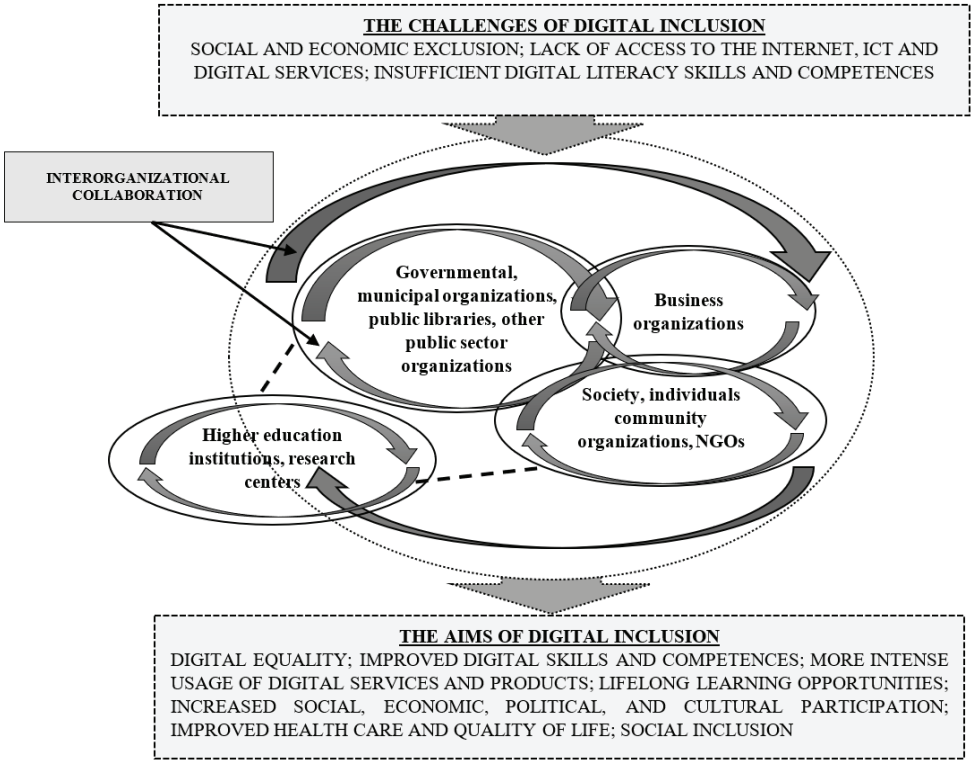


Fig. 2. **Quadruple Helix model for digital inclusion**

Source: the author's own compilation, based on C. Kaletka and B. Pelka (2015), E. G. Carayannis et al. (2018), J. Holgersson et al., (2019), J. Terstriep et al., (2020) S. Strover et al. (2020).

provide funding for the activities of subordinate public sector organizations. Also, these stakeholders can be directly involved in digital inclusion initiatives (Ilse, Leo, 2012; Gangadharan, 2017; Gallardo, 2019). The benefits of digital inclusion for policy makers are related with improved digital competences of society members. The improved digital competences are closely related with more active participation in social, economic and political life (e.g., e-voting), increased usage of digital services (e.g., e-health, e-government), social inclusion and improved quality of life (Damodaran et al., 2015; Helsper, Reisdorf, 2017; Bonina et al., 2020).

The third group of stakeholders is *public organizations*, especially *public libraries*. Public libraries can be identified as one of the most significant stakeholders in the field of digital inclusion. Public libraries provide free access to the Internet and ICT (computers, printers, scanners, tablets, etc.), offer digital services (organize virtual events, provide access to e-books, databases, e-government, e-health, employment services, etc.), organize digital literacy trainings (which are free of charge

and open to all members of society) and give individual digital literacy consultations (Ilse, Leo, 2012; Kaletka, Pelka, 2015; Beyne, 2018; Manžuch, Macevičiūtė, 2020; Strover et al., 2020). C. Kaletka and B. Pelka (2015), A. T. Rashid (2016), S. P. Gangadharan (2017) notice, that public libraries can be described as *digital inclusion providers*, because their free and accessible services can reach all people, including the most vulnerable groups of society. Other stakeholders are educational, cultural, employment, health, social service, and other organizations, e.g., schools, museums, vocational training institutions, employment services, social care centres, etc. These organizations are mainly interested in the digital inclusion of their service users (e.g., access to the Internet and ICT, development of digital competences, more active participation in lifelong learning, economic, civic, and cultural activities) (Ilse, Leo, 2012; Gallardo, 2019; Strover et al., 2020).

The benefits of digital inclusion for public sector organizations are related with the advanced usage of their services, fulfilled needs of their service users, employees, founders, and society. For example, libraries benefit from the increased usage of their digital services, more active participation in digital literacy training activities. Organizations that offer educational, employment, health or social services can involve their service users in digital literacy training activities through collaboration with other organizations (e.g., public libraries). Engagement in interorganizational collaboration activities can help organizations to unify their resources and organize various initiatives, oriented towards digital inclusion increase (Damodaran et al., 2015; Gann, 2019, 2020; Strover et al., 2020).

The stakeholders operating in the second sphere of the helix are *business organizations*. Some of them provide digital services and/or create digital products and are interested in their usage. Others offer telecommunication services, provide Internet access, sell ICT equipment, and can contribute to digital inclusion initiatives by providing good quality Internet, upgrading digital equipment, etc. Another group of business organizations are employers, interested in improving digital literacy skills and competences of their employees. Also, Chambers of Commerce and other similar associations of business organizations play an important role in this context and may be involved in digital inclusion initiatives (Ilse, Leo, 2012; Gallardo, 2019).

The benefits of digital inclusion for these stakeholders are associated with expanded usage of their services and products, fulfilled needs of their service users, increased corporate social responsibility, etc. (Damodaran et al., 2015).

The stakeholders operating in the third sphere of the helix are *higher education institutions* and *research centres*. The main functions of these stakeholders in the digital inclusion field are the provision of research methodologies and instruments, implementation of digital inclusion surveys and identification of vulnerable groups, lacking digital inclusion (Ilse, Leo, 2012; Holgersson et al., 2019). C. Kaletka and B. Pelka (2015), J. Terstriep et al., (2020) notice, that in the field of digital inclusion, higher education institutions do not play a leading role, they are often replaced by other public sector organizations. That is why

in this model they are illustrated a bit further from other stakeholders. However, according to the authors, there is a potential to strengthen the functions of these stakeholders. This could be done by involving them in interorganizational collaboration activities with other organizations, operating in the field of digital inclusion. For example, higher education institutions could contribute to the development of competences of public libraries employees, who work directly with digital inclusion initiatives, they could organize internships or volunteering activities for ICT students in public libraries, etc.

The fourth sphere of the helix is comprised of the following stakeholder groups: *society* and its *individual members, community organizations, NGOs*. The *society* and its *individual members* are the main participants of digital inclusion activities and the final users of digital services and products. Therefore, it is important to assess their needs through surveys, open discussions, and involvement of their representatives in the creation, implementation, and evaluation processes of digital inclusion initiatives (Ilse, Leo, 2012; Gallardo, 2019). As digital inclusion increases, the society and its individual members, especially those lacking digital inclusion the most, are provided with wider access to the Internet and ICT. Increased digital inclusion also means that their digital literacy skills and competences are improved and their opportunities to use various digital services and products, to participate in lifelong learning activities, labour market and involve in social, cultural, and political life become wider than ever (Caruso, 2014; Beyene, 2018; Feehan, Cobb, 2019; Strover et al., 2020). Other important stakeholders in this sphere are *community* and *non-governmental organizations* (e.g., associations unifying people with disabilities, seniors, organizations representing local communities, etc.) which can help to reach members of local communities and the most vulnerable groups (seniors, people with disabilities, the unemployed, the poor, etc.) and to encourage them to involve in digital inclusion activities. Community and non-governmental organizations are usually involved in digital inclusion initiatives, participate in various project activities, which are implemented by other public or private sector organizations. However, these stakeholders can *be the initiators* of digital inclusion activities themselves and involve other organizations into the implementation of these initiatives (Rashid, 2016; Gangadharan, 2017; Gallardo, 2019, Gann, 2019, 2020). L. Damodaran et al. (2015) emphasize, that the benefits of digital inclusion for non-governmental organizations are related with the opportunities to involve their members in digital inclusion activities, to enable them to use digital technologies more efficiently, to encourage their engagement in lifelong learning activities, labour market, to enrich their leisure, and to expand their socialization and communication opportunities. Through the involvement into interorganizational collaboration activities, non-governmental organizations can strengthen their role in social policy formation, apply for additional sources of funding, etc.

C. Kaletka and B. Pelka (2015), A. Mehmood and M. Imran (2021) emphasize, that in the filed of digital inclusion, the prominent position is contributed to *interorganizational collaboration* between stakeholders, operating in the quadruple

helix: governmental and municipal institutions, public libraries, educational, employment, health care, social service organizations, business, community organizations, NGOs, etc. In order to increase digital inclusion, these stakeholders involve in interorganizational collaboration processes and carry out various initiatives aimed at solving this problem, such as the provision of universal access to the Internet and ICT, development of digital services and products, implementation of activities, oriented towards improvement of digital literacy skills and competences, etc. (Real et al. 2016; Ragnedda 2018; Rutherford et al., 2018; Strover et al., 2020; Gann, 2019, 2020; Gallardo et al., 2020). Interorganizational collaboration is possible between stakeholders operating in the same, and in different spheres of the helix (Ilse, Leo 2012; Mehmood, Imran, 2021). For example, in the first sphere the interorganizational collaboration between governmental, municipal, and public sector organizations is necessary while seeking to create and implement digital inclusion policies, carry our various initiatives and project activities. However, the complexity of digital inclusion challenges requires the involvement of other stakeholders (organizations form private and non-governmental sectors) representing other spheres of the quadruple helix.

Summarizing the quadruple helix model in the field of digital inclusion, it can be stated that the stakeholders from public, private, and non-governmental sectors engage into interorganizational collaboration activities in order to solve digital inclusion problems. These stakeholders can be conceptualized as *digital inclusion issue stakeholders* (Rolof, 2008; Mahon et al., 2016; Towner, 2018) because they are interested in solving common problems and, by pooling resources and potential, seek to increase digital inclusion. The first sphere is composed of policy making organizations, local authorities, public libraries and other public sector organizations (educational, employment, health care, social service organizations, etc.), which are considered as the main creators, providers and implementers of digital inclusion activities. The second sphere is composed of business organizations. The third sphere is composed of higher education institutions and research centres, which are a bit further because they usually are not involved in digital inclusion initiatives directly. An important position in this model belongs to the fourth sphere of the helix – society and its individual members, community organizations and NGOs. These stakeholders are directly involved in digital inclusion initiatives, use ICT and digital services, participate in digital literacy development activities, etc. (Ilse, Leo, 2012; Kaletka, Pelka, 2015; Beyene, 2018; Holgersson et al., 2019; Strover et al., 2020). In order to increase digital inclusion, these stakeholders involve in interorganizational collaboration processes and implement various initiatives aimed at solving digital inclusion issues.

Conclusions

Today's global pandemic context has highlighted the ubiquitous need to use the Internet and digital technologies in various fields of life and the issues of digital inclusion increase became relevant as never before. The challenges of digital inclusion cover a wide range of areas, from

access to the Internet, ICT and digital services, development of digital literacy skills and competences, to digital equality and social inclusion. The aims of digital inclusion are related to expanded access to the Internet, ICT, and digital services, to increased economic, civic, social, and cultural participation, improved public health and enhanced social inclusion in general. This variety of aims goes beyond the scope of a single organization, as their implementation requires different competences, resources, and experience. Therefore, digital inclusion requires the collaboration of several stakeholders, which can be grounded on the issue-focused stakeholder theory perspective (Rolof, 2008; Mahon et al., 2016; Towner, 2018). In order to increase digital inclusion, stakeholders engage in interorganizational collaboration activities and share resources, improve existing and/ or create new services, increase their accessibility and promote the involvement of society and its members, including those belonging to marginalized groups (Ilse, Leo, 2012; Damodaran et al., 2015; Bertot, 2016; Phelps, 2017; Graves, German, 2018; Holgersson et al., 2019; Manžuch, Macevičiūtė, 2020).

This collaboration can be conceptualized by applying the *quadruple helix model* (Carayannis, Campbell, 2009; Carayannis et al., 2018; Kaletka, Pelka, 2015; Hernández-Pérez et al., 2020). The quadruple helix model in the field of digital inclusion, in comparison with innovation contexts, has some specific features. According to M. Ilse and A. Leo (2012), R. Gallardo (2019), Y. Noh (2019), the main activities, related to digital inclusion increase are performed by the first sphere of the helix, which consists of three different groups of stakeholders (governmental, municipal and public sector organizations). Governmental and municipal organizations focus on the formulation and implementation of digital inclusion policies and contribute to the funding of digital inclusion initiatives. One of the most important stakeholder groups in this sphere are public libraries (Ilse, Leo, 2012; Kaletka, Pelka, 2015; Beyne, 2018; Manžuch, Macevičiūtė, 2020; Strover, 2019; Strover et al., 2020). They are open and accessible community centers, which carry out a large part of digital inclusion activities: provide free access to the Internet, ICT, offer digital services, perform various activities, oriented towards the development of digital literacy skills and competences (Ilse, Leo, 2012; Gallardo, 2019; Strover et al., 2020). C. Kaletka and B. Pelka (2015), M. Ilse and A. Leo (2012) emphasize, that the second sphere of the helix consists of business organizations. These stakeholders are usually involved in the implementation of digital inclusion initiatives, but the intensity of their participation depends on their organizational goals in this field. Higher education institutions and research centers, operating in the third sphere, play a less important role than other public sector organizations in the field of digital inclusion. These stakeholders mainly focus on research of society needs but are not directly involved in digital inclusion initiatives and interorganizational collaboration activities (Kaletka, Pelka, 2015; Terstriep et al., 2020). The fourth sphere of the helix is comprised of stakeholders, which can be considered as participants of digital inclusion activities and the end users of digital inclusion services and products. These stakeholders are society and its individual members, community organizations,

NGOs, etc. These stakeholders are the main beneficiaries of digital inclusion, but they can initiate digital inclusion activities themselves (Helsper, Reisdorf, 2017; Strover et al., 2020; Gallardo et al., 2020). In the quadruple helix model, interorganizational collaboration is considered as a key factor, stimulating, and promoting digital inclusion and enabling all stakeholders to pursue common goals (Kaletka, Pelka, 2015; Hernández-Pérez et al., 2020).

In general, digital inclusion can be understood as a transformation that enables individuals not only to connect to the Internet and use it for leisure, but also to use digital technologies for learning, problem solving and more active participation in economic, cultural, political, and social life. This transformation has a positive impact on both individuals and society (Helsper, 2012; Damodaran et al., 2015; Helsper, Reisdorf, 2017; Strover et al., 2020; Gallardo et al., 2020).

Implications for further research

The theoretical quadruple helix model for digital inclusion, proposed in this paper, provides a conceptual basis for further theoretical and empirical research on digital inclusion. This model allows to investigate the roles and functions of digital inclusion stakeholders in empirical environment and lays basis for deeper examination of the relationships between stakeholders (such as interorganizational collaboration), enables to analyse the success factors of collaboration and to investigate the limits and barriers to successful collaboration.

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TEORINIS KETURGUBOS SPIRALĖS MODELIS SKAITMENINEI ĮTRAUKČIAI DIDINTI

Santrauka

Šio straipsnio tikslas yra konceptualizuoti teorinį keturgubos spiralės modelį skaitmeninei įtraukčiai didinti. Atlikus mokslinės literatūros analizę, straipsnyje atskleidžiama skaitmeninės įtraukties problematika, identifikuojamos skaitmeninės įtraukties didinimo srityje veikiančių socialinių dalininkų funkcijos, apibrėžiami pagrindiniai keturgubos spiralės modelio aspektai bei jo taikymo galimybės. Socialinių dalininkų bendradarbiavimo poreikis grindžiamas į problemų sprendimą orientuotų socialinių dalininkų (angl. *issue-focused stakeholder*) teorijos perspektyva (Rolof, 2008; Mahon ir kt., 2016; Towner, 2018). Keturgubos spiralės modelio, kuris pasirinktas šio straipsnio objektu, pritaikymas skaitmeninės įtraukties srityje leidžia atskleisti skaitmeninės įtraukties didinimu suinteresuotų socialinių dalininkų įvairovę, apibrėžti jų funkcijas bei indėlį sprendžiant šią problemą. Integruota mokslinės literatūros analizė parodė, kad keturgubos spiralės modelyje, siekdami spręsti su skaitmeninės įtraukties didinimu susijusias problemas ir įsitraukdami į tarporganizacinio bendradarbiavimo procesą, sąveikauja šie socialiniai dalininkai: pirmąją sferą sudaro politiką formuojančios organizacijos, vietos savivaldos institucijos, viešosios bibliotekos ir kitos viešojo sektoriaus organizacijos (užimtumo tarnybos, socialinių paslaugų centrai, švietimo, socialinės globos įstaigos ir kt.). Vyriausybinės ir vietos savivaldos institucijos orientuojasi į skaitmeninės įtraukties politikos formavimą ir įgyvendinimą, prisideda prie skaitmeninės įtraukties iniciatyvų finansavimo. Vienos iš svarbiausių pirmojoje spiralės sferoje veikiančių socialinių dalininkių – tai

viešosios bibliotekos (Ilse, Leo, 2012; Kaletka, Pelka, 2015; Beyne, 2018; Manžuch, Macevičiūtė, 2020; Strover, 2019; Strover ir kt., 2020), kurios, būdamos atviromis ir visiems prieinamomis, bendruomenes telkiančiomis organizacijomis, vykdo didelę dalį skaitmeninės įtraukties veiklų: teikia nemokamą prieigą prie IKT ir interneto, plėtoja įvairias skaitmenines paslaugas, ugdo gyventojų skaitmenines kompetencijas ir pan. Antrąją sferą sudaro verslo įmonės. Verslo įmonės dažniausiai įsijungia į skaitmeninės įtraukties iniciatyvų įgyvendinimo procesus, o jų dalyvavimo intensyvumas priklauso nuo organizacijų tikslų šioje srityje (Ilse, Leo, 2012; Kaletka, Pelka, 2015). Trečiąją sferą sudaro aukštojo mokslo institucijos ir tyrimų centrai, kurie yra šiek tiek nutolę nuo pagrindinių veiklų įgyvendinimo, nes jų atliekamos funkcijos orientuotos ne į tiesiogines skaitmeninės įtraukties didinimo veiklas, bet į bendrų tendencijų bei vartotojų poreikių tyrimus. Reikšminga pozicija šiame modelyje tenka ketvirtajai spiralės sferai – visuomenei ir pavieniams jos nariams, bendruomeninėms organizacijoms ir NVO, kurie tiesiogiai įsitraukia į skaitmeninės įtraukties didinimo veiklas, naudojasi IKT ir skaitmeninėmis paslaugomis, tobulina skaitmenines kompetencijas ir pan. (Ilse, Leo, 2012; Kaletka, Pelka, 2015; Beyene, 2018; Holgersson ir kt., 2019; Strover ir kt., 2020). Keturgubos spiralės modelyje tarporganizacinis bendradarbiavimas yra laikomas pagrindiniu veiksniu, stimuliuojančiu ir skatinančiu skaitmeninės įtraukties didinimą bei suteikiančiu galimybes siekiant bendrų tikslų sutelkti visus suinteresuotus socialinius dalininkus (Kaletka, Pelka, 2015; Hernández-Pérez ir kt., 2020). Šis teorinis keturgubos spiralės modelis padeda konceptualų pagrindą tolesniems teoriniams ir empiriniams skaitmeninės įtraukties tyrimams, kuriuose būtų empiriškai tiriamos socialinių dalininkų funkcijos, detaliau nagrinėjami jų tarpusavio ryšiai, tokie kaip tarporganizacinio bendradarbiavimo procesas, bendradarbiavimo veiksmingumą lemiantys bei jį ribojantys faktoriai ir pan.