

Research article

Measuring Digital Capital: Methodological Approaches

G. Bannykh*, and **S. Kostina**

Ural Federal University named after the first President of Russia B.N. Yeltsin, Yekaterinburg, Russian Federation

ORCID

 G. Bannykh: <https://orcid.org/0000-0002-8175-591X>

 S. Kostina: <https://orcid.org/0000-0001-9346-600X>

Abstract. The relevance of this study is determined by the ongoing digital transformation of Russian society. The formation and accumulation of digital capital influences the effectiveness of social actors and is a way to overcome social inequality. Researchers are actively engaged in investigating the phenomenon of digital capital and in developing models and methods for its measurement. The purpose of this article was to study methodological approaches to measuring the level of digital capital and to conceptualizing the idea itself. The main methodological foundations of the work were the theory of the information society, the concept of the digital economy, the theory of social capital (Bourdieu), the theory of digital capital (Ragnedda), the theory of digital capitalism (Fuchs), and the theory of digital inequality (digital divide). Theoretical sources were analyzed in this empirical analysis. In modern science, there is no common concept of digital capital and there are numerous possibilities for its measurement and impact on the digital divide. This article discusses the main theoretical approaches to measuring digital capital based on basic theories. Existing methods for measuring digital capital were analyzed, and the advantages and disadvantages of these methods were identified.

Keywords: digital capital, measurement of digital capital, digital divide, information society, digital capitalism


1. Introduction

The current stage in the development of public relations is characterized by the ongoing digital transformation, which has affected almost all spheres of society. In this regard, scientific interest in various phenomena of the digital economy and digital society is growing. One such phenomenon is the category of digital capital. Interest in the topic of digital capital among representatives of modern science is growing steadily, which is expressed in an increasing number of diverse approaches, opinions, and interpretations of this phenomenon. After analyzing the materials posted in well-known databases (Scopus, WoS, RSCI), we can state an annual increase in the number of studies on this issue, in which digital capital is studied from the point of view of economics, sociology, pedagogy, etc. Relatively little in scientific circles presented methods for assessing the

Corresponding Author: G.

 Bannykh; email:
g.a.bannykh@urfu.ru
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 G. Bannykh, and S. Kostina

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level and methodics of measurement the digital capital. Therefore, the purpose of this article is to study methodological approaches to conceptualizing the concept of digital capital and measuring the level of its development.

Thus, the main research questions are:

1. study of theoretical approaches to the concept of "digital capital";
2. consideration of existing methods for measuring digital capital;
3. comparative analysis of the presented methods

2. Methodology and Methods

The main methodological foundations of the work were the theory of the information society, the concept of the digital economy, the theory of social capital, suggested by P. Bourdieu, the theory of digital capital of M. Ragnedda, the theory of digital capitalism by C. Fuchs, the theory of digital inequality (digital divide).

The methodological position is based on the theory of the information society, which substantiates its transition to a new qualitative stage, characterized by the active development of information and communication technologies. This theory also gives rise to the concept of the digital economy, proposed by Negroponte in 1965, within which it is assumed that digital technologies and digital media will gradually create a symbiosis of a real physical and digital virtual environment for humans. However, some authors (for example, F. Webster) suggested considering a new qualitative stage as an extension or continuation of existing capitalism. At the same time, the theory of social capital, proposed by P. Bourdieu, is acquiring a new reading — in a new digital society, connections formed in and through digital technologies lead to new opportunities for any social actors, simultaneously creating barriers and conditions for the emergence of inequality.

The ongoing digital changes are creating a digital divide (from geographic and technological aspects to cultural and spiritual). Modern researchers claim that there are already 4 levels of the digital divide (M. Ragnedda, van Deursen and van Dijk).

The theory of digital capitalism implies a redistribution of roles in the system of relations between three sectors (society, state, business) with a certain dominance of the digital economy and widespread digitalization of social relations, widening the income gap, transformation of the professional sphere and technologies, etc. [1]. One of the essential characteristics is considered by C.Fuchs — exploitation and alienation within the framework of digital labor.

The analysis of theoretical sources was used as an empirical analysis. The sources collected in various citation bases were divided by us into several groups depending on the approach used in them to conceptualize the concept of digital capital. Also, during the analysis, sources were identified that proposed various approaches to assessing the level of formation of digital capital.

3. Results and Discussion

Let's consider the main approaches to determining the content of digital capital. A prerequisite for the emergence of the concept of digital capital can be works that substantiate changes in the role of human capital in new economic conditions. For example, M. Mankins, K. Harris, D. Harding consider the changes that have occurred in the concept of human capital over the past three decades since the beginning of the digital revolution [2]. In their opinion, in the new era, human capital is the most important resource for productivity. Tapscott, Roberts and Townsend used the category of "digital capital" in relation to the resources on which the development of new services and products for the digital economy is based [3], while Seale, Ziebland and Charteris-Black instead used it as a basis for understanding the relationship between support of technologies and their use in higher education [4].

The phenomenon of digital capital attracted special attention during the Covid-19 pandemic, when the practices of remote employment, digital labour, online education and leisure, etc. digital capital began to be comprehended in the category of human capital [5]. In a number of works by Russian researchers, this phenomenon is considered as a special type of human capital in the digital economy.

Quite a lot of works are devoted to the study of the relationship between digital technologies and the concept of capital, in which digital capital is understood as tangible and intangible resources that determine the degree or level of information and communication technologies (ICT) use [6, 7, 8, 9, 10].

S. Park and M. Ragnedda were among the first to study digital capital in detail. M. Ragnedda defined digital capital as a set of internal abilities (digital competencies) and external resources (digital technologies) that can be historically accumulated and transferred from one sphere to another, as a connecting capital between offline and online experience [11]. For S. Park, digital capital seems to be an integral digital ecosystem, which is formed on the basis of human interaction with digital technologies [12].

According to Pandolfini, digital capital represents the accumulation of digital skills and digital technologies, and acts as a bridge between the effective use of digital technologies and the skills for their use, which they transform in the social space [13].

Within the framework of this approach, digital capital is considered in relation to other types of capital. At the same time, in a number of works of economists, a broader approach to the conceptualization of the category of digital capital is traced, when it is considered not at the micro level (of an individual), at the meso level (in an organization), but at the macro level (state).

The phenomenon of the dependence of a person's success on his attitude to the computer and telecommunications revolution has been called the "digital barrier" or "digital divide" [14, 95]. The digital divide is explored from a variety of research perspectives. Some authors point to the need to identify three types of digital divide: global, national and individual. Others focus on the evolution of the digital divide: the first level is access to digital infrastructure, the second level is mastering digital competencies, and the third level is opportunities and life chances (the utility gap). In the social aspect, digital inequality manifests itself through the quality and quantity of an individual's qualification capital; it is influenced not only by the level of income, but also by such variables as gender, age, education level, nature of work, and informational needs of the individual. The most vulnerable from this point of view are such social groups as the elderly and residents of small settlements in the periphery.

Fuchs' ideas about digital slavery in the online labor environment are especially interesting. He provides compelling evidence that digital capitalism continues to be the foundation of digital slavery, racism and other conditions of labor inequality, albeit in a digital environment. [16]

In each of the considered approaches to digital capital, attempts were made to develop a methodology for its assessment. Let's consider a number of them. First is the methodology suggested by Ragneda and Ruyu. According to this model, Digital capital includes two sub dimensions, represented by digital access and digital competence [17].

Digital access includes four sub-components that have been shown to play a key role in determining the quality and type of digital experience, namely digital hardware, connectivity, support and training, and total time spent online. The Digital competence measure was developed based on the DigComp 2.1 proposal defined by the European Digital Competence Framework for Citizens and includes five areas of competence: information literacy, communication and collaboration, digital content creation, security and problem solving. As a result of empirical research, Ragneda concluded that the

digital capital index is associated with the socio-economic and socio-demographic characteristics of individuals, such as age, income, education level and place of residence.

Further, M. Ragneda, together with Russian researchers, tried to apply the method of assessing digital capital at the individual and regional levels (among residents and territories of Russia) [18]. The methodology was based on the hypothesis that there is a connection between the ethnic diversity of eight federal districts of Russia and their technological development (access and use of ICT, digital literacy, etc.). As a result of a survey of 398 people — Russian Internet users, it was possible to establish the presence of a correlation in the level of digital capital based on ethnic and settlement characteristics.

Attempts to measure digital capital have been undertaken in a number of studies, including those related to the study of the formation of digital capital in the education system. Thus, Cortoni and Perovic believe that indicators of digital capital should be associated, firstly, with the material aspect related to the technological infrastructure of the school and the availability of digital technologies and resources for the development of activities mediated by technologies, and, secondly, with the strengthening of digital competencies of various school subjects [19]. Based on data from the nationally representative Global Kids Online survey on the digital skills and practices of primary and secondary teachers, conducted in Montenegro with the participation of UNICEF in 2018, they conclude that teachers have a lack of digital skills, especially those of a creative nature. The indicators they propose relate to the use of technology to plan the teaching and learning process depending on levels (acceptance and transformation) and stages, which include approximation, assimilation, reorientation and evolution.

Carlos Enrique George-Reyes Salado Rodríguez Lilian Ivette developed a model for measuring digital capital in education [20]. The model is based on the idea of teacher professional development and growth related to the accumulation of digital capital to achieve pedagogical changes in learning, and integrates the changes expected as a result of the introduction of technology in the school through pedagogical practice. Its main parameters are: 1) digital capital, which attaches importance to expanding access to technological infrastructure, digital knowledge, certificates and formal and informal recognition related to the use of technology in schools; 2) the stages of the inclusion of ICT in learning, which give the character of the continuity of digital capital over time; 3) changes expected as a result of the inclusion of ICT, which explain the evolutionary nature of the use of technology in the educational process.

Separately, it is possible to single out a whole line of research devoted to the assessment of digital literacy. In this case, the measurement techniques are quite

diverse. For example, Gómez proposed four techno-social dimensions — motivation, degree of formality, degree of sociality, and type of technological domestication — to construct a typology of four ideal forms of digital literacy: unconscious literacy, self-motivated literacy, professional literacy, and social support [21].

Measurements of digital capital at macro levels are based, first of all, on assessing the state of development of the digital economy of the territory [22] These include:

1. indicators of the availability of various IT technologies for the population (the number of subscribers of cellular mobile telephone networks per 1000 people; the share of the population using the Internet; the number of active subscribers of fixed broadband Internet access, etc.)
2. various indices of the development of the digital economy and the digital society — the ICT Development Index (IDI), which is formed by the International Telecommunication Union on the basis of 11 indicators characterizing the availability and use of ICT, the availability of ICT skills among the population. Global Cybersecurity Index (GCI) Assessment of Population Samples on Digital Literacy

4. Conclusions

The introduction of a new category of digital capital into the scientific circulation set the task of its theoretical and methodological substantiation. It can be stated that in the present period a unified approach to understanding it has not been developed. This is due, *inter alia*, to attempts to substantiate it within the framework of various methodological approaches. At the same time, the task of translating this construct into the empirical plane is being actualized, which requires the development of a methodologically substantiated system of criteria and indicators for its assessment and measurement. One can observe some attempts at empirical research into the valuation of digital capital. At the micro level (of an individual), indicators related to digital literacy are used to assess digital capital, and in a broader sense, digital competence. At the level of individual organizations, studies already assess the state of the digital infrastructure — tangible and intangible (which may include the digital competence of personnel). Digital capital at the macro level is measured in terms of the development of the territory's IT infrastructure. In general, we can only talk about the first steps in this direction.

Of course, the category of digital capital has a high scientific and practical potential. The possibility of assessing it will not only reveal the current state of formation of digital

capital at different levels, but will also provide an opportunity to study its relationship with various socio-economic phenomena and processes.

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