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LONG PAPER

From digital divide to digital capital: the role of education and digital skills in social media participation

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Abstract
Social media platforms have become significant media for participating in society. This, and society's digitalization overall, has resulted in concerns regarding access and inclusion. By combining theories of social media participation and digital inequality, we explore issues regarding the prerequisites of participating through social media platforms, focusing especially on education. Through an analysis of data from a representative survey study in Finland ($N = 3724$), we illuminate the ambiguity of the perceived obstacles to both digital skills and political participation. We further build on the concept of digital capital to show the significant mediating effect of digital skills on education and participation. By utilizing the ISS (Internet Skills Scale), we break down digital skills into operational, information navigation, social, creative and mobile skills, and show how the operational skills have most significant mediator between education and political participation in social media. In studying digital inequality, we claim that the concept of digital capital is a valuable tool to illuminate the mechanisms for overcoming digital divides through the transaction of other forms of capital into digital capital, and digital capital to other forms of capital, in this case political capital.

1 Introduction

In this article, we address some of the most pressing questions regarding the digitalization of society and its implications for public participation. As of now, a substantial portion of all information is published online, and a significant part of all communication is mediated through Information and Communication Technologies (ICT). Consequently, participatory activity is also increasingly either taking place entirely online or coordinated and promoted through digital media. This enables new forms of participation, while simultaneously requiring a new (and evolving) skillset. Thus, the digital skills required to engage in the digital public sphere have become higher. Furthermore, the widespread use of personally accessible ICT is changing communication, organization and mobilization, and thus affecting social structures and participatory norms. Although this is widely regarded as a positive development, it raises questions about inclusion as ICT and related resources are unevenly distributed in the population. These resources include tangible ones, such as access to devices and networks, and intangible resources, such as digital skills, supportive networks, access to educational material, and psychological resources restraining overuse. In this article, we analyze how the respondents' educational background in an extensive survey correlates with ICT skills and digital participation. To reach a theoretical understanding of these links, we draw on the literature on digital participation, digital inequality and digital capital.

Our central theoretical thesis is, in line with the works of Park [53], Ragnedda and Ruiu [54], Merisalo and Makkonen [50], that digital capital, namely digital skills combined with other resources, works as a bridge capital that enables one type of capital to transfer/accumulate another. In the context of social media participation, we are looking at the role of digital capital in the interplay of cultural capital and political capital. Its pervasiveness and effects on power relations highlight the relevance of social media in this context. Arguably, the most essential effect of social media is its ability to redistribute and decentralize societal power. Today, ordinary citizens have numerous possibilities to join the formation of public opinion and thus influence others. Yet, these possibilities are not distributed evenly throughout the population

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as some encounter more barriers than others. Thus, several distracting mechanisms prevent citizens from utilizing their political potential in the societal sphere. Participation that ICT mediates relies on the citizens' abilities to navigate the pitfalls and possibilities of digital technology. Negative effects relating to digital overuse are increasingly becoming apparent [5, 26, 59], raising concern about its consequences for the individual and society. Nonetheless, the list of potential benefits is extensive. These include the reduced cost of communication, campaigning, coordination, maintaining and expanding social networks, and improved access to information, expertise, and educational tools, including tools to shape and create content online. Unsurprisingly, there is a positive correlation between both perceived harms and perceived benefits [5], suggesting that all those who use ICT extensively also encounter some amount of trouble. However, the number of obstacles and troubles encountered when using technology varies depending on the amount of relevant resources the individual is able to mobilize.

Many of these resources link to other well-established divisions in society, such as socioeconomic factors. Accordingly, previous research has found support for the so-called normalization hypotheses, which states that those who already have an advantage in terms of resources will be most likely to mobilize online [45]. Yet simultaneously, other studies have shown there is a potential for digital technology to bridge conventional divides within society by mobilizing those often excluded, if certain conditions are right [65, 79]. Thus, there also seems to be some support for the so-called equalization, or mobilization hypothesis [32]. Our research design takes us past these "either/or" scenarios by focusing on digital inequality's various aspects. We do this through the operationalization of the digital divide and digital capital frameworks.

Digital inequality studies arise from the tension between the positive and negative effects of digital technology, a central issue when it comes to participating online. The digital divide is the most commonly used framework in this context. However, in line with Park [53] and Ragnedda and Ruiu [54], we find that the digital divide framework can be developed further by connecting it to other digital inequality theories, namely digital capital. Our objectives with this paper are thus twofold. Firstly, we aim to construct a detailed understanding of digital inequality in light of our empirical material, which we will do by focusing on the links between societal background, digital skills, and participatory action on social media. We will further analyze the process of overcoming the digital divide barriers in terms of mobilizing digital capital. Building on previous work that developed the mediating effect of digital capital as a "bridge capital," we also hope to contribute to the theoretical discussion on the mechanisms involved in converting digital capital to political capital. This process can be understood by focusing on the dysfunctions in the processes of exchange between various forms of capital. We argue that for understanding inequalities in digitalized participatory processes, scholars should comprehend the prominence of digital capital as a bridge resource that transmits inequalities from offline to online as well mediates the processes of exchange between various forms of capital in digital spaces.

The data analyzed in this article are derived from an extensive survey collected during December 2017 and January 2018. The three main parameters we look at are as follows: educational background, skills related to information and communication technology (ICT), and participatory activity on social media. Based on our theoretical framework and other previous studies [4, 15], we suggest that these parameters form a triangular relation of causality, where background factors affect the accumulation of digital capital, and result in the prerequisites for digital participation. However, the direction of causality cannot be determined with certainty. Digital participation may link back to the skills as the will to engage may work to lower the motivational barrier.

The article is structured in three parts. Firstly, we will present our theoretical framework based on previous research and relevant theoretical conceptualizations. Here, research and theory on digital participation and digital inequality are brought together to construct a theoretical framework for the study. Secondly, we will present the variables and hypotheses we formed based on previous research. Here, we will connect the theoretical framework to the context of the study and the parameters outlined above. The third and final section contains the results of our analyses and discussion.

2 Digital participation and social media

In this article, we are especially interested to find out how socio-demographic background and digital capital associate with digital participation. Yet, within the messy field of social media, the definitions for both of our main concepts, digital participation and digital capital, become unclear. In this section, we will clarify the concept of digital participation. Overall, participatory activity is usually defined as activities online with the objective to influence either public opinion or decisions about societal issues, and is thus separated from political communication without explicit intention to have an impact [33]. However, this definition is problematic when it comes to digital participation, where the participant's intention is often obscure. Due to this conceptual fuzziness, it is essential to carefully consider what forms participation takes in the social media sphere.

Firstly, political participation on social media has raised a lot of questions regarding how it relates to conventional public participation [39]. From the perspective of individuals

and grassroots social movements, coordinating campaigns and taking activist actions as an individual have become significantly more available and effective through using digital media, specifically social media [16, 20, 64]. Previous research has further shown that participation on social media differs from conventional participation due to the wide networks and social capital accumulation of those who use it for political purposes [23, 39, 67]. Digitalization is thus changing not only how we interact in our private and professional lives, but also how citizens engage/are engaged in shaping the public opinion, and how individuals can organize outside of governmental structures to influence decision-making and societal structures. The concept of participating increasingly includes actions individuals take on social media, and thus, participation is intertwined in our everyday lives more than ever before [20].

Secondly, digital participation is often opaque when it comes to the participating actors. This may result in negative forms of interaction and veiling or distorting the representativeness of the acting subjects. For example, one actor may send multiple complaints/suggestions under different user names, or those who participate may all belong to one socioeconomic group that has mobilized around an issue important to them, thus directing resources disproportionately to those already in advantageous positions in society. Distressing arguments, self-defeating disputes, ad hominem attacks, and hate speech are other examples of problematic interaction online (e.g., [57]), also referred to as flaming, or flame wars [36, 46]. Moreover, the opaqueness also relates to whether the participation is done by a human being at all. Digital participation is subject to a number of disruptive undercurrents such as misinformation and disinformation and trolling. These societally negative acts are often carried out through algorithms (bots), such as commercial actors aiming to influence consumers, or in worse case as part of illegal political campaigns designed to create social instability. Recognizing and preventing these types of actions thus becomes one central part of designing digital participation, and this work is dependent on the same algorithmic innovations as the bots it aims to control. These methods for analyzing "big data" present both possibilities and challenges for the field of participation (see [48]).

Similarly, as digitalization has changed *the ways we can* take part, it has also changed *what we perceive as* participation. Furthermore, digitalization has redefined the relationship we have with the media, governmental institutions, NGOs, and commercial actors regarding participation in decision-making and shaping public opinion. This shift is made possible by several social media platforms and websites that make communication, organization, and planning cost-effective and pervasively available. Although not limited to it, digital participation includes all forms of conventional political participation online, such as signing petitions and engaging in party politics. In principle, examples of these also include formal channels for e-participation [1, 19, 21]. As this development is driven both from "above" by governmental institutions and other powerful institutional actors, and from "below" by individuals, NGO´s, and social movements, it is often studied as two separate developments. Institutional actors, such as municipalities [14, 61] and political parties [4], are driving the participation from above with their ongoing development of services for electronic participation. However, this top-down approach has also emerged in online services traditionally perceived as tools for "bottom-up" participation, such as social media. Thus, social media has become a significant arena for participation, regardless of the classical division between bottom-up and top-down.

Furthermore, previous research suggests that the development of social media has caused an enormous transformation of political participation and engagement, specifically from the bottom-up. At the root of this lies a wider cultural shift from consuming digital media to producing and sharing it [7]. The spread of knowledge about how to work with everything digitally, from producing digital media content to program coding, has enabled new cultures of participation to emerge. These new modes of political participation have been described, for example, as *connective action* [3], *networked individualism* [80], and *participatory culture* [37]. Taken together, these concepts portray how new modes of political participation and engagement differ from the traditional ones. That is, traditional forms of political participation are strongly based on hierarchical organizational structures and collectively shared action frames. Instead, the new means of political action are more likely to be built on individuals' motivations [3] and can be employed through activities such as sharing political information via social media networks [78].

Most importantly, social media platforms are emphasizing the importance of interaction as a form of participation in deliberative democracies. In their concept of *discursive participation*, Carpini et al. [12] highlight the importance of producing, disseminating, and curating discourse in the public sphere by talking, discussing, debating, and deliberating with other citizens. In the era of social media, the importance of discussions between citizens has truly increased. For example, Vromen et al. [78] and her research group argue that *everyday political talk* on social media has become one of the most prolific modes of political engagement, especially among youth and young adults. Similarly, social media platforms, blogs, and wikis have made it possible for anyone to publish texts almost without any cost, and these have started to function as a channel for reporting and journalism [44]. Therefore, we will focus on the deliberative forms of participation in social media. Social media can be understood as a new and significant discursive space that

influences which political issues are raised in the formal sphere of politics, which issues traditional media report on, and what discourses are spread and popularized in public discussions [42, 43]. In this sense, it is important to assess who is filling the digital public sphere and thus how public opinion is formed on social media.

3 Digital inequality, divides and capital

Social media arguably brings new participatory possibilities to those with the skills and devices needed. This can be conceptualized through the concepts of *field* and *capital*. The potential for everyday actions on social media to carry political messages far and wide, and thus shaping public opinion, places public participation on social media in the *political field*. The power within the political field can be described in terms of *political capital*. The concept of political capital has often described individuals' links to politicians and political parties, yet its original meaning is much wider than that. Bourdieu [6] describes political capital as the power that individuals compete for within the political field by utilizing their habitus. The habitus consists of internalized principles that influence the actions and evaluations of agents within the field. In the case of digital participation, these would include abilities such as the tacit understanding of the inner workings of social media platforms and the targeted online culture, such as understanding where to post what type of content for it to have the desired effect. The political capital is further described as the social skills and capabilities needed to win elections or carry out policies, yet in the realm of social media, this materializes as the ability to use the medium in a way that carries political messages as far as possible. The essence of social media platforms for participation is the re-distributive tendency through which citizens are provided with decentralized possibilities to create an impact within the field of politics. In other words, citizens are now provided more possibilities to accumulate political capital.

The potential reach or impact of participation depends on the individual's networks, linking political capital strongly back to other resources. Thus, similar to forms of social capital in general [47], political capital in the online sphere accumulates strongly through the networked relations. Moreover, online spaces are open only for those with a specific set of digital skills, and specific economic and social capital is needed for acquiring these skills, defined here as digital capital. If this divide is crossed, digital capital may further improve individuals' capacity for action, resulting in a range of positive outcomes. However, the playing field is far from equal from the start, as many studies have shown (e.g., [55].

Building on the theories of information inequality that predate the Internet, the digital divide theory describes the divisions between those who, in one way or another, benefit as digital technology diffuses throughout society, and those who do not [51, 77, 81]. The theory of digital divides has been further developed into a variety of levels, ranging from accessibility to skills and outcomes [8, 58, 72]. The theory of digital divides is based on a number of obstacles, or thresholds, relating to the use of digital technology in a beneficial way. Moreover, the theory is constructed in levels that increase in the level of detail they look into. The first level of the digital divide is a relatively coarse dichotomous conceptual framework to describe the haves and have-nots of the digital revolution in the'90 s [2]. The second level consists of a divide in skills needed to make use of ICT as well as the different use purposes of ICT [70]. In this context, access to education and other socioeconomic factors play a significant part [9, 27]. The third and final level of the divide is between those who manage to benefit from the technology in terms of tangible real-life benefits and those who do not [72].

Many studies develop the idea of how different types of digital skills correlate with gaining positive outcomes, such as making a societal impact [75]. J. A. M. [26, 28, 58, 71, 74]. Consequently, there are various frameworks outlining what these skills are and how they can be operationalized [28]. One such framework is the Internet Skills Scale (ISS) that differentiates between operational, information navigation, social, creative, and mobile skills [73]. In this framework, operational skills consist of: the basics of using digital devices and software; information navigation skills, such as the ability to navigate the Internet to find relevant information; social skills; the awareness of social norms online; the ability to use the Internet for social purposes; creative skills, such as the ability to produce content online; and finally mobile skills such as the ability to use mobile devices (ibid.).

To use digital skills in a beneficial way, the individual has to cross the final obstacle, often defined as the usage threshold [68, 76]. To overcome this barrier, the individual will have to understand how to implement ICT in a productive and valuable way. In some cases, the ability to apply digital skills in a beneficial way is itself categorized as a strategic skill [76]. New divides are identified that combine the "skills" and "use" obstacle, such as the resilience to overuse [26] and the ability to maintain a separation between work and other life realms [13]. Thus, the way these four obstacles are avoided or overcome define the actual outcomes. Focusing on outcomes is crucial both from the perspective of the individual and society [72], and it is especially the study of outcomes, and wider interrelations, that can benefit from the operationalization of digital capital alongside the digital divide.

Digital capital is one of several theoretical concepts that set out to illuminate digital inequality through a framework based on the unequal distribution of a specific form of

capital. These Bourdieu-inspired conceptualizations include technological capital [11, 24], techno-capital [56], e-capital [49] and digital capital [50, 53, 54]. Despite slight differences in definitions, the central idea remains the same, i.e., that ICT and ICT-related resources can be seen as capital in line with Bourdieu's original capital concepts (i.e., cultural, social, economic, and symbolic capital). Thus, we argue that rather than an alternative to the digital divide, digital capital supports the digital divide theory by providing a concept that sheds light on the processes involved in crossing the obstacles to participation and by achieving desired outcomes through converting digital capital to other forms of capital. The central tenets of these approaches are alike; they all aim to explain and understand digital inequality and elaborate on how this "digital" relates to other forms of inequality. The relevance of Bourdieu in this context is further highlighted by his studies of inequality [63] and the digital [35, 54].

The Bourdieu-inspired concept of digital capital provides the concept of divides with a theoretical understanding of the process involved in achieving desired outcomes. Digital capital consists of a predetermined set of dispositions that, if present, influence individuals' possibilities to engage with digital technology [53]. These dispositions can refer to a wide array of aspects, from access to networks and devices, and to a position in a social network where digital technology is frequently used. Digital capital resembles cultural capital in terms of specific skills and knowledge one can acquire, and social capital in the way it is linked to social networks[54]. In a practical sense, digital capital constitutes a cumulative resource attainable through investment that can be used to achieve certain goals, overcome obstacles, and be converted to other forms of capital. Digital capital allows an individual to strengthen and maintain wide social networks with weak ties, which is considered beneficial in many social theories [10, 25]. Therefore, in line with Bourdieu's definition, capital is a cumulative resource, it produces social benefits, requires investment and effort to attain, and can be converted into other forms of capital [6, 54].

In line with Ragnedda & Ruiu [54], we argue that digital capital relates to other forms of capital by functioning as a *bridge capital*, a vital component connecting offline experiences and resources with the online environment. As digital capital forms a link between conventional offline capital and all the possible arenas in the online sphere, it may serve to increase the existing capitals, which is in line with the normalization hypothesis. Moreover, the bridge works both ways, simultaneously enabling access to vital, and potentially capital-enriching, arenas (ibid). This may work in favor of those who lack conventional offline capital, but have the digital capital needed to cross barriers they could never cross offline, thus supporting the equalization hypothesis. An example of this is the possibility to access education in remote areas and thus gain cultural and social capital through the conversion of digital capital. Therefore, the digital capital concept provides a way out of the dichotomous dead end the normalization and equalization hypotheses represent. Instead of asserting that digitalization leads to greater or lesser degrees of inequality, we can focus on illuminating *how,* through the conversion of capital, *both* hypotheses may hold, depending on the circumstances. The role of digital capital as a "bridge" between the online and offline environment entails that it increases the convertibility of different capital. This process can be visualized as a "double loop," where offline capital enables the investment in digital capital and digital capital can further be converted into various form of offline capital [54].

Overall, political participation on social media offers an interesting case for assessing the dynamics between digital divides and digital capital. In this context, political participation on social media could be understood as a *purpose of use* that requires *motivation* and distinct types of *skills*, and that may provide various sorts of individual and collective *benefits* [43]. In this study, we assess the relations between social background, digital skills, and digital participation to elaborate the current understanding of digital divides. We do this by inquiring about how inequalities are saturated within various levels and how they are allocated from one level to the next. Yet, we do not comprehend this process as a deterministic structure that dictates the possibility to engage politically and the outcomes of such activity. Rather, this is an elastic process where individuals are also able to overcome barriers that former levels of digital divides set, and to do so with the aid of extensive exchanges between different forms of capital. With this line of inquiry, we can address the dynamics of inequality in digital participation and lace-up the black-and-white arguments between academic discussion related to the normalization and equalization hypotheses.

4 Research design

In light of the theoretical works presented above, we construct our research design around testing three hypotheses. Firstly, we will look at how socio-democratic factors such as age, gender, and education correlate with political activity on social media. Previous research indicates there are significant inequalities between the population groups represented in the public discourse on social media [31, 38, 60]. In this study, we focus on how citizens from different population groups participate in political discussions as well as processes of content production and dissemination on social media. Due to the uneven distribution of access and use, social media's benefits are divided unequally in society [72].

Earlier research shows that, with the continuation of digitalization, divisions in social media use in terms of access have lessened, but the differences in beneficial use practices,

such as civic and political participation, have grown among population groups in Finland [41]. Moreover, a common assumption is that younger, highly educated, and wealthier population groups tend to have more experience with technology and thus a better ability to take advantage of new platforms [17, 60, 69, 75, 77]. The first hypothesis we set out to test in our material is thus:

H1 Socio-demographic factors are related to political participation in social media (namely age, gender, and especially education).

Secondly, we test the extent to which education is indirectly associated with political activity through digital skills, proposing that digital skills mediate the effect of education on participation (Fig. 1). The rationale here is that education (i.e., the main source of cultural capital) increases people's ICT skills and competencies (i.e., forms of digital capital), which potentially impacts the relative differences between highly educated and non-educated users' political activity (i.e., the utilization of political capital) on social media. Thus, our second hypothesis is formulated:

H2 Digital skills mediate the relationship between education on participation.

The versatile and effective use of platforms also require digital skills that are transmitted mainly through formal education, namely strategic and informational skills. Thus, the effect of education on political participation in the digital public sphere could be conveyed via digital capital through a system of exchange of various forms of capital (Fig. 1). The digital capital concept is operationalized here as the sum of digital skills, uses, and attitudes toward digital technology.

In addition, a variety of skillsets has alternative functions in questions related to digital inequality [76, 28]. In this research, we focus on the separate mediating functions of operational, information navigation, creative, and mobile skills. We propose that at a population level, some skillsets become more important bridges between the forms of cultural and political capital on social media. Therefore, we suggest that:

H3 Primary skills, namely operational and information navigation skills, have a stronger mediating effect than secondary skills, such as creative and mobile skills.

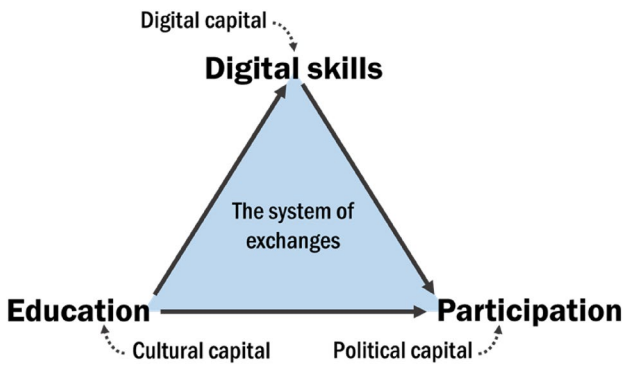

Fig. 1 An analytical model of the mediation analysis

5 Material and methods

5.1 Participants

This study used survey data collected during December 2017 and January 2018 in Finland. The survey questionnaires were sent to 8,000 Finnish speakers aged 18–74 selected by simple random sampling from the Finnish Population Register database. In total, 2,470 (30.9%) respondents answered the questionnaire by mail or filling out an online questionnaire. The data were improved with 1254 participants (also aged 18–74) gathered at the same time with a similar questionnaire from a nationally representative online panel administered by a private research company (Taloustutkimus Inc.). The final data included a total of 3724 respondents, of which 66% comes from the probability sample and 34% from the nonprobability sample. We used post-stratification weights to balance the age, gender, and education distributions to correspond with Finnish population distributions. The data set in use is published along with a codebook and data description for free research use and replication purposes through the Finnish Social Science Data Archive [1] (Sivonen et al. [62]).

5.2 Measurements

Our dependent variable was a measure of *online political activity*. As others before, in this article, we also emphasize the importance of producing, disseminating, and curating discourse in the social media sphere by talking, discussing, debating, and deliberating with other citizens [15, 41, 78]. This variable involved several types of social media participation, from passive to various levels of activity. We first coded "Non-users," who did not use social media at all. After that, we combined a total of four single items to improve the data of the applied variable. We considered questioning whether social media users followed political discussions, participated in political discussion, shared political content, and created political content, and therefore asked respondents about their participation in such activities using a 5-point Likert scale, with 1 "Never," 2 "Sometimes," 3 "Weekly," 4 "Daily," and 5 "Many times per day". We coded those who used social media but not for political

purposes as "Inactive users". Afterward, we classified the category of "Following users" containing those who only followed political discussions in social media at least sometimes. Finally, we differentiated "Participating users" who at least sometimes used social media for participating in political discussions, creating political content, or sharing political content. Table 1 shows the descriptive statistics for each variable used in the analyses.

In the first phase of the analyses, we estimated how *online political activity* was linked to various demographic factors. Our main interest was to analyze the role of education in terms of online political activity. In general, well-educated individuals are more actively taking part in different participatory practices both offline and online [34, 38, 41, 60]. This has been explained by looking more closely at how education translates into digital skills, or more specific, the correlation between education and diverse types of digital skills. Digital skills are often learned by practice, by doing rather than through formal education (e.g., [77]). Some have further concluded that this only holds for operational and formal internet skills, but that strategic and informational skills are more closely associated with formal education [71]. These are also the skills regarded as strongly connected with positive outcomes. Thus, it follows that the formal educational system plays a significant role in determining positive outcomes for the individual regarding the use of ICT. In terms of education, in our analyses, we followed the International Standard Classification of Education (UNESCO [66]) by separating those who achieved at least a tertiary level of education and those who had no more than a secondary level education.

Table 1 Descriptive statistics of the applied variables

	N	*M*/%	SD	Min	Max
Categorical variables					
Online political activity	3,724			1	4
Non-user	%	25.6			
Non-active user		20.4			
Following user		22.2			
Participating user		31.8			
Education	3632			0	1
No higher education	%	65.7			
Higher education		34.3			
Age group	3711			1	6
18–24	%	7.2			
25–34		13.3			
35–44		11.9			
44–54		16.5			
55–64		24.0			
65–74		27.2			
Gender	3706			0	1
Male	%	50.0			
Female		50.0			
Economic activity	3633			1	4
Working	%	49.2			
Non-working		8.9			
Retired		34.9			
Student		7.0			
Region	3698			1	4
West Finland	%	26.9			
Helsinki-Uusimaa		23.9			
South Finland		26.4			
North & East Finland		22.9			
Continuous variables					
Political interest	3698	5.8	2.7	0	10
Digital skills (mean variable)	3543	3.6	1.0	1	5
Internet usage frequency	3682	4.2	0.9	1	5

We also considered *age* because it is one of the most prominent predictors of social media use and using digital technologies. However, previous research indicates that age does not determine online participation as much and, while there are differences between age groups, research shows that in Finland middle-aged people are almost as active as young adults when other socio-demographic variables are standardized between the age groups [43]. Recent studies indicate that the age divide is now located between "old seniors" aged 70 + and those who are younger [22]. Similarly, the age gap differs when it is broken down into specific ICT skills. For instance, the older generations tend to perform better with content-related skills [71]. Therefore, instead of treating age as a continuous variable, we determined the effect of age by classifying participants into six age groups: 18–24, 25–34, 35–44, 45–54, 55–64, and 65–74 years. Treating age as a categorical variable enabled us to assess differences between age groups more precisely.

We also adjusted the model to account for effect of *gender*. Although there are no apparent differences regarding access [52], some areas of the Internet have significant gender differences. One example is Wikipedia, where men contribute significantly more than women [30]. This could be due to a difference in ICT-related skills, yet studies also show that women tend to underestimate their ICT skills in comparison to men, although their skills in searching for information online are equal to those of men [29]. Moreover, other studies found no difference in men's and women's Internet skills [71]. These studies affirm that other factors are at play, and thus, the gender variable may work as an indicator of the digital cultures' openness toward gender inclusion in the given sample. Another way to frame gender differences is to assess it as an indicator of equality in the availability of digital capital. Yet, in all cases, it is relevant to assess the gender gap in digital participation. In this study, we treated the gender variable as dichotomous, due to the

limited amount of those respondents who identified with non-binary classes.

In addition to these demographic factors, we considered the motivational effects on political activity. Here, we considered *interest in political affairs* by the respondents' self-ratings of their interest in politics. As socio-demographic background highly correlates with political activity as well as the level of interest in political affairs [34, 41], it is necessary to moderate the effects of these motivational aspects. In this article, the variable measuring interest in politics was used as a continuous variable, with scores that ranged from 0 (not at all interested) to 10 (very interested).

Finally, we analyzed the role of *digital skills*. Digital skills are arguably the most defining variables for realizing desirable outcomes for an individual. The digital skillset is the last one in a succession of obstacles, per the steps Van Dijk [77] outlined. The question for many has been how to define and operationalize the concept. Previous studies offer a variety of conceptual frameworks outlining different sets of skills and how to measure them. In forming digital skills, we utilized a validated measurement of the Internet Skills Scale (ISS) [73]. We focused on four separate skill dimensions, namely operational, information navigation, creative, and mobile.

We reduced the number of initial ISS items by following a factor solution presented in a paper on measurement validation [73]. In our analysis, *Operational skills* included two items inquiring to what extent respondents (1) knew how to open download files, and (2) knew how to download/save files they found online (Mean = 3.7; SD = 1.4; alpha 0.82). *Information navigation skills* were based on two variables that measured to what extent respondents (1) found it hard to decide what the best keywords were to use for online research, and (2) found it hard to find a website they previously visited (Mean = 4.0; SD = 0.95; alpha 0.82). *Creative skills* were combined according to two variables measuring to what extent respondents (1) knew how to make basic changes to the content that other users had produced, and (2) knew which different types of licenses applied to online content (Mean = 3.2; SD = 1.2; alpha 0.82). *Mobile skills* considered two variables that measured to what extent respondents (1) knew how to install applications on a mobile device, and (2) knew how to keep track of the costs of mobile application use (Mean = 3.4; SD = 1.2; alpha 0.82). Each item was measured with the same main question: "To what extent do the following Internet activities describe you?" and the responses were given with the Likert scale ranging from 1 for "Not at all," 2 for "Very little," 3 for "Somewhat," 4 for "Well," and 5 for "Very well."

Yet, while these items measuring different aspect of digital skills correlated significantly, in the first part of our analyses we combined different skill dimensions by forming a mean variable that measured holistically respondents' digital skills (Mean = 3.63; SD = 1.0; alpha 0.89). However, we also examined the extent to which each variable independently was related to the relationship between education and online political activity.

Each model also controlled for the effects of "Internet usage frequency" measures with a 5-point Likert scale (1 "Never," 2 "Sometimes," 3 "Weekly," 4 "Daily," and 5 "Many times per day"). We assumed that controlling the activity of general internet use improved the validity of our results as it evened out the differences between highly active and passive population groups. In addition, we tested the effects of the user's *economic activity* and *place of residence* in regression analyses, but we did not find their associations with online political activity or confounding effects with other variables, so we excluded them from the final analysis.

The descriptive information for all variables used in this study is presented in Table 1.

5.3 Analysis strategy

In the empirical part of the study, we first estimated the demographic differences existing in online political activity. Also, we considered the effects of political interest and digital skills, respectively. In each model, we held the control variables as constant and employed the multinomial logistic regression to predict the likelihood of online political participating. The main results of the multinomial logistic regression are presented as average marginal effects with statistical significance. The average marginal effects describe changes in the probability of online participation according to changes in independent variables.

Secondly, we analyzed to what extent the educational differences were related to the relationship between digital skills and online participation. Here, we decomposed the effect of education concerning digital skills. The decomposition analysis was conducted with the KHB method, allowing comparison of nonlinear regression models [40]. The KHB method provided us with detailed information concerning the mediating effect of digital skills by decomposing the effect of education into total, direct, and indirect effects. Unlike during the first part of the analysis, we assessed the effects of several types of skills, namely operational, information navigation, creative, and mobile. The indirect effect described the share, which was digital skills mediated from the total effect of education. The KHB method's results were estimated as multinomial logit coefficients. The standard errors were calculated by conducting 50 replications with the bootstrap method.

The analyses were performed with Stata 16.

6 Results

In our twofold analysis strategy, we firstly concentrated on the direct effects between our independent variables and participatory action social media. Secondly, we assessed the mediating effects of various digital skills between education level and political social media use. The results regarding our first analysis are shown in Table 2. The first model shows that educational differences existed: those who achieved at least tertiary-level education were more likely to participate when compared to respondents with lower education levels. The results also strengthen previous findings as respondents aged 55–64 and 65–74 were less likely to use social media for political purposes. Yet, in terms of gender, we did not find any differences.

In the second model, we added the variable measuring respondents' interest in politics. The results indicated that interest in politics had a relatively high effect on online political activity. Additionally, we found that controlling the model for interest in politics influenced the effects of demographic differences: the relative differences between the age groups increased substantially. However, we found that gender differences emerged, and age differences grew after including interest in politics in the analysis. Accordingly, women were more likely to participate in online political discussions if differences in political interest were standardized between male and female participants. Unsurprisingly, educational differences were found to correlate with differences in political interest.

Next, we considered the effects of digital skills. The third and final model of our first analysis illustrated how digital skills had a clear association with online political activity. According to the multinomial logit models, increasing of digital skills by one unit of standard deviation inclined the probability of online political participation by 10 percentage points. Additionally, we found that after controlling for digital skills, the effect of education diminished, and there was no statistical significance between lower- and higher-educated participants. Moreover, digital skills correlated with age differences: the relationship between age and online political participation decreased after adding the skills variable to the model.

After inquiring about the direct effects of our independent variables on online political activity, we conducted a decomposition analysis to test the mediating effect of digital skills on educational differences. The results of our second analysis are shown in Table 3. The analysis indicated that the effect of education was indirect through digital skills ($B = 0.29$; $p < 0.001$). According to the decomposition models, digital skills mediated over 80% of educational differences when predicting online political activity.

After assessing the mediating effect of digital skills holistically, we disentangled the skill variable to figure out which skill variable had the most influential mediating role between education and online political activity. We tested the effect of each skill variable individually by adding them into the base model that held the control variables constant. The results shown in Table 3 convey that each skill variable had a statistically significant mediating effect on the relationship between education and online political activity. Our analysis indicates that the operational skill variable was clearly the most influential factor as a broker for the effect of education ($B = 0.52$; $p < 0.001$).

Table 2 Predicting online political participation according to demographic factors, political interest, and digital skills; average marginal effects post-estimated from multinomial logit models

	M1		M2		M3	
Higher education (ref = no higher)	0.08***	(0.02)	0.04*	(0.02)	0.01	(0.02)
Age: 18–24 (ref)						
25–34	0.07	(0.04)	0.06	(0.04)	0.08	(0.04)
35–44	0.08	(0.05)	0.06	(0.05)	0.09*	(0.05)
44–54	0.03	(0.04)	−0.01	(0.05)	0.04	(0.04)
55–64	−0.11*	(0.04)	−0.17***	(0.04)	−0.10*	(0.04)
65–74	−0.12*	(0.05)	−0.20***	(0.05)	−0.12*	(0.05)
Female (ref = male)	0.01	(0.02)	0.04*	(0.02)	0.05**	(0.02)
Political Interest			0.05***	(0.00)	0.04***	(0.00)
Digital Skills					0.09***	(0.01)
Model fit (Wald chi)	804.32***		924.22***		929.91***	
Pseudo R2	0.12		0.16		0.16	
Observations	3505		3487		3353	

***$p < .001$, **$p < .01$, *$p < .05$

Average marginal effects for probability of participating online with robust standard errors in parentheses

Models control for the effects of internet usage frequency

Table 3 The decomposition of the relationship between education and online participation concerning digital skills

	B	SE	*p* value	95% cis	
Total effect of higher education	0.42	0.11	< 0.001	0.19	0.64
Direct effect of higher education	0.08	0.11	0.48	− 0.14	0.30
Indirect effect through digital skills (the mean variable)	0.33	0.04	< 0.001	0.26	0.41
Indirect effect of higher education through:					
Operational skills	0.52	0.05	< 0.001	0.42	0.62
Information skills	0.12	0.02	< 0.001	0.07	0.17
Mobile skills	0.07	0.02	< 0.001	0.03	0.11
Creative skills	0.14	0.03	< 0.001	0.09	0.19

B = Multinomial logit coefficients for predicting online participating

All the models control for the effect of age, gender, internet usage frequency, and political interest

7 Discussion and conclusions

In this article, we assessed the structural mechanisms of societal background as well as the mediating effects of digital skills as a form of capital in online political participation. We also contributed to the theoretical discussion on the mechanisms involved between cultural capital, digital capital, and political capital. Our analytical strategy was twofold. First, we evaluated the associations between our independent variables and online political participation. Then, we assessed the mediating role of digital capital as a bridge capital between participants' structural positions and online political participation.

In line with earlier research [28, 68, 76], our analyses show that online participation is dependent on the combination of many factors, of which digital skills account for the strongest correlation. While socio-demographic variables have a significant effect on those who participate on social media, it seems that digital skills ultimately transmit participatory practices online. Our results support the argument of the social basis of online participation [18, 60, 69, 75, 77]. In addition to digital skills, all other independent variables—namely age, gender, education, and interest in politics—had a somewhat statistically significant effect on online participation. As expected, age had a significant effect on online participation, as those in older age groups were more passive to join a political discussion or share political content. However, there were no significant differences between young adults and middle-aged respondents. In fact, after standardizing the differences in other socio-demographic variables, political interest, and digital skills, respondents aged 35–44 were the most active age group participating on social media. Similarly, gender had an effect on online participation that differed from many previous studies: After controlling other variables, female participants were more likely to participate in the digital public sphere. This may be the positive result of inclusion policies that have been prevalent in Finland for a long time.

From the background variables, we were especially interested in the effect of education level. Education level had a significant effect on online political participation, as highly educated people were more active in participating. Yet, our further analyses showed that digital skills highly mediated the effect of education. Highly educated people evidently have better skills to utilize social media and digital technology. Moreover, our results showed how much of these differences in skills explain the differences in online citizen activity. From the societal equality perspective, it is somewhat problematic that well-educated and better-off people can disseminate discourses and promote their interests in the field of digital politics. Nevertheless, our results still indicate that these structures do not entirely determine individuals' capabilities to join the digital public sphere.

The results of the second part of our analysis elaborate on the concept of digital capital. Our results indicate that digital capital is exchangeable with other forms of capital. This holds true especially for education, a crucial source of cultural capital, which is easily transformed into the form of digital capital. Similarly, through the processes of online participation, these forms of digital capital are further transacted with forms of political capital.

Comprehending the characteristics of digital capital expands the theoretical concept of digital divides focusing on the digital sphere as a stratified field toward the field of societal power. The transactions between different forms of capital thus reveal the complex and multi-relational being of digital inequalities. The background factors do not determine individuals' success in the digitalized field, but these structural features are indeed providing advantages for some and barriers for others. Yet, those with lower amounts of relevant resources in their personal background, such as education, are still able to compensate for scarce resources with alternative forms of capital, such as several forms of digital skills. Thus, the concept of digital capital permits a two-sided understanding, where both normalization and equalization of power relations within the societal sphere may appear simultaneously. In this sense, instead of having

simply one-sided consequences for equality and political power, digitalization and the emergence of the digitalized public sphere could reshuffle power relations, improving one's possibilities and disseminating another's.

Similarly, digital inequality is a much more complicated phenomenon than the distribution of a single resource [26, 72]. Rather, it is a continually changing and evolving field of resources that responds to the development of new technologies and cultures of usage. This field consists of resources relating mainly to information, knowledge, and communication, and it is introduced into populations that differ immensely in terms of existing structures of inequality. These differences define the transactions of one capital for another, that is, the power of digital capital to work as a bridging capital. Therefore, the outcome of digital capital accumulation for inequality, i.e., the opportunities and benefits that it can open for those in a disadvantaged position, varies depending on the structures of inequality offline.

According to our analyses, all separate aspects of digital skills, namely operational, information related, mobile, and creative, mediated the relationship between education and online political participation. Yet, the analysis showed that operational skills were the most crucial aspect. The ways to counteract the effects of digital inequality on individuals, populations, and society will surely remain a widely debated subject. However, it is promising that the skillset that is the easiest to improve on, through changes in formal education plans and the availability of courses and educational material, is also the most significant one.

Additionally, in the scattered public sphere on social media, different networks and groups do not always require the same abilities and skills [78]. Thus, the social context determines which resources are needed: Some audiences require fluent writing skills and argumentation, while others do not necessarily appreciate these "elitist" modes of communication. These formal and class-related forms of communication may even create a burden for those who aim to disseminate their political aims and discourses. Similarly, incivility, trolling, and aggression may convince some small part of the population, but others reject them. In the age of fake news and post-truth politics, evidence of populist forms of effective political communication styles is indisputable. Due to the multi-complexity in the social media, more studies are needed to investigate how problematic features of online communication, especially regarding to anonymity, bots, trolling, online aggression and disinformation.

For the individual, this means that an understanding of the online norms as well as diversification of skills and abilities is needed. However, the diversification of different skills' is dependent on overcoming primary obstacles and the prevalence of base resources. In this sense, the finding that shows operational skills as the most relevant skills for online participation supports the idea of primary and secondary skillsets. Thus, operational skills, namely abilities and knowledge related to the basics of using technologies, could be seen as the primary skillset when assessing the population level. However, for comprehending the importance of different context-related mechanisms for a variety of digital skills, more nuanced research designs, populations, and qualitative methods are needed. In particular, we call for qualitative studies into the transaction mechanisms of cultural, social, and economic capital into digital capital and how this further feeds into capital accumulation. Finally, besides the role of education, future studies should consider the use of other measures of socioeconomic status, such as occupational status and income class.

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Data availability The datasets analyzed during the current study are available in the Finnish Social Science Data Archive repository, http://urn.fi/urn:nbn:fi:fsd:T-FSD3500.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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