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Article

Inequality Matters

The Role of Economic, Social, Cultural, and Person Capital in Explaining Inequalities in the Accessibility and Usability of Digital Health Technologies

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Abstract
The use of digital health technologies could offer promising ways for sustainable health opportunities. However, the accessibility and use of such technologies differs between groups in society. Previous research indicates that differences in people's socioeconomic position are associated with the degree to which they have access to and use digital health technology. Inequality in socioeconomic position is often operationalised as differences in economic capital. A more comprehensive definition of inequality that also encompasses differences in social, cultural and person capital provides a richer understanding of the interplay between inequality and the accessibility and use of digital health technology. In this paper we provide a theoretical rationale for the examination of access and use of digital health technology from a social inequality perspective. Specifically, we examine how variations in multiple types of capital may affect one of the leading models on the use of health technology (the UTAUT model) and its predictors. By doing so, we discuss the model in light of social inequalities and aim to contribute to bridging the gap between the literature on the acceptance and use of digital health technology, the digital divide, and social inequality.

Keywords
Health technology, digital divide, social inequality, capital.

The use of digital technologies to maintain or improve our health has become an indispensable part of our lives. However, the extent to which the advancement of digital technologies in healthcare and well-being domains is purely a positive development, remains a topic of debate.

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Digital health technologies could positively influence a wide variety of individuals' health and well-being. Research has found that eHealth technologies are associated with enhanced levels of independence, active living and an autonomous lifestyle, for example for older individuals (Bernardo et al., 2022). Also in other healthcare domains, digital health technologies are expected to drive the ongoing systemic transformation. They can play a key role in moving away from paternalistic and interpretive medical models towards more informative and deliberative models, that integrate medical care with person-centred and community-based care perspectives (Barberan-Garcia et al., 2021; Emanuel & Emanuel, 1992; Rodrigues et al., 2022). Theoretically, the use of digital health technologies could thus offer promising ways for sustainable and accessible health opportunities, because it aligns with a patient-centred approach to health and well-being (Borghouts et al., 2021; Connolly et al., 2020; Hollis et al., 2015; Meier et al., 2013; Ossebaard & Van Gemert-Pijnen, 2016).

An important reason why this promise and potential have not been realised, is a persistent 'digital divide', in which access, use, and outcomes of digital health technologies are linked to pre-existing social inequalities. Literature reveals both an accessibility divide (e.g., unequal access) and a usability divide (e.g., unequal possibilities to use a resource), related to digital health technologies. This means that even when access is not an issue, digital interventions for health often yield lower benefits for disadvantaged groups, such as those with lower SES (Szinay et al., 2023; Western et al., 2021). Several researchers have already pointed out the risk of widening disparities in life expectancy and well-being, with the rise of digital health technologies (Bolman, 2019; Shaw et al., 2021; Swinkels, 2017; Timmermans & Kaufman, 2020; Weiss et al., 2018). This risk became particularly apparent during the COVID-19 pandemic, when the rapid shift to digital technologies to ensure the continuity of care, exposed differences in accessibility between diverse groups of patients (Eberly et al., 2020; Litchfield et al., 2021). Studies that were conducted during this time reported that specific groups in society were being cut off from receiving care, as they were unable to access the digital alternatives. (Beaunoyer et al., 2020; Davies et al., 2021; Freeman et al., 2022; Khilnani et al., 2020; Paakkari & Okan, 2020; Whitelaw et al., 2020).

The relationship between this digital divide and social inequalities is reciprocal, which means that differences in access to digital health technologies are often a reflection of offline differences in social position, and vice versa (Fang et al., 2019; Litchfield et al., 2021; Ragnedda et al., 2022; Reddick et al., 2020). In addition, previous work on health inequalities mentions a strong correlation between inequalities at the societal level and health inequalities (Link & Phelan, 1995; Meisters et al., 2022). This suggests that an increasing digital divide also carries the risk of widening health inequalities. Social inequalities in terms of four different types of capital are important here: economic, social, cultural and person capital (Campen, 2014). Differences in age, education, living in a rural or urban area, health literacy, digital literacy and skills, cultural background and socioeconomic status, are factors that influence access to and beneficial use of digital health technologies (Szinay et al., 2023; Western et al., 2021). However, existing research lacks an integrated, interdisciplinary approach to understanding accessibility issues in digital health technologies. While much of the literature has focused on individually-based predictors for technology acceptance and use (e.g., Venkatesh et al., 2012), research on the digital divide (e.g., Ragnedda et al., 2022) suggests the need for a broader sociological perspective to this knowledge. Research investigated specific processes that mediate the relation between social inequalities and digital health technology use, such as health literacy and digital skills (Zhao et al., 2024). Yet, a comprehensive

framework in which health inequalities, possible mediators and moderators, and access to and use of digital health technology are linked, is still missing. Such a comprehensive model, that can facilitate our understanding of the societal level factors underlying a potential (detrimental) impact of digital health technologies on health inequalities, has not been well-developed.

If policymakers aim to decrease health inequalities by focusing on digital health technologies as a solution, they should carefully consider the relationships between the access and successful use of digital health technologies, social inequalities and health inequalities (Bibi et al., 2023; Majcherek et al., 2024; Robinson, Ragnedda, & Schulz, 2020). Knowledge about the interplay between these phenomena and their effects is highly relevant to the debate about the risk of digitalisation exacerbating health inequalities.

Purpose of this Paper

In this paper we aim to provide a position on how social inequality relates to inequalities in the use of digital health technologies. We do so by discussing a theoretical rationale for the exploration of the accessibility and use of digital health technologies, and how this is presumably affected by variations in different types of capital. This rationale integrates relevant theoretical angles, to gain a deeper understanding of why access to digital health technologies is not equal for all. To this aim, we examined existing theory on the core elements of inequality in access to digital health: technology acceptance and use, the digital divide, and social inequalities. Taking this as a starting point, we cycled through additional and more specific literature, using a forward snowball method.

We will discuss the challenges of analysing the predictors for digital health technology access and use through a sociological lens, and examine how this connects to the digital divide in society. Specifically, we will discuss how the Bourdeusian four types of capital (economic, social, cultural and person capital) interact with access and use of digital health technologies, and how this may affect one of the leading models on the use and acceptance of technology (i.e., the UTAUT model). We will synthesise the current knowledge of these four types of capital, and the possibly complex interactions between them. We will also analyse their expected relationships with digital health technology access to and use, contributing to existing theory on technology acceptance, and strengthening existing models. This enriches and specifies the current literature on the predictors for the intention to use digital health technology. We place the UTAUT model in a sociological perspective, by which we aim to contribute to bridging the gap between the literature on the acceptance and use of digital health technology, the digital divide, and social inequality. This outlines our position on why and how the digital divide should be approached more interdisciplinary, serving as a departure point for future research that addresses this complex interaction of societal factors. Consequently, this will deliver possible directions and strategies to mitigate the risk of inequalities regarding access to digital health technologies.

Unequal Access to Digital Technologies: The Digital Divide

As mentioned above, research has illustrated a gap in people's access to and use of digital healthcare on the one hand, and people's well-being on the other. Research on the 'digital divide', has shown that social inequalities affect the use of digital health technology (Fang et

al., 2019; Litchfield et al., 2021; Ragnedda et al., 2022; Reddick et al., 2020; Scheerder et al., 2017; Van Deursen et al., 2017). To monitor and improve people's well-being, it is therefore important to understand this digital divide and its implications for access to and use of digital technologies.

One way in which the digital divide is conceptualised and understood, is that the gap in technology access and use often reflects offline inequalities. This begins with material access to technology, also referred to as the *first level digital divide* (Van Deursen & Van Dijk, 2019). Although some of these challenges have been addressed and mostly overcome in Western societies, disparities remain in access to a strong, stable (home) internet connection, and up-to-date devices which are essential for utilising digital health technologies (Robinson, Schulz, et al., 2020; Van Deursen & Van Dijk, 2019). Another factor, which might be more prevalent and persistent in Western societies, is the extent to which people are engaged and competent enough to properly use digital health technologies. This *second level digital divide* reveals large differences among groups in society concerning the motivation, emotional commitment, health literacy, and digital skills to use technology (Ragnedda & Muschert, 2017; Steyaert, 2002; Van Deursen et al., 2017; Van Dijk, 2006). Finally, the *third level digital divide* reflects differences regarding people's capacity to generate tangible (health) outcomes and benefits from using digital health technology (Ragnedda & Muschert, 2017; Van Deursen et al., 2017). For example, someone may be able to successfully use a self-monitoring app to monitor calorific consumption, but this does not automatically imply that someone can translate this knowledge into healthier food choices.

Digital inequalities on the different levels of the digital divide are mutually reinforced in a compound or sequential way. For example, engagement and skills, both aspects of the second level digital divide are of mutual influence and reinforce each other (Ragnedda et al., 2022; Van Deursen et al., 2017). This mechanism can be explained by the compound relationship between digital inequalities, meaning that inequalities are reinforced within one level of the digital divide (Ragnedda et al., 2022; Van Deursen et al., 2017). An example of a sequential divide is a situation in which people do not have the materials to access digital health technologies (first level), resulting in an inability to enhance their skills (second level). Another example is that when people have a lack of digital skills (second level digital divide), they are much less likely to engage in technology, and as a result will not be able to generate tangible outcomes from its use (third level) (Ragnedda et al., 2022; Van Deursen et al., 2017).

The Use of Digital Health Technology

Regardless of the digital divide, the increasing prominence of digital health technology, both on an organisational and personal level, has led to a vast amount of research into factors that influence access, usage, and the (clinical) effectiveness of these technologies in general. Scholars frequently mention examples of general usage barriers and negative effects of digital health technologies: a lack of access to the available technology or the skills to use this technology; the perception both patients and specialists might have that technology impoverishes the therapeutic interaction; not experiencing benefits from using technology; technical hassles; and privacy and safety issues (Connolly et al., 2020; Davies et al., 2020; Ross et al., 2016).

Much of the knowledge on predictors of access and usage of digital technologies has been integrated in the *unified theory of acceptance and use of technology* (UTAUT) model (Venkatesh et al., 2003; Venkatesh et al., 2012). In the domain of healthcare and well-being, this model is frequently used to identify potential gaps between the availability of digital health technology, and the possibility and desire to access and use it. The model explains the use of technology by discussing the most important predictors for people's intention to use technology, direct predictors for the actual use of technology, and the moderating factors within these relationships. To the best of our knowledge, these individual predictors were not reviewed in light of the digital divide, while differences in intention to use digital health technologies likely relate to social inequalities.

In the initial version of the UTAUT model, Venkatesh and colleagues (2003) theorise that the intention to use technology depends on three key factors: expected performance of the technology, the expected effort to use it, and the influence of people's social environment. In addition, they found a direct relationship between the facilitating conditions to use technology, and the actual use behaviour (Venkatesh et al., 2003). In a revised version of their model three variables were added to the model: motivation, the expected balance between price and value, and people's habit of using technology. Previous research has found that age, gender, and experience with technology moderate the predicting relationship between these variables and the intention to use technology (Venkatesh et al., 2012). We propose that there will also be variation between different types of social groups in these relationships.

Research into the applicability of the UTAUT model, particularly in healthcare settings, reveals additional predictors that vary by context: trust in technology, self-efficacy, the personal ability to handle innovative technologies, and resistance to change (AlQudah et al., 2021; Gu et al., 2021; Hoque & Sorwar, 2017).

Various studies indicate that the UTAUT variables predict digital health technology usage, explaining up to 70% of the variance in intention to use these technologies (Lin & Anol, 2008; Nuq & Aubert, 2013). However, research on technology acceptance in healthcare settings illustrates that, despite the growing knowledge on the factors predicting and moderating the intention to use technology, the complex interplay of socioeconomic, cultural, and personal factors affecting users' intention to adopt technology, require further attention. So far, there is little research on the way in which these factors affect the intention to use technology in real-world and general population settings, in the domains of health and well-being (Ammenwerth, 2019; Gu et al., 2021). We therefore need a deeper understanding of how social inequalities relate to digital inequalities, and subsequently how they affect accessibility and usability of digital health technologies.

Social Inequalities and the Digital Divide

Established social inequalities, like differences in socio-economic status, have been shown to impact the persistence of digital inequalities (Fang et al., 2019; Litchfield et al., 2021; Ragnedda et al., 2022; Reddick et al., 2020). Existing real-world social inequalities are reproduced and reinforced in digital societies (Van Deursen et al., 2017), which appears to happen especially amongst the most vulnerable in society (Ragnedda et al., 2022). This 'self-reinforcing effect of digital and social exclusion' (Ragnedda et al., 2022) happens on all three levels of the digital divide. Earlier research indicates that age, income, gender, race, and

education significantly shaped people's initial access to technology at the start of the digital era (i.e., possession of a device, being connected to the internet). This resulted in unequal access to, for example, information, social networks, and job opportunities (*access gap*) (Gómez, 2018). In other words, the aspects that were at the basis of determining material access to technology (i.e., socio-economic determinants) amplified the digital inequalities this resulted in (Helsper & Reisdorf, 2017).

Whereas in recent years there have been major improvements regarding equal material access to technology gap in the use of digital technology and intertwined social inequalities persists. This can be explained by the interaction between social inequalities and digital inequalities on the second and third level of the digital divide (Scheerder et al., 2017). Differences in digital skills and competencies (second level) affect how people engage in the technological possibilities they can now access (*use gap*). This leads, for example, to information and knowledge gaps, that in turn have consequences for someone's position and societal advantages (Gómez, 2018; Scheerder et al., 2017). Finally, there is a reciprocal relationship between social inequalities and the third level of the digital divide. Tangible outcomes people get from using digital technologies are strongly influenced by their ability to allocate offline resources (*utility gap*), such as education, salary, and social networks. It also works the other way around: when people have the capacity to generate concrete benefits from using technology, this will positively influence their offline position and resources (Gómez, 2018; Ragnedda et al., 2022; Van Deursen et al., 2017). In conclusion, it is important to consider the digital divide in relation to social inequalities, because they are complex interacting and reciprocal concepts (Ragnedda et al., 2022; Robinson, Schulz, et al., 2020). Understanding how these concepts interact, will clarify how the intention to use digital health technologies, and the predictors that can be derived from the UTAUT model, may vary among different societal groups.

Social (In)equality Based on the Disposition of Multiple Types of Capital

To develop a better understanding of the relationship between social inequality and the digital divide, we need to discuss the concept of social (in)equality, provide it with a more distinct definition, and identify the relevant factors that relate to this concept. When referring to social (in)equality, the term *socio-economic status* is often used, which is measured by indicators such as labour market position, education, and income (Oakes & Rossi, 2003). This is congruent with the class-based Marxist view on social stratification in which the focus is on one single aspect of social inequality, namely economic capital (Ragnedda & Muschert, 2013). In the historical Marxist approach, a class-based society is associated with having economic capital (i.e., property and financial means) or not. Transferring this to current times, economic capital would be determined by education, labour market position, income, real estate, and financial resources (Ragnedda & Muschert, 2013). In this view, this dimension alone determines one's socio-economic status.

However, based on Link and Phelan's (1995) *fundamental cause-theory*, the influence of socio-economic status on societal inequalities is not always direct. Instead, it depends on the disposition and combination of different types of capital, the interaction between the different resources, and the effect of (not) having access to them (Link & Phelan, 1995). This aligns with a Weberian view on social inequalities based on the complex interplay of social, political, and

economic capital (Ragnedda & Muschert, 2013). The Weberian approach goes beyond class-based stratification, recognising that access and skills are influenced by many other factors than economic resources. Building further on the Weberian approach, Bourdieu's trichotomy of economic, social, and cultural capital is relevant (Pierre, 1979). Based on Bourdieu's work, adopted and adapted by various other scholars, societal position is determined not merely by economic resources, but also people's social capital (social relations, social networks), and cultural capital (knowledge, skills, status), and the complex interaction between these three forms of capital (Abel, 2008; Hashemi et al., 2018; Pinxten & Lievens, 2014). Essentially, social capital is about relationships with other people and someone's position within social networks (Campen, 2014; Robison et al., 2002; Snel et al., 2021). These networks can provide social support (e.g., having someone to talk to, or do activities with) or instrumental support (e.g., support with administration or cleaning). Both types of social support are relevant for accessing digital health technologies. People might be more familiar with such technologies if they see other people in their social networks who are also using them (social influence), and whom they could potentially ask for technical support (e.g., downloading apps, installing it, creating a user profile, navigating the menu, etc.).

The third form is cultural capital, which relates to the knowledge, skills and status that is gained either through education or the direct living environment someone grows up in (Abel, 2008; Campen, 2014; Hashemi et al., 2018). We can distinguish embodied cultural capital (e.g., values, skills, and knowledge), objectified cultural capital (e.g., books, art, and clothes), and institutionalised cultural capital (e.g., academic and/or professional titles) (Campen, 2014; Hashemi et al., 2018). Cultural capital thus includes skills (i.e., digital skills) and knowledge, as well as access to high culture, such as theatre, museums, or international travel, which is not necessarily related to education level or income. Individual digital skills and knowledge (e.g., digital literacy, (e)health literacy, information literacy) are indicators of both access to and effective use of digital health technologies (Cheng et al., 2020; Chetty et al., 2018; Estacio et al., 2019). People with greater digital skills and knowledge on topics such as digital technology, health, and online information might be better equipped to engage with these technologies.

From sociological research it appears that besides Bourdieu's widely used tripartite of economic, social and cultural capital, a fourth type of capital may influence someone's chances of a good societal position, which is person capital (Campen, 2014). That is why in this paper we add this as a fourth type of capital. Following the Netherlands Institute for Social Research (SCP), physical health, mental health and aesthetic capital can be conceptualised as indicators of person capital (Campen, 2014).

A rationale for including person capital as a separate variable to explain social inequality can be found in the literature on the presumed reciprocal relationship between health and socio-economic status (Ahrenfeldt & Möller, 2021; Garbarski, 2010; Mulatu & Schooler, 2002). In the past decades, much research has been done that suggests a close relationship between social inequalities and health inequalities, also referred to as the '*social gradient in health*' theory (Theodossiou & Zangelidis, 2009). This theory indicates that people with lower socio-economic status are less healthy, have a higher risk of diseases and (chronic) conditions, and a shorter life expectancy (Adler & Ostrove, 1999; Lynch, 2006; Oakes & Rossi, 2003; Präg et al., 2016; Theodossiou & Zangelidis, 2009). In many cases, the relationship rests on a causal relationship between socio-economic status and health outcomes. According to this theory, people in 'low(er) social classes' are more likely to live in an unhealthy environment, have less access to health information and health facilities, adopt unhealthier lifestyles, and experience

higher levels more stress (Adler & Ostrove, 1999; Lynch, 2006; Oakes & Rossi, 2003; Präg et al., 2016; Theodossiou & Zangelidis, 2009).

To explain this, more recent studies claim that health status should be seen as a separate variable or type of capital, which can independently influence someone's social position (Campen, 2014; Grossman, 1972; Mackenbach, 2019). In turn, how exactly this mechanism works, depends on demographic (e.g., age) and other socio-economic variables. In other words, in order to prevent conflating social inequality with health status, physical and mental health can be treated as indicators of person capital. In this way, its relationship with the use of digital health technologies can be examined separately. For example, individuals suffering from mental illness are often lacking the cognitive ability and motivation to deal with digital health technologies (Spanakis et al., 2021). In addition, stress about one's health or medical situation significantly affects an individual's cognitive ability to process and evaluate information (Rood et al., 2015; Schwartz‐Arad et al., 2007). Thus, mentally or physically ill individuals are disadvantaged when accessing and using digital health technologies. Furthermore, sociological research has shown that someone's physical attractiveness affects the chances of having friendships, relationships, a good job, and other privileges in life (Hanquinet & Savage, 2015). An increasing focus on aesthetics in modern society, combined with the impact of beauty on socially-based forms of wealth, legitimates the inclusion of this variable as a criterion for social inequality. This, in turn, contributes to the reciprocal relationship between social and digital inequality, integrating it into person capital (Anderson et al., 2010).

This overview of types of capital, as a way of conceptualising social inequalities, enables a more distinct explanation of the digital divide and its connection to the factors predicting the intention to use digital health technologies across different societal groups. It provides more specific variables to relate to accessibility and usability outcomes. For example, we expect that a low level of health literacy, as one of the variables that make up the concept of cultural capital, is related to the expected effort to adopt digital health technology. If people already struggle with accessing traditional health resources, they are more likely to experience difficulties when faced with digital health technologies. This may tip the balance towards abstaining from using this technology, regardless of the content or the relevance of the tool for the individual. As another example, a limited social network could minimise the extent to which people can draw on social support for the use of the technology, negatively affecting their intended usage. People who are unable to ask for support or share experiences are more likely to drop out from, or never initiate, the use of digital health tools than people who do have such social support. Both of these factors are thus examples of how the use of digital health technology can differ between different types of social groups, in ways that are relatively unrelated to the traditional indicator of economic capital. Lastly, since some digital health technologies for people with mental or physical health issues, it is important to explore how people with lower person capital engage with (or avoid) these technologies, and how this relates to the effects of other types of capital.

In summary, in this position paper we propose a broader interpretation of social inequality as a concept that relates to the accessibility and usability of digital health technologies. This creates a more multifaceted understanding of the mutually reinforcing relationship between health inequalities and inequality in digital health technologies. By placing the literature on digital health technology within a broader sociological framework, we aim to contribute to the sociological discourse on social inequality by integrating research on access to digital health

technology. This provides a first conceptualisation of an interdisciplinary perspective on the digital divide in healthcare.

Conclusion

In conclusion, the current paper argues that to enhance our understanding of inequality in digital health technologies, we need to integrate theories on the use of technology, which are commonly focused on individual-level predictors, with sociological literature on health inequalities and capital. Five key messages follow from the theoretical rationale provided in this position paper:

1. Factors influencing technology acceptance are often approached without incorporating different diversity domains, thus underestimating the many sociological influences that diversify commonly used (unified) predictors.
2. Social inequality appears to be a complex phenomenon that needs further operationalisation. This narrative takes a more holistic approach to social inequalities by distinguishing between four different types of capital. The variables underlying the different types of capital, in combination with the unified predictors from rooted theoretical models for technology acceptance, provide a new, more in-depth and diversified, theoretical model on the relationship between social inequality, and access and use of digital health technologies.
3. Understanding these potential relationships between social inequalities and access to health technologies enables further research, for example structural equation modelling (SEM) and latent class analysis to test the hypothesised relationships, and qualitative research methods to gain a more in-depth understanding of these relationships.
4. Using the theoretical model in large population-based datasets, enables researchers to gain more in-depth knowledge on particular groups in society that are more at risk of being excluded from digital health technologies.
5. The societal impact that can be gained from broadening our knowledge on the relationship between social inequality and access and use of digital health technologies, lies in the development of more personalised approaches within the design of the technology itself, as well as tailored strategies to increase accessibility of digital health technologies for different groups in society.

Currently, too little is known about the nature of the relationship between all four types of capital and the intention to use technology for health and well-being. Given the prevalence of primarily the second and third level of digital divide in Western societies, it is useful to seek explanations for digital inequalities that go beyond just socio-economic structures, by taking a differentiated approach to capital, and consider the multiple forms that this may take. Moreover, considering the sociological perspectives into models such as the UTAUT, raises the question of how a more holistic understanding of the influence of social inequality on the intention to use digital technology enhances our knowledge of the origin of health inequalities.

In an era of digitalisation in healthcare and well-being, in which policymakers and health professionals increasingly rely on digital health technologies to decrease health inequalities in multifaceted, real-world contexts, such a differentiated understanding of these relationships is

needed. Explorations of the relationships between the disposition of capital on the predicting variables for intention to use digital health technology are needed. Specifically, we consider it necessary to examine the way in which the predictors in the UTAUT model are affected by variables that tap into economic, social, cultural, and person capital. Conceptualising and testing how different types of capital interact, and how they predict or moderate relationships within the UTAUT model, will serve as a first step towards developing a more tailored approach for the effective implementation of digital health technologies across different societal groups.

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Conflict of Interest

The authors declare no conflicts of interest.

Ethical Approval

This study did not involve human subjects. Therefore, no ethical approval was necessary.

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