In his earlier work, van Dijk (2005) suggested a hierarchical relationship between these different access levels. More recently, the links between motivation/attitude, physical access, digital skills and usage are considered part of circular logic, meaning positive attitudes towards technology can also impact skills and use (van Dijk, 2020).

Supported by extensive empirical evidence (albeit mainly in North America and Europe), van Dijk (2020) has theorised digital inequalities and come up with different personal and positional categories that influence the resources individuals have at their disposal, whereby these resources have an impact on the levels of access. *Personal* categories include gender, race/ethnicity, intelligence, personality and health. *Positional* categories operate on a personal and societal level, including the labour position, education, household, network and nation/region. These categories thus determine the available resources, including temporal, material, mental, social and cultural resources.

In his book *The Digital Divide*, van Dijk (2020) also argues that there are three levels of digital divide(s):

- The *first-level* divide mainly focuses on physical access to ICT infrastructure and gained much attention between 1995 and 2003.
- The *second-level* divide focuses on skills and usage and has become more prominent since 2004.
- The *third-level* divide pays more attention to outcomes of ICT usage and gained increased attention starting in 2012.

Ellen Helsper (2021), in her book *The Digital Disconnect*, follows a similar line of thinking. However, she is also interested in the causes and consequences of the relationship between digital and social inequalities.

While access to and diffusion of ICT has always been a focal point in innovation studies (e.g., Rogers, 1995), nowadays we assume that access has become less relevant. However, a thorough analysis of worldwide internet penetration (e.g., Internet World Stats) reveals that different levels of access to ICT infrastructure persist. In 2023, almost 94% of North America's population was online, while in Africa it was 43% (Internet World Stats 2021). Another important nuance is that the access type can vary in different parts of the world. In the non-Western world, the internet is mainly accessed through digital mobile devices, thereby (partly) skipping the desktop and laptop internet era that the Western world went through, and this also impacts the skills, use and outcomes inequalities.

Second-Level Divides: Skills and Use Inequalities

Eszter Hargittai (2002) was among the group of scholars criticising the exclusive attention to access to ICT, and she, together with Paul DiMaggio, popularised the term *second-level digital divide*. They pointed out that what is essential is not so

much *who* has access to the internet but *what* they can do with it. The second-level digital divide thus refers to the extent to which people can use ICT efficiently and effectively. This depends on skills, knowledge and support networks (Courtois and Verdegem, 2016). While some experts and policy-makers declared that the digital divide was overcome in the early twenty-first century, researchers and other policy-makers documented that more should be considered than physical access alone. New attention was given to what skills people need to use applications that can support the economy, society and culture. This resulted in projects investigating digital skills and differences in terms of ICT use.

Van Dijk and van Deursen were involved in research on operationalising and measuring digital skills. They notably contributed with their distinction between medium-related skills and content-related internet skills (van Deursen and van Dijk, 2011):

- *Medium-related skills* are people's operational skills to use the internet and its services (e.g., navigating the internet).
- *Content-related skills* include both information and strategic skills. The former refers to locating information (e.g., choosing search terms), whereas the latter is about taking advantage of the internet (e.g., making the right decision to reach a specific goal).

Van Deursen and van Dijk (2011, 2014) have operationalised and measured digital skills and their determinants in several projects. This type of research fed into a broader debate about literacy. Media and digital literacy is broader than skills and includes the ability to create content, critically evaluate content and understand the interests of content producers (Livingstone, 2004).

The scales for measuring internet skills were used in surveys investigating internet use and policy discussions about what literacy initiatives to undertake. Beyond this, these studies also observed different patterns of internet use. Different engagement with ICT was also considered an aspect of the second-level digital divide (Warschauer, 2003; van Dijk, 2020). More specifically, digital divide scholars became interested in how people use the internet and how this can be substantially different in terms of frequency and time spent online, as well as the type of internet use and for what purposes it is used. Another usage gap was identified. Inspired by the so-called *knowledge gap theory* (Tichenor et al., 1970), positing that highly educated people get more out of their media use, scholars observed a gap between people using primarily information, education and career-oriented online applications and others who were mainly using commercial and communication applications for entertainment (van Deursen and van Dijk, 2014; Zillien and Hargittai, 2009). Thus, attention shifted from who has access to what they do with it and what they (can) achieve with ICT. And yet another level of digital divide emerged, one focused on outcomes.

Third-Level Divides: Outcome Inequalities

This *third-level digital divide* goes beyond access, use, and skill levels. The focus here is on the difference in outcomes that users achieve by their internet use, even if access and use are relatively similar (van Deursen and Helsper, 2015). Outcomes can play out in different spheres, including economic, social, political, cultural and personal development. Research has shown, for example, that people with higher education, jobs and younger generations benefit much more from the internet than those with lower education jobs and older people (e.g., paying lower prices for products or better health information) (van Dijk, 2020). An important nuance here is how society values specific outcomes differently; productivity in the workforce is considered more important than personal well-being or creative expression (Helsper, 2021). Another question is whether the outcomes extend traditional inequality patterns or include new forms of social exclusion (Ragnedda, 2017).

In addition, a broader discussion exists around the relationship between access to ICT and participation in society. This deals with whether access and use of digital technology are necessary and sufficient conditions for full participation, online or offline. Carpentier (2011) investigates participation in political terms and asks how participation is linked to power and the ability to participate in decision-making. He considers participation as part of a process of co-decision. This co-decision is essential so that people can be involved in the production and use of technology and the content circulated via digital platforms. This brings us to discussions beyond digital inequalities and how technology, social exclusion and discrimination are linked.

The Role of Technology in Reproducing Social Inequalities

Helsper (2021) prefers discussing *socio-digital inequalities* instead of digital ones. She is interested in the causes and consequences of inequalities. She takes a holistic approach and brings (economic) systems and structures, capabilities and agency, socialisation and context, and nature and nurture into the analysis of inequalities. She links different types of socio-economic resources to digital resources, analyses what drivers and causes exist between them, and theorises how these relationships result in different outcomes and consequences:

- For *socio-economic* resources she looks at economic (class), social (social capital), cultural (socialisation) and personal (literacy) resources.
- Regarding *digital* resources, she analyses infrastructure and access, digital skills and learning, literacy and digital engagement.

Extensive empirical data supports these theoretical assumptions and relationships, which helps consider the bigger picture of socio-digital inequalities.

One of the contributions of Helsper (2021) is that she provides insights into how to think about opportunities versus outcomes. Inequalities in digital *opportunities* can be caused by access, literacy or engagement. These elements, however, are also impacted by personal dispositions and different types of resources. On the other hand, there is an interplay between inequalities in opportunities and inequalities in *outcomes*. The latter can manifest in economic, social, cultural and personal well-being outcomes. This analysis is vital for investigating the relationship between data, tech and inequalities.

Technochauvinism and Technosolutionism

Technochauvinism is a set of ideologies surrounding tech culture with the overarching belief that technology is always the solution, introduced by Meredith Broussard (2018) in her sharply titled book *Artificial Unintelligence: How Computers Misunderstand the World*. This concept is accompanied by a range of other values such as techno-libertarian beliefs, neoliberal meritocracy, the conviction that computers and tech are always *objective* and *unbiased*, the belief in free speech without the recognition of the problem of online harassment, but also 'an unwavering faith that if the world just used more computers, and used them properly, social problems would disappear and we'd create a digitally enabled utopia' (Broussard, 2018: 8). One of the risks of technochauvinism is that it entails a particular world-view leading into a reinforcement of socio-economic inequalities, but also raises questions whether technology is the driver behind creating a better world.

Broussard's critique of technochauvinism is highly relevant, particularly in a world where technology companies are among the most valuable companies, and these companies' political power is larger than that of some countries. Broussard is not the first to be critical of technological ideologies. Evgeny Morozov (2013) also provides a critical account of *technological solutionism* in his book *To Save Everything, Click Here*. In this work, Morozov analyses some of the values and world-views prominent in and around Silicon Valley. Technological solutionism is a more extreme version of *technological determinism*. The latter is a term associated with (among others) Thorstein Veblen, a well-known critic of capitalism, and refers to the belief that technologies are the driving force in a society and determine the development of its social structures and cultural values (Wyatt, 2008).

By critiquing *technosolutionism*, Morozov (2013) is warning us of the dark side to the utopianism surrounding big data/tech. He talks about the widespread use of technology for surveillance and a potential *dictatorship of data*, where algorithms used for data mining and automated recommendations are inscrutable and unaccountable *black boxes*. In response, there should be more efforts for *algorithmic auditing*, an approach to detect potential bias in data systems (Mittelstadt, 2016).