

Master thesis

Life satisfaction in the digital age

the understanding role of digital competence and social capital on contentment in life.

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Abstract

Digitalisation has a major impact on today's society in everyday life. Technological developments bring many opportunities but are also accompanied by disadvantages. Previous studies find diverging results of digitalisation on life satisfaction, often referring to *digital divide* between those who are digitally competent and those who are not, that arises as a result of digitalisation. This study answers the question whether being digitally competent affects life satisfaction and whether this effect is mediated by social capital. Based on several theories, including the modernity theory, digital divide theory, digital capital theory, constant presence theory, time displacement theory and hierarchy of needs theory, hypotheses were derived. After conducting multiple regression analyses with European Social Survey data, the results showed a significant positive effect of digital competence on life satisfaction. This positive effect is partly mediated by social capital. The effects remained significant after adding control variables (income, health, age, etc.). In addition, the descriptive results show that the difference in digital competence levels between European countries is large, with frontrunner countries also having room for improvement. This study demonstrates the urgency of improving digital competence levels in Europe, in order to increase the life satisfaction of European citizens. A more unified vision and standardised training program from the European Commission regarding increasing digital competence is therefore advised.

Keywords: Digitalisation, digital competence, digital divide, social capital, life satisfaction.

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Ethical statement

This research has been approved by the Ethical Committee of Utrecht University (reference number 23-1619).

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1. Introduction

The printing press, steam engine, automobile, and cable television are all technological advancements that commentators predicted would revolutionise society and dramatically alter the course of civilization. The fast development of the Internet was received with the similar adulation (Howland, 1998). The Internet is often associated with universal access for information and educational opportunities, but also creates new complexities (Van Deursen & Van Dijk, 2019). In an increasingly complex society, there are many factors that can affect one's life satisfaction, such as social support, health, and financial stability (Helliwell et al., 2019). What role do these rapid developments have on life satisfaction in the current digitally driven society?

As of 2022, the diffusion of the Internet has reached as high as 95% in several Western countries meaning that almost everyone in those countries uses the internet on a daily basis (Eurostat, 2022). From a sociological perspective, digitalisation refers to the integration of digital technologies into various aspects of life, including communication, work, and education. It involves the development of new digital technologies and the use of digital technologies such as the Internet to create, store, manipulate, and transmit information in various forms, for example images, video, and sound (Ragnedda & Muschert, 2013).

Every aspect of our lives is being digitised: the technology is deeply embedded in us (for instance, through brain implants), between us (through social media), constantly learning to behave more like us (robots and software exhibit intelligent behaviour and can mimic emotions) and knowing more and more about us due to big data (Est, 2014; Royakkers et al., 2018). The process of digitalisation has both advantages and disadvantages. New digital technologies may contribute to a comfortable and satisfied life. New information and telecommunication technologies (ICT) and other internet-related items deliver benefits ranging from better healthcare to less energy consumption and a safer living environment (Van Deursen et al., 2019; Van Deursen & Van Dijk, 2014). In addition, according to Dimaggio et al. (2011), the expansion of the internet and digital technologies provides citizens to have more direct access to governmental resources, and creates more access to relevant information, education, good jobs, and better health.

Another important aspect of digitalisation is the 'new age of connectedness' (Watts, 2003). The new digital society has an impact on the social life of people. Research from

Backstrom et al. (2012) found that social distances in current society have fallen from 4 degrees of separation to 3.5 degrees due to the rise of social network sites like Facebook and Instagram. This brings us closer together and accelerates diversity; different people, from varying origins, places and backgrounds are getting involved in dynamic networks (Edunov et al., 2016). These dynamic networks create possibilities because it generates large amounts of information. This is in turn seen as an important resource within the concept of social capital (Bourdieu, 1986), which is at its core, the value of social networks to individuals and society (Portes, 1998, Putnam, 2000).

To have access to the benefits mentioned above, an important prerequisite must be met, which is digital competency. In 2022, 54% of people in Europe aged 16 to 74 had at least basic overall digital skills (DESI, 2022; Eurostat, 2022), meaning that within five areas of digital competence (information, data, content creation, safety skills, and problem-solving skills), the respondent scored sufficient in at least one area.

Societies have been divided throughout history into several social classes or strata that differentiate people's rights and advantages based on a range of elements including ethnicity, race, gender, age, and handicap (Zdjelar, 2021). Research shows that a great degree of (economic) inequality implies that some members of society lag behind others in terms of their wealth. This will result into implications for outcomes such as health, well-being, and life satisfaction (De Graaf & Wiertz, 2019). In the current digitally driven society, research has shown that these classic inequality distinctions increase as a result of digitalisation (Roberts, 2023; Van Deursen & Van Dijk, 2010). The growing intricacy of internet-related items implies that disparities in access have the potential to worsen the already existing social inequality (Est, 2014; Van Deursen et al., 2021). Individuals with less digital skills will therefore be further disadvantaged and experience negative consequences within the digitally driven society. In addition to physical societal separation, negative impacts may also be felt by citizens. Qualitative research by Foley et al. (2022) found that unequal distribution of internet skills in society leads to digital segregation in which a privileged set of elites enjoy improved social and recreational opportunities while those who were less fortunate felt left out, victimized, and preyed upon.

Arguments regarding ICT and its effects on inclusion and life satisfaction are reflected in the “digital divide” discourse with the premise that not being digital competent has negative consequences on someone’s contentment in life (Van Deursen & Van Dijk, 2019; Van Deursen

et al., 2019). According to the research of Movisie (2019), people with insufficient digital skills experience trouble in different areas in society, for example, they have trouble applying for government benefits, filing tax returns, signing up for an online patient portal, and applying for a job (Movisie, 2019). Therefore, it can hinder people from improving their social standing (Movisie, 2019; Roberts, 2023; Van Deursen & Van Dijk, 2014). In sum, the digital divide has significant negative impact on individuals and communities, exacerbating existing inequalities and limiting opportunities for social and economic mobility for those who are less digitally competent (Van Deursen & Van Dijk, 2019).

From a societal perspective, it is relevant to study the effect of digital competence on life satisfaction. Current challenges in Europe, like an ageing population and rising immigration creates a bigger group of people who are insufficiently digitally skilled (Archick, 2016). Research shows that older people and people with language barriers have a higher chance on being insufficient digitally skilled (Fuglsang, 2005; Movisie, 2019). With the current challenges of Europe in mind it is of importance to keep testing the life satisfaction of European citizens and how digital competence is of influence. In addition, the COVID-19 pandemic has increased the need for digital skills (Garcia et al, 2021). A consequence of the pandemic is that working from home has become more common. Working from home requires higher digital skills, as barrier is higher to ask a colleague how a certain technological operation works; employees rely more on themselves while working (CPB, 2021; Lissitsa & Chachashvili-Bolotin, 2016; Garcia et al., 2021). The average number of hours worked from home increased from 3.8 hours per week before the corona crisis to 8.0 hours per week after the corona crisis (CPB, 2021). This doubling effect emphasises the need for digital skills.

Moreover, research on the topic of digitalisation and social life is attracting attention from both academia and the industry because the literature is underdeveloped. Most research on the topic of digitalisation and digital competence is often focused on the technical opportunities and possibilities of the Internet (Van Deursen & Van Dijk, 2019). While important characteristics and sometimes even requirements such as skills, motivations and social life effects are neglected (Van Deursen et al., 2021). In addition, it is important that the effects of digitalisation are constantly examined due to its fast-changing nature. Over the years, the Internet has become more and more complex (Van Deursen en Van Dijk, 2019). Given the increasingly prominent role of the internet in people's daily lives, an understanding of its influence on individual life satisfaction is crucial. Therefore, this research will focus on the

effect of digital competence on life satisfaction and will look if this effect is mediated by social capital. Three research questions are derived:

1. *What are characteristics of people who are digitally competent?*
2. *To what extent is there an effect of digital competence on life satisfaction? And does social capital mediate this relationship?*
3. *How can current policy regarding digital competences formulated by the European Commission be improved?*

2. Theoretical framework

This theoretical framework explores the effect of digital competence on life satisfaction and explains mechanisms of the possible mediated factor of social capital. First, the modernity theory is linked to the (possible) effect of digital competence on life satisfaction mediated by social capital. Then, a deeper look is taken at the mechanisms separately, starting with the effect of digital competence on life satisfaction and then looking at the mediation effect by explaining mechanisms between digital competence on social capital and social capital on life satisfaction.

2.1 Modernity through a historical lens

Rapid technological development and digitalisation in today's society creates new social order in which people who are digitally skilled have an advantage over those who are not (Roberts, 2023; Van Deursen en Van Dijk, 2019). This new social order may create differences to which extent citizens experience contentment in life (Royackers et al., 2018). The modernity theory by Emile Durkheim (1893) gives an insight into this possible mediated effect through a historical lens.

One could argue that the start of digitalisation in the early 20th century has led to a digital world, just as the industrial revolution led to an industrial society 200 years earlier. Emile Durkheim lived during the industrial revolution a period of significant social, economic, and political change (Lukes, 1973). The modernity theory of Emile Durkheim (1893) argues that in a traditional society individuals have strong bonds based on shared beliefs, values, and norms due to the fact that everyone had the same religion and ethnicity, which is called 'collective consciousness' (Durkheim, 1893). In a modern society, people are less dependent on their core physical networks to gather information and receive support. People identify themselves more often with online groups instead of a group that is physically close to them due to the fact the Internet does not have physical boundaries (Ackland, 2016). This leads to a reduction of collective consciousness in the physical world (Ackland, 2016; Royackers et al., 2018).

New channels of communication have been associated with rising individualism due to the weakening of the 'collective consciousness'. Some studies found that this has negative consequences for social relationships (Chen, 2013; Rayan et al., 2017; Turkle, 2011; Vriens & van Ingen, 2018). For example, Rayan et al. (2017) found that a high rate of internet use was associated with poor psychological health among students. In addition, Turkle (2011) found that

if social interactions are primarily virtual, people may lose their social skills, including the ability to handle rejection and resolve conflicts. Turkle's investigation into the impact of the Internet shows that physical intimacy may be avoided and relationships through social media are less binding, therefore the current generation could be less empathic than its ancestors were (Turkle, 2011).

Weakening social bonds leads, according to Durkheim (1893), to anomie. Anomie is a state of normlessness in which deviant behavior occurs. Anomie can lead to feelings of disorientation and disconnection from society, which in turn lead to feelings of loneliness, lack of purpose and depression. This process of not feeling connected to society as a consequence of modernisation is confirmed in the recent study by Royakkers et al. (2018) that focuses on ethical and social issues resulting from digitalisation. Alienation and desocialisation are cited as a major consequence of digitalisation (Royakkers et al., 2018). Feelings of alienation and disconnection with peers, in turn, contribute to lower reported life satisfaction rates (Cacioppo & Cacioppo, 2018; Helliwell, Layard, & Sachs, 2019).

The modernity theory would predict a negative relationship between digital competency and life satisfaction, because of the decreasing 'conscience collective' (Durkheim, 1893). Although the modernity of Durkheim is rather old, it remains highly relevant and is still widely discussed in academic circles to this day to explain the trend of individualism (Malik and Malik, 2022). However, current literature on the relationship shows different diverging results.

2.2 Digital competence on life satisfaction

2.2.1 The digital divide

Internet implementation in contemporary society has a side effect: it has created a digital divide between those who have access to ICT technologies and know how to utilize them, and those who do not (Compaine, 2001). The main message of the digital divide is the discourse about disparities in society, created as a consequence of digitalisation (Van Dijk, 2017). Classical inequalities in society produce an unequal distribution of resources and this creates unequal access to digital equipment (Van Dijk, 2017). This, in turn, affects digital competence in an unequal manner, ultimately creating further disparities in participation within society (Van Dijk, 2017). Those who are already disadvantaged in these classic inequality areas may be further marginalized if they lack internet access or digital competence, as they do not have the

same opportunities to access information, resources, and communication channels as those who have greater digital competence (Van Deursen et al., 2021).

Recent studies have shown that internet adoption and usage in someone's life do have a positive effect on the life satisfaction of someone who is digitally competent (Lissitsa & Chachashvili-Bolotin, 2016). The 'haves' (people with sufficient digital skills), compared to the 'have nots' (people without digital skills) enjoy more access to a variety of resources online. The 'haves' can incorporate the Internet into their daily lives, by using it for recreational web surfing, socializing online, academic uses, establishing relationships, obtaining information, and entertainment purposes (Rayan et al., 2017). In addition, the Internet creates closer connections between its users offering a way to mobilize resources (Ackland, 2016). The Internet therefore provides users with new opportunities and resources for promoting their careers, work, education, and social status (DiMaggio et al., 2004; Hargittai & Hinnant, 2008; Zillien & Hargittai, 2009; Van Dijk, 2005) and enhancing income and social mobility, which correlate positively with individual well-being (Lissitsa & Chachashvili-Bolotin, 2016). The 'haves' have more opportunities to participate in society and increase their social status (Van Deursen & Van Dijk, 2019). Opportunities such as better chances for a good job and education provide a higher social status, more power and life satisfaction (Van Dijk, 2017). These are factors in which there is consensus in the literature that this leads to higher life satisfaction (Boyce et al., 2010). The arguments above make it more likely that the life satisfaction and well-being of a 'have' is higher than that of the 'have not'.

In addition, Internet access is now seen as a social norm in developed countries, which is a reason within the digital divide discourse to assume a positive relationship between Internet use and happiness. Even if the 'have nots' experience no desire to adopt the Internet, they may feel socially isolated or abandoned due to the intimate penetration of ICT technologies in the day-to-day life and therefore experience lower life satisfaction (Foley et al., 2022; Khvorostianov et al., 2012).

2.2.2 Digital capital theory

According to Ragnedda (2018) a new type of capital arises as a consequence of digitalisation: digital capital. Digital capital helps to gain resources from the digital realm and transform them into resources to exploit the full advantages offered by the Internet. Digital capital is a concept that explains how the accumulation and utilisation of digital resources such

as knowledge, skills, and networks contribute to a person's satisfaction and well-being in life (Heejeong et al., 2020). The digital capital theory proposes that individuals with higher levels of digital capital are better equipped to take advantage of the opportunities stated earlier, that arise in the digital world. This makes them better prepared for the offline world (Aday et al., 2010). For instance, when using online areas like news, online forums, and online counselling correctly, the internet can help to foster psychological empowerment, lifelong learning, and self-sufficiency in the physical world (Fowler et al., 2015), which in turn, creates a higher quality of life (Lissitsa & Chachashvili-Bolotin, 2016).

This mechanism can be explained by the study of Aday et al. (2010). Aday et al. state that the use of new media forms promotes individual transformation. Citizens can bypass both governmental and mainstream media in their traditional roles as gatekeepers. People with digital capital can find recent information, which they can then turn into efficient and effective actions in the physical world. For instance, information about political parties and social trends, as well as access to scientific studies. In addition, research has shown that owning a lot of information leads to more power and higher social economic status (Van Dijk, 2007), which is also correlated with higher life satisfaction (Ragnedda & Ruiu, 2020). Therefore, Internet users with higher digital skills can develop new competencies and own more information which allow them to be more prepared within the offline world.

Based on the mechanisms and theories stated above, the first hypothesis is derived.

Hypothesis 1: Digital competence has a positive direct effect on life satisfaction.

2.3 Digital competence on social capital

The new digital society has an impact on the offline and online social life of people. The internet facilitates the formation and maintenance of social relationships or online interactions with people that have never met in person (Penard & Poussing, 2010; Shklovski, Kiesler, & Kraut, 2006; Vriens & Van Ingen, 2018). As discussed earlier, Durkheim's (1893) modernity theory would predict that internet penetration leads to loss of social capital. Some studies confirm that digitalisation leads to individualism and the loss of social capital. However, other studies suggest a positive effect of digital competence on social capital.

2.3.1 Social presence theory

Digital competence can facilitate communication and social connections allowing individuals to connect with others, build and maintain relationships, and participate in online communities (Pernard & Poussing, 2010). One of the biggest benefits of participating in digital communication is its independence of time and place (Masur, 2021). Social network sites allow you to communicate with people in instantaneously, asynchronously, or synchronously even if they are not physically present (Masur, 2021).

Studies have found that social media users who are more digitally competent tend to have more offline friends and online followers, participate in more online groups, and engage in more online discussions than less digitally competent users (Hampton, Livio, & Goulet, 2010; Van Deursen & van Dijk, 2010). Digital communication can enable individuals to connect with like-minded people, find support networks, and engage in social activism, which can contribute to the formation of social capital (Ellison et al., 2014). This in turn creates bigger and more dynamic social networks. Having digital skills can also empower individuals to engage in civic activities, such as online voting, participating in online forums, and engaging in social and political discussions (Littlejohn et al., 2012). This can facilitate civic engagement, encourage participation in community initiatives, and promote collective action, all of which can contribute to the formation of social capital (Boulianne, 2016).

Another opportunity that arises from having digital competence is the ability to look for a love partner online through online dating websites and apps (Ackland, 2016). In 2006, 37% of all Internet users in the United States who were single and looking for a partner used an online dating site (Madden and Lenhart, 2006). Having more digital competence, creates opportunities to find a love partner, and therefore increase social capital, whereas those who have no digital competence miss out on this opportunity.

2.3.2 Time displacement theory

Other theories suggest a negative effect of digital competence on social capital. Research has shown that higher levels of digital competence are associated with increased reliance on technology (Frangos et al., 2011). For instance, individuals who possess higher digital competence are more likely to use digital tools for communication, information seeking, and online transactions, and to integrate digital technologies into their daily life (Hargittai, 2010; Van Deursen & Van Dijk, 2019). Increased reliance on digital technologies for

communication and social interaction can lead to social isolation since internet activities are largely performed in solitude and displace potentially face-to-face interactions with others. This possible negative effect can be explained by the time displacement theory. This theory argues that high rates of Internet use and digital competence would increase social isolation as it presumably displaced time otherwise spent with family and friends (Vriens & Van Ingen, 2018). This can result in decreased social capital, as the quality and depth of social interactions may be compromised in digital spaces compared to in-person interactions (Lissitsa & Chachashvili-Bolotin, 2016; Sagioglou & Greitemeyer, 2014).

2.3.3 Compulsive internet use

Higher digital competence leads to more Internet use (Frangos et al., 2011). According to researchers, excessive and improper Internet use can lead to psychological problems such as Internet addiction (Adalier & Balkan, 2012; Frangos et al., 2011). Since, for example, the rise of gambling and pornography on the internet it has allowed new forms of online addiction to take shape. According to Koc (2011), students who use the Internet for six hours a day are more likely to have psychiatric symptoms, for example somatization, interpersonal sensitivity, anxiety, depression, and paranoid ideation (Benjanin et al., 2015). Similarly, Christakis et al. (2011) found that heavy Internet users are more likely to be depressed than light Internet users. These depressive feelings may lead to a loss of social capital and has a negative effect on study performance since people with depressive feelings tend to isolate and withdrawal themselves (Chen en Peng, 2008; Teo, 2012). Chen and Peng (2008) reported that students who are non-heavy Internet users have better academic grades and better relationships with peers. In sum, higher digital competence increases internet use, which in turn increases the risk of compulsive internet use, which is correlated to depression and social withdrawal. This results into a decrease in social capital.

2.4 Social capital on life satisfaction

Social capital is known to be one of the main factors influencing life satisfaction (Elgar et al., 2011; Oh et al., 2014). Increased social support, companionship, and a sense of belonging are all known to be important factors in life satisfaction (Diener et al., 2018). Within the literature, there is general consensus on the effect of social capital on life satisfaction (Amati et al., 2018). For example, the multi-level analysis of Elgar et al. (2011) showed that within fifty

countries, there is a positive effect of social capital on life satisfaction. This positive role of social relationships on life satisfaction may be explained by the benefits they bring.

2.4.1 Hierarchy of needs

Maslow's hierarchy of needs is a psychological motivational theory that consists of a model with five levels of human desires, which are commonly shown as hierarchical levels within a pyramid (Zimbardo et al, 2013). The more needs from the pyramid are fulfilled, the more satisfied someone is satisfied with life. For this research, level three holds the most value, as it contains the need for love and belonging (Maslow, 1943). Relationships have an important role in reinforcing an individual's sense of self and satisfying the basic human urge for belongingness (Deci and Ryan, 2002). Life satisfaction rises in proportion to the number of persons with whom an individual can confide and discuss concerns or critical issues (Amati et al., 2018). A greater overall volume of communication, as well as the ability to constantly stay in touch with others, allows for a continuous state of connected presence and belonging (Licoppe, 2004). Consequently, these social activities can generate greater well-being by improving and expanding social capital (Elgar et al., 2011; Oh et al., 2014).

2.4.2 Promoting healthy behaviour

The presence of social ties has a favourable impact on mental and physical health, contributing to a person's overall life satisfaction, whereas the absence of social relationships increases a person's vulnerability to psychological discomfort. Several studies have found that social relationships both stimulate and reinforce healthy behaviours (Myers & Diener 1995; Putnam, 2000). Social interactions have the potential to protect vulnerable individuals, by encouraging them to develop coping strategies for dealing with difficulties and promote positive personal and social development (Myers & Diener, 1995).

In sum, some studies suggest a negative effect of digital competence on social capital due to the fact that the internet may replace the time that could be spent online with friends and family offline. In addition, high internet use (as a result of having digital competence) may contribute to compulsory internet use and decreases life satisfaction. However, other studies suggest that digital competence and the internet facilitate new ways of communication in which social connections could be created and maintained. This leads to more social interactions which is an important predictor for life satisfaction (Elgar et al., 2014).

Based on the diverging mechanisms and theories stated above about digital competence on social capital, a neutral hypothesis derives.

Hypothesis 2: The effect of digital competence on life satisfaction is partially mediated by life satisfaction.

3. Method

To test whether digital competence have an effect on life satisfaction and whether this effect is mediated by social capital, data from the European Social Survey (hereafter ESS) 2020 round 10 is used. Within this study, the ESS is used for two reasons. First, the data is relatively new, which is important in the digital age, because technology changes very rapidly (Van Deursen et al., 2019). Second, compared to its North American counterpart, the General Social Survey, the ESS has not received as much attention from social capital researchers.

The ESS is a high-quality cross-national study that uses strict random probability sampling and an extensive concept-based design process to ensure measure equivalence, providing an opportunity to test in multiple European countries at the same time. The ESS data were collected through face-to-face interviews, which took place in respondents' homes. Respondents who had not participated in previous rounds of the ESS and were older than 15 years were selected by random probability sampling to form cross-sectional samples representative of the nations of residence. The data is collected between August 2020 and December 2021, and the duration of data collection within each country varied between two and eight months. Before exclusion criteria were posed to the data set, the survey consists of 33.087 (N = 33087) respondents from 32 European countries (European Social Survey, n.d.).

3.1 Ethical considerations

In the ESS data, the respondent's information cannot be traced back to the specific individual. Respondents under 16 years old need parental consent to participate in the survey. Participation to the survey was voluntary and the participant could stop the at any moment in time without consequences. Before analysing the data in this study, permission was obtained from Utrecht University's ethics committee, the consent form can be found in the *appendix E*.

3.2 Operationalization of main variables

3.2.1 Life satisfaction (dependent variable)

In this paper, the question "How satisfied with life as a whole?" was used to measure life satisfaction. Respondents responded to this variable on a scale ranging from 1 "Extremely dissatisfied" to 10 "extremely satisfied". Respondents who did not answer this question, refused to answer, or answered that they "do not know" were set to be missing values and were excluded from this study.

3.2.2 Digital competence (independent variable)

The variable digital competence is a created variable consisting of three merged items. The following items are combined into the variable digital competence: “How familiar are you with each of the following computer and Internet-related items: preference settings (question 1), advanced search (question 2) and Pdf (question 3). The three questions did have the same answer categories, consisting of a five-point scale ranging from 1 “Not at all familiar” to 5 “Completely familiar”. First, a factor analysis was conducted to test whether the items measure the same construct. Table 1 (*see appendix A*) shows the correlation between the three items. The correlation coefficients show a high correlation between the items, this strengthens the internal validity of this research (Field, 2014). Table 2 (*see appendix A*) represents the factor loadings and eigenvalues from the factor analysis, which shows high factor loadings meaning that the three items measure the same construct. In addition, a reliability test was done to test internal consistency within the items. The Cronbach’s Alpha is .945 ($\alpha = .945$), meaning that there is an excellent reliability within the three items (Field, 2014). It is recognised that only a small part of digital competence and mostly basic digital skills are measured as a result of data restrictions. Respondents who did not respond to one or more of the three items, refused to answer, or answered that they “do not know” were set to be missing values and were excluded from this study.

3.2.3 Social capital (mediator)

Within this study, social capital is measured by three dimensions inspired by the study of Sappleton et al. (2009) who also measured social capital using the European Social Survey as data. Three dimensions of social capital within this study contain; social networks, social participation, and trust. It is recognised that there are many other dimensions of social capital, however the ESS does not capture all of these. A factor analysis was conducted to see if the three items could be combined into one variable social capital. However, the factor analysis showed low correlations (*see table 3, appendix A*) between the different items. In addition, low factor loadings (*see table 4, appendix A*) and a low Cronbach’s Alpha ($\alpha = .370$) confirmed that the three items measure different areas of social interaction. To keep a high reliability and internal validity within the study, the different dimensions will be added to the analysis separately as three different mediators.

Social networks captures whether or not individuals have friends, family and other individuals close to them. This is measured by a single item: “How many people, if any, are there with whom you can discuss intimate and personal matters?” This item has 7 categories (0= none; 1= one person; 6 = ten or more).

Social participation is measured as the individual’s integration into the wider community, excluding associations with close friends and family. The item “Compared to other people of your age, how often would you say you take part in social activities and voluntary work” was used to measure social participation. This item ranges from 1 “Much less than most” to 5 “Much more than most”.

Social trust is measured by the single item: “generally speaking, would you say that most people can be trusted, or that you can’t be too careful in dealing with people?” This is a 10-point scale ranging from 1= “you can’t be too careful”, to 10. = “most people can be trusted”.

Respondents who did not answer to any of these questions, refused to answer, or answered that they “do not know” were set to be missing values and were excluded from this study.

3.3 Operationalization of control variables

To minimize confounding and to strengthen the internal validity, control variables will be added to the analysis. The control variables in this paper will be age, gender, income, religiosity, and general subjective health.

3.3.1 Age

Multiple studies show that there is an established association between age and exclusion from online services (Heponiemi et al., 2022). Research by Movisie (2019) shows that older people have a much higher risk to be digital incompetent. Therefore, age will be added as a control variable within this study. The variable age is having a ratio measurement level, within the analysis the variable ‘Age of respondent, calculated by year of birth’ is added to control for age.

3.3.2 Gender

Research has found that men overall score higher on ICT knowledge and competence than women. However, women score higher in having a positive attitude to learn the ICT skills (Casillas et al., 2017). Therefore, gender will be added to the analysis. The variable added to the analysis is converted into a dummy variable, in which the reference category is male (0 = male).

3.3.3 Income

According to multiple studies there is a correlation between income and life satisfaction; money can buy happiness because it can be exchanged for goods that will increase an individual's utility and therefore will increase someone's life satisfaction. Therefore, income will be added to this analysis (Boyce et al., 2010; Frijters et al., 2004). Income is controlled for by using the variable 'household's total net income'. Within this variable, 10 categories are used to place a household total net income into equally large subsections in which the data is ranked from largest to smallest values.

3.3.4 Religiosity

Religiosity has often been examined in relation to life satisfaction and subjective well-being. The meta-analysis of Sholihin et al. (2022), showed that there is a general positive linear effect of being religious on someone's life satisfaction. Within this analysis, religiosity is measured by one item: 'Belonging to particular religion or denomination at this moment'. This variable is dichotomy and converted into a dummy variable (0= no, 1 = yes).

3.3.5 General subjective health

The last control variable added to this analysis will be general subjective health which is measured by the item: 'How is your health in general? Would you say it is...'. This item is measured on a five-point scale (1 = very good, 5 = very bad). To remain consistent in values, the item has been recoded to 1= very bad and 5 = very good. In this way, better general subjective health, means a higher life satisfaction.

3.4 Descriptive statistics

After removing missing values and recoding some of the variables, a total of 24.912 (N=24912) respondents are left that can be included in the regression analysis. Table 5 represents the descriptive statistics of each variable used in this research. On average,

respondents gave their life satisfaction a score of 7.04 ($M = 7.04$). However, the standard deviation is quite high 2.13 ($S.D. = 2.13$). The digital competence level is on average 3.00, meaning that on average respondents are ‘somewhat familiar’ with internet related items. In addition, the mean of the variable social networks is 2.45 ($M = 2.45$), meaning that on average, people have 2 to 3 people that they can discuss intimate matters with. Within the sample size, the average age is 50.62 years old ($M = 50.62$), which is relatively old. No peculiarities were found in the descriptive statistics.

3.5 Assumptions and Analysis

To ensure the quality and reliability of the multiple regression analysis, a number of assumptions were tested in advance. None of the assumptions were violated and the multiple regression analysis is therefore conducted. To analyse the data, four bivariate linear regressions will be performed and eight multiple linear regressions using IBM SPSS software version 27.

Table 5. Descriptive statistics

	N	Min	Max	Mean	S.D.
Digital competence	24912	1	5	3.00	1.36
Life satisfaction	24912	0	10	7.04	2.13
Social trust	24912	0	10	4.92	2.56
Social participation	24912	1	5	2.69	.90
Social networks	24912	0	6	2.45	1.40
Age	24912	15	90	50.62	18.35
Gender	24912	0	1	.54	.49
Income	24912	1	10	5.36	2.67
General subjective health	24912	1	5	2.16	.91
Religiosity	24912	0	1	.37	.48

Note. Data from European Social Survey (ESS) round 10.

4. Results

4.1 Descriptive results

Cross-tables were made specifying the means of digital competence for the attributes: country, gender, age, religion, and income. First, the mean digital skill level per country was looked at, these averages can be found in table 6 (*See appendix B*). The table shows that there are differences in means within European countries, with the Netherlands and Finland scoring highest on average (both 3.648) and Northern Macedonia lowest (2.334).

Table 7 shows that in Europe, on average, males are .223 more digitally competent than females (*see table 7, appendix B*). In addition, table 8 (*appendix B*) represents descriptive statistics to compare means for digital competence and age. The table shows a clear pattern in which the average level of digital competence decreases as the age groups increase. In addition, looking at table 9 (*appendix B*) that gives an insight in in level of income and average digital competence level, the table shows that respondents with higher income report on average a higher level of digital competence compared to respondents with a lower income level. Last, respondents who are religious report on average a lower digital competence level than respondents who are not religious (*see table 10, appendix B*).

In sum, according to the descriptive results, digitally competent people are often young, male, not religious and have a high income. In addition, the digitally competency level is the highest in the Netherlands and Finland.

4.2 Analytical results

The proposed relationships are tested within regression models, for which we report the results in this section. Within the analysis, standardized regression coefficients (Beta) were used in order to compare effect sizes. Within this research, the analyses will be reported by using the Field (2018) guidelines.

The first two models are represented in table 11. Model 1 tests the main effect of digital competence on life satisfaction and appears to be significant ($R^2 = .045$, $F(1) = 2.122$, $p < .01$). There is a positive effect between digital competence and life satisfaction, and this effect is significant (Beta = .218, $p < .001$). Model 2 ($R^2 = .142$, $F(1) = 2.011$, $p < .001$) tests the same effect, including the control variables gender, age, income, general subjective health, and

religiosity. When controlling for these variables, the main effect of digital competence on life satisfaction remains significant (Beta = .107, $p < .001$), however the effect does decrease when control variables are added. The explained variance rises quite some percentage from 4.5% to 14.2% when adding control variables. As expected, all control variables have a positive effect on life satisfaction. Looking at the standardized regression coefficients, general subjective health (Beta = .287, $p < .001$) is the strongest predictor for life satisfaction. In addition, the standardized direct effect of digital competence on life satisfaction gets smaller, when adding control variables. In sum, a positive significant effect of digital competence on life satisfaction is found, also when controlling for other factors. Therefore, support is found for hypothesis 1: *Digital competence has a significant positive direct effect on life satisfaction.*

Table 11. Regression analyses for variables predicting life satisfaction (N=24912).

	Model 1		Model 2	
	B (Beta)	SE	B (Beta)	SE
Constant	6.049***	.380	6.849**	.147
Digital competence	.331*** (.218)	.012	.138*** (.107)	.015
Gender			.087** (.020)	.033
Age			.123*** (.147)	.001
Total income			.096*** (.167)	.004
General subjective health			.682*** (.287)	.022
Religion			.138*** (.037)	.011
R ²	.045		.142	
F	2.122**		2.011***	

Note. Significance levels: * $p < .05$; ** $p < .01$; *** $p < .001$.

Reference category gender (male = 0, female = 1).

Reference category religion (no = 0, yes = 1).

Data from European Social Survey (ESS) round 10.

Due to a significant direct effect of digital competence on life satisfaction in model 1 and 2, there is the possibility for a mediation relationship. In order to see if the three mediators actually mediate the relationship in between, four conditions must be met (Field, 2018). Models 1 and 2 show that the digital competence has a significant effect on life satisfaction. Therefore, the first condition is met. The second condition for mediation is that the predictor digital competence must significantly predict the three possible mediator social trust, social participation, and social networks. Tables 12, 13 and 14 show the effect of digital competence on one of the three mediators. Model 3 ($R^2 = .038$, $F(1) = 1020.046$, $p < .001$) in table 12 shows the effect of digital competence on social trust. This effect appears to be significant ($Beta = .011$, $p < .001$), also when controlling for gender, age, total income, general subjective health, and religion the effect in model 4 ($R^2 = .085$, $F(1) = 394.816$, $p < .001$) remains significant ($Beta = .014$, $p < .001$). Therefore, the second condition of mediation is met for the possible mediator social trust.

Table 12. Regression analyses for variables predicting social trust (N=24912).

	Model 3		Model 4	
	B (Beta)	SE	B (Beta)	SE
Constant	3.944***	.380	.230	.126
Digital competence	.364*** (.011)	.011	.299*** (.014)	.014
Gender			.083** (.016)	.031
Age			.022*** (.152)	.001
Total income			.100*** (.104)	.006
General subjective health			.335*** (.199)	.020
Religion			.727*** (.138)	.032
R^2	.038		.085	

F 1020.046*** 394.816***

Note. Significance levels: * $p < .05$; ** $p < .01$; *** $p < .001$.
 Reference category gender (male = 1, female = 2).
 Reference category religion (no = 0, yes = 1).
 Data from European Social Survey (ESS) round 10.

Looking at table 13, which represents the effect of digital competence on social participation, models 5 ($R^2 = .035$, $F(1) = 743.512$, $p < .001$) and 6 ($R^2 = .087$, $F(1) = 252.709$, $p < .001$) show a significant effect of digital competence on social participation, also when control variables are added ($Beta = .110$, $p < .001$). Therefore, the second condition of mediation is also met for the possible mediator social participation.

Table 13. Regression analyses for variables predicting social participation (N=24912).

	Model 5		Model 6	
	B (Beta)	SE	B (Beta)	SE
Constant	2.314***	.014	1.631***	.050
Digital competence	.124*** (.004)	.004	.073*** (.110)	.005
Gender			-.052*** (-.029)	.011
Age			.002*** (.046)	.001
Total income			.022*** (.063)	.002
General subjective health			.193*** (.192)	.007
Religion			.727*** (.138)	.032
R^2	.035		.087	
F	743.512***		252.709***	

Note. Significance levels: * $p < .05$; ** $p < .01$; *** $p < .001$.
 Reference category gender (male = 1, female = 2).
 Reference category religion (no = 0, yes = 1).
 Data from European Social Survey (ESS) round 10.

Lastly, Table 14 shows in model 7 ($R^2 = .060$, $F(1) = 1612.541$, $p < .001$) and 8 ($R^2 = .092$, $F(1) = 431.48$, $p < .001$) that digital competence has a significant effect on social networks. Both the effect without and with control variables is significant ($Beta = .124$, $p < .001$). All three possible mediators, social trust, social participation, and social networks meet the second requirement of mediation which indicates that the independent variable must have a significant effect on the mediator. This allows the third condition of mediation to be considered.

Table 14. Regression analyses for variables predicting social networks (N=24912).

	Model 7		Model 8	
	B (Beta)	SE	B (Beta)	SE
Constant	1.744***	.021	.927***	.076
Digital competence	.250*** (.244)	.006	.127*** (.124)	.008
Gender			.122*** (.043)	.017
Age			-.004*** (-.047)	.001
Total income			.057*** (.107)	.004
General subjective health			.116*** (.075)	.011
Religion			.318*** (.109)	.018
R^2	.060		.092	
F	1612.541***		431.481***	

Note. Significance levels: * $p < .05$; ** $p < .01$; *** $p < .001$.
Reference category gender (male = 1, female = 2).
Reference category religion (no = 0, yes = 1).
Data from European Social Survey (ESS) round 10.

The third condition of mediation states that the three possible mediators must significantly predict life satisfaction. Table 15 shows the effect of each mediator on life satisfaction. The first mediator is incorporated in model 9, which addresses whether social trust has an effect on life satisfaction. The overall model is significant ($R^2 = .143$, $F(6) = 696.747$, $p < .01$). The results of model 9 show a significant positive effect between social trust and life satisfaction ($Beta = .214$, $p < .05$). Having more social trust, leads to more life satisfaction. Model 10 ($R^2 = .154$, $F(6) = 647.666$, $p < .01$) incorporates the second possible mediator of social participation. There is a positive significant effect of social participation on life satisfaction ($Beta = .105$, $p < .001$). The more a person participates in social activities, the more life satisfaction is experienced in life. Model 11 entails the third mediator social networks. The overall model is significant ($R^2 = .165$, $F(6) = 704.325$, $p < .001$). Social networks have a significant effect on life satisfaction ($Beta = .153$, $p < .001$). As the results show, discussing intimate matters with more people in your social network, increases life satisfaction.

Models 9, 10 and 11 show that the third condition of mediation is met for all three possible mediators. Table 16 shows model 12 ($R^2 = .201$, $F(9) = 699.404$, $p < .001$) in which all mediators are incorporated to predict life satisfaction. When comparing the standardized regression coefficients within model 12 of the three possible mediators, social trust ($Beta = .189$) has the largest effect on life satisfaction. Model 12, in which all areas of social capital are incorporated together with the control variables, has an explained variance of 20.1%. This shows that combining the three areas of social capital (trust, participation, and networks) into one model explains the most variance of life satisfaction together with digital competence and control variables.

Table 15. Regression analyses for variables predicting life satisfaction (N=24912).

	Model 9		Model 10		Model 11	
	B (Beta)	SE	B (Beta)	SE	B (beta)	SE
Constant	2.096***	.112	1.699***	.113	1.880***	.111
Digital competence	.111*** (.072)	.011	.147*** (.095)	.011	.136*** (.088)	.011
Social trust	.178* (.215)	.003	-	-	-	-
Social participation	-	-	.243*** (.105)	.014	-	-
Social networks	-	-	-	-	.231*** (.153)	.009
Gender	.065** (.015)	.025	.912** (.021)	.025	.050* (.011)	.024
Age	.017*** (.113)	.000	.016*** (.142)	.000	.018*** (.154)	.000
Total income	.114*** (.143)	.005	.126*** (.158)	.005	.118*** (.149)	.005
General Subjective health	.608*** (.261)	.015	.620*** (.266)	.016	.640*** (.149)	.015
Religion	.016*** (.007)	.026	.176*** (.040)	.026	.090** (.020)	.026
R ²	.143		.154		.165	
F	696.747***		647.666***		704.325***	

Note. Significance levels: *p < .05; ** p < .01; *** p < .001.

Reference category gender (male = 0, female = 1).

Reference category religion (no = 0, yes = 1).

Data from European Social Survey (ESS) round 10.

Table 16. Regression analyses for variables predicting life satisfaction (N=24912).

	Model 12	
	B (Beta)	SE
Constant	1.672***	.110
Digital competence	.087*** (.056)	.011
Social trust	.157*** (.189)	.005
Social participation	.168*** (.072)	.013
Social networks	.146*** (.097)	.009
Gender	.056** (.013)	.024
Age	.014*** (.118)	.118
Total income	.104*** (.131)	.000
General Subjective health	.565*** (.243)	.015
Religion	.009 (.002)	.025
R ²	.201	
F	699.404***	

Note. Significance levels: *p <.05; ** p <.01; *** p < .001.

Reference category gender (male = 0, female = 1).

Reference category religion (no = 0, yes = 1).

Data from European Social Survey (ESS) round 10.

To provide further insight into the possible mediation effects, it has been chosen to illustrate the effects using figures, which can be found in *appendix C* (Field, 2018). For all three the mediators, the indirect and direct effects are significant. The fourth and last condition for mediation argues that the effect of digital competence on life satisfaction must decrease when the mediator is considered (Field, 2018). For all three mediators, this the case. The mediator explains a part of the variance of life satisfaction that is also partially explained by digital competence. Therefore, partial mediation is found for all three mediators (*see appendix C*).

In sum, all three mediation effects, both the direct effect and the indirect effect are significant and to effect between digital competence on life satisfaction decreases when the three mediators are added. In addition, the effect between digital competence on life satisfaction decreases when the mediators are considered. All three mediators are partial mediators (Field, 2018); the higher the digital competence level, the larger the social network (more people to discuss intimate matters with), the more social trust (trusting more people), and the higher social participation (joining more activities that involve a contribution to society). These positive effects in turn create higher life satisfaction. As a result, support is found for hypothesis 2: *The effect of digital competence on life satisfaction is partially mediated by social capital.*

5. Conclusions and discussion

This study examined the effect of digital competence on life satisfaction and whether this effect was mediated by social capital. Hypotheses were derived from mechanisms of modernity theory, the digital divide theory, digital capital theory, the social capital theory, social presence theory, time displacement theory and the hierarchy of needs theory. In this paper, European cross-sectional data from the ESS round 10 was used to test these hypotheses. The effect stated above was analysed using linear regression models.

5.1 Conclusions

Based on the results in this study, we conclude that being digitally competent has a significant positive effect on a person's life satisfaction. The finding that being more digitally competent leads to a higher life satisfaction supports the digital divide theory that argues that people who are digitally competent experience more opportunities in society compared to those who are not digitally competent. Being digitally competent enhances social mobility because 'haves' are provided with more information and opportunities which gives them advantages in life, and this results into an increase in life satisfaction (Lissitsa & Chachashvili-Bolotin, 2016; Van Dijk, 2017; Van Deursen & Van Dijk, 2019). In addition, support is found for the digital capital theory which emerges from the digital divide theory. The digital capital theory predicts that people who are digitally proficient have more accumulated resources leading to being better prepared as in the physical world as it stimulates life-long learning and life satisfaction (Aday et al., 2010; Fowler et al., 2015; Ragnedda, 2018).

The second conclusion derived from this study is that social capital plays a partial mediating role between digital competency and life satisfaction. Therefore, support for the social presence theory was found; a continuous state of connected presence as a result of digital competence creates the ability to constantly stay in touch with others which generates feelings of belonging, greater well-being and expands life satisfaction (Elgar et al., 2011; Masur, 2021). In addition, the motivational theory by Maslow (1943) argued that humans desire love and belongingness by connecting with others and this results in increase in life satisfaction. In this, digital competency gives an enabling role to meet more people online. Also, social bonds promote healthy coping strategies and social development, which in turn increases life satisfaction (Myers 2000; Putnam 2000).

Other theories like the modernity theory (Durkheim, 1893) and the time displacement theory suggested a negative effect of the mediator social capital, due to the fact that being digital competent creates more internet use, which decreases social connections based on shared beliefs and values (Durkheim, 1893), which may lead to anomie, and displaces time that could be spent with family and friends in the physical world (Vriens & Van Ingen, 2018) which results into an individual world where people experience more feelings of loneliness and depression (Benjanin et al., 2015; Christakis et al., 2011; Turkle, 2011). However, regression results show no support for theories who suggested a negative effect.

In sum, based on the results within this study we conclude; having digital competency creates opportunities for purposeful social interaction on online platforms that fulfil the need to belong and to be connected. These feelings create higher contentment in life.

5.2 Discussion

This study confirms the research of Lissitsa and Chachashvili-Bolotin (2016) who looked at Internet adoption and life satisfaction differences between young and elderly people in Israel. In which it was found that seniors and vulnerable groups who can use the Internet have higher life satisfaction than those in the same group who cannot. Lissitsa and Chachashvili-Bolotin therefore stress the importance of digital competence as an important component on Israel's national policy agenda. Within this study, we build further on their results by looking at the European context and using more recent data. This is important within the digital age that is rapidly changing in nature. Therefore, this study contributes to the scientific gap due to the fact it focuses on the downside of digitalisation and used recent data (Van Deursen & Van Dijk, 2019).

Within this study, an attempt was made to keep both internal and external validity as high as possible. A large sample was used by analysing 24.912 respondents. In this regard, randomised probability sampling also ensured that every possible unit in the European population has an equal chance of being included in the sample. This minimises the chance of selection bias and increases the probability of representativeness (Field, 2018).

In addition, critical requirements for item merging were used in order to maintain a good quality of internal validity. Whereby the digital competence variable has both high factor

loadings as an excellent Cronbach's Alpha. For these reasons stated above, the items measuring social capital were kept separately, as a result of having low factor loadings.

However, the results of this study and the interpretations must be interpreted with caution. The study has attempted to shed light on the effect of digital competence on life satisfaction. Nevertheless, there are some areas for improvement. First, it has been shown that digital proficiency is a diffuse concept (Ferrari, 2012; Ferrari, 2013) making it difficult to conceptualise and measure. Within this study, digital competence is measured by combining three items who are based on 'familiarity'. As a result, only three small components of digital competence are measured in this study. As research by van Deursen et al. (2021) shows a difference between four different types of digital proficiency (operational, formal, information and strategic digital skills) breaking down different components of digital proficiency is useful for future research in order to get a better measurement of digital competence. In addition, the items measuring digital competence are completed on a self-report basis. Since self-reporting is within the measurement of digital competency, the Dunning-Kruger effect must be considered (Mahmood, 2016). The Dunning-Kruger effect argues that people who may have low digital competence will over-estimate their own competence and people who have high competence will under-estimate themselves. For better internal validity, observations and tests would be a better option. However, observations are not feasible in this study given the high cost and time restrictions. This may affect the results; therefore, a digital competence test may be valuable for follow-up research to verify self-reported proficiency.

Given data restrictions, only three levels of social capital are measured within this study. It is recognised that there are many other forms of social capital like, social influence, social norms, and social resources (Putnam, 2000; Sappleton, 2009). Therefore, future research could deepen out the different areas, to see if there is a mediating effect of other areas of social capital within the main effect of digital competence on life satisfaction.

In addition, life satisfaction, was measured by one question in the survey. Therefore, this dependent variable only concerned information on the reports of respondents themselves on how satisfied they are with life. For convenience purposes, we refer to this as "life satisfaction". However, no conclusions can be drawn from this paper about the different types of life satisfaction, for example, the different emotional and cognitive experiences that people within well-being feel are not represented within this research (Ruggeri et al., 2020; WHO, 2001).

These distinctions could be made in a future study to cover the whole concept of life satisfaction.

6. Policy advice

This study highlights the need for digital skill levels of European citizens as it offers positive outcomes on social capital and life satisfaction. Based on the outcomes within this study, a policy recommendation can be formulated. But first, the current policy situation regarding digital learning is outlined.

6.1 Current policy

In February 2020, the European Commission mapped out a strategy for the digital future called ‘Digital Compass 2030’ (*A Europe fit for the digital age*, 2020). The main goal of this strategy is to ensure that 80 percent of the EU population has basic digital skills by 2030 (NextGenerationEU, z.d.). To achieve this goal, financial investments will be made into training courses to enhance the digital skills of individuals and businesses. Despite the European Commission's intentions to make citizens in Europe more digitally competent, literature shows that there are differences within the European countries in their views on the digitalisation discourse (Beblavy et al., 2019). The nations demonstrate disagreements on governance concerns regarding digitalisation, such as regulation against non-regulation, centralised versus decentralised data interchange, the amount to which digital skills training is supplied and accessible, and the view on increasing disparities within the digital divide (Martens & Zscheischler, 2022). In addition, the study of Marengo et al. (2021) found that the digitalisation discourse within the media also differs a lot in framing digitalisation as a threat or opportunity within the European countries.

As a result of the factors stated above, despite the efforts of the European Commission, policy at the national level still varies considerably regarding increasing digital skills of citizens (Marengo et al., 2021; Martens & Zscheischler, 2022). This is not an unusual case, policy at the international level is generally a difficult exercise on a national level (Knill & Tosun, 2021). A clear direction motivated by a comprehensive vision is now lacking. Too frequently, each country has its own point of view and agenda when it comes to digital learning. In addition, experts argue that policy from the European Commission is too abstract (Beblavý et al., 2019). This leaves space for implementation for countries themselves, but this can also lead to negligence (Knill & Tosun, 2021). This may possibly explain the differences in average digital competence level found within this study, as the descriptive results indicate (*see 4.1, table 6, appendix B*).

6.2 Policy recommendation

To provide the opportunity of increasing life satisfaction as a result of digital competence to all European citizens, a policy recommendation has been formulated:

1. *The European Commission should establish a standardised training programme for all European citizens.*

One vision, one programme and one desired digital competence level in all European countries. All participants will receive training with the same level of consistency and quality thanks to a standardised programme. A standardised programme can help prioritise digital learning by making policy from the European Commission more concrete. This reduces the scope for countries to make their own interpretation and therefore reduces the chances of neglectation (Knill & Tosun, 2021).

By adopting one digital format, the training program can reach a large number of participants, overcoming geographical barriers and enabling broader access to training opportunities. This scalability ensures that a wider population can benefit from the program, promoting inclusivity and reducing skills gaps. The training programme should be drawn up based on the latest literature. Therefore, advice within this study is to look at the four levels to digital competence distinguished by Van Deursen and Van Dijk (2019), in order to cover the whole concept of digitally competence in this way. As a result, all European citizens can experience more life satisfaction and greater social capital due to being digital competence.

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Appendix A

Correlation tables and factor analysis

Table 1. Correlation matrix for components of digital competence.

Digital competence	PDF	Advanced search	Preference settings
Familiarity with pdf	1.000	.849	.818
Familiarity with advanced search	.849	1.000	.888
Familiarity with preference settings	.818	.888	1.000

Table 2. Factor Loadings and Eigenvalues of the 3 items of digital competence (N =32759).

Items	Factor loading Component 1
Familiarity with PDF	.936
Familiarity with advanced search	.962
Familiarity with preference settings	.951
Eigenvalue	2.705
% of Variance	90.163
Cumulative %	90.163

Note. Extraction method: Principal Component Analysis; Rotation method: Oblimin with Kaiser normalization; One-solution factor solution.

Table 3. Correlation matrix for components of social capital.

Social capital	participation	networks	trust
Social participation	1.000	.254	.259
Social networks	.254	1.000	.118
Social trust	.259	.118	1.000

Table 4. Factor Loadings and Eigenvalues of the 3 items of social capital (N =32260).

Items	Factor loading Component 1
Social participation	.309
Social networks	.499
Social trust	.318
Eigenvalue	1.426
% of Variance	47.532
Cumulative %	47.532

Note. Extraction method: Principal Component Analysis; Rotation method: Oblimin with Kaiser normalization; One-solution factor solution.

Appendix B

Descriptive results

*Table 6. Descriptive cross table comparing means digital competence*country (N = 24912).*

Country	Mean	N	S.D.
Bulgaria	2.580	2179	1.442
Switzerland	3.546	1227	1.161
Croatia	2.912	1057	1.426
Czechia	3.095	1614	1.317
Estonia	2.952	1493	1.365
Finland	3.648	1494	1.277
France	3.221	1718	1.392
Greece	2.995	2147	1.519
Hungary	2.967	1256	1.432
Iceland	2.959	782	1.060
Italy	2.856	1519	1.375
Lithuania	2.693	1269	1.318
Montenegro	2.642	1049	1.293
North Macedonia	2.334	1029	1.328
Netherlands	3.648	1276	1.087
Norway	3.579	1322	.987
Portugal	2.644	1149	1.494
Slovenia	2.843	1086	1.273
Slovakia	3.027	929	1.462

Note. Data from European Social Survey (ESS) round 10.

Digital competence (1 = low familiarity with internet related items, 5 = high familiarity with internet related items).

*Table 7. Descriptive cross table comparing means digital competence*gender (N = 24912).*

Gender	Mean	N	S.D.
Male	3.123	11602	1.395
Female	2.922	13310	1.364

Note. Data from European Social Survey (ESS) round 10.

Digital competence (1 = low familiarity with internet related items, 5 = high familiarity with internet related items).

*Table 8. Descriptive cross table comparing means digital competence*age (N = 24912).*

Age group	Mean	N	S.D.
15-25	3.911	2064	.970
25-35	3.871	3235	1.29
35-45	3.675	3995	1.10
45-55	3.307	4340	1.209
55-65	2.587	4582	1.277
65-75	2.134	4085	1.219
75-85	1.634	2147	.991
85+	1.348	464	.749

Note. Data from European Social Survey (ESS) round 10.

Digital competence (1 = low familiarity with internet related items, 5 = high familiarity with internet related items).

Table 9. Descriptive cross table comparing means digital competence income (N = 24912).*

Income level	Mean	N	S.D.
1st decile	2.009	1773	1.338
2nd decile	2.169	2541	1.293
3rd decile	2.489	2786	1.357
4th decile	2.722	2958	1.324
5th decile	2.982	3014	1.320
6th decile	3.216	2726	1.260
7th decile	3.385	2697	1.215
8th decile	3.579	2470	1.174

9th decile	3.744	2002	1.097
10th decile	3.952	1945	1.382

Note. Data from European Social Survey (ESS) round 10.

Digital competence (1 = low familiarity with internet related items, 5 = high familiarity with internet related items).

*Table 10. Descriptive cross table comparing means digital competence*religion (N = 24912).*

Religious	Mean	N	S.D.
Yes	2.793	15332	1.395
No	3.372	9580	1.283

Note. Data from European Social Survey (ESS) round 10.

Digital competence (1 = low familiarity with internet related items, 5 = high familiarity with internet related items).

Appendix C

Mediation figures

Figure 1. Regression analysis testing the mediated effect of social trust between digital competence and life satisfaction.

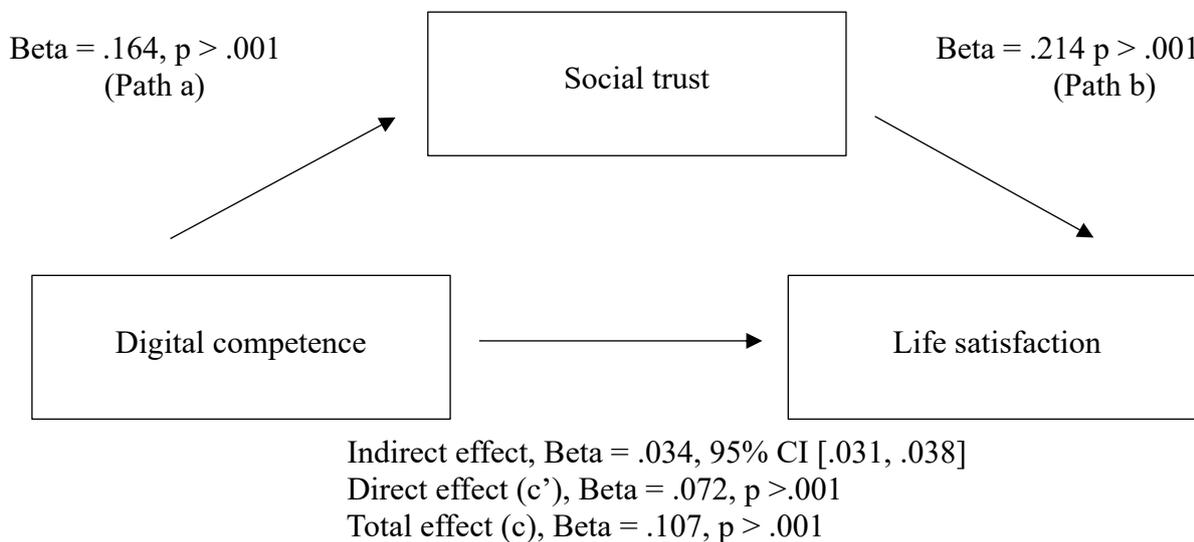


Figure 2. Regression analysis testing the mediated effect of social participation between digital competence and life satisfaction.

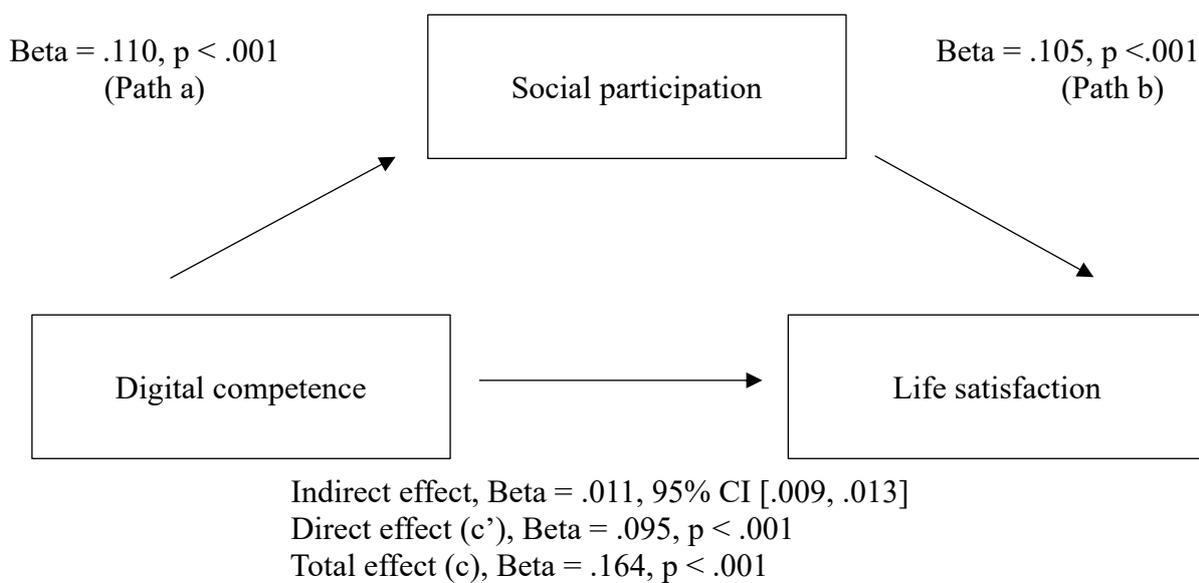
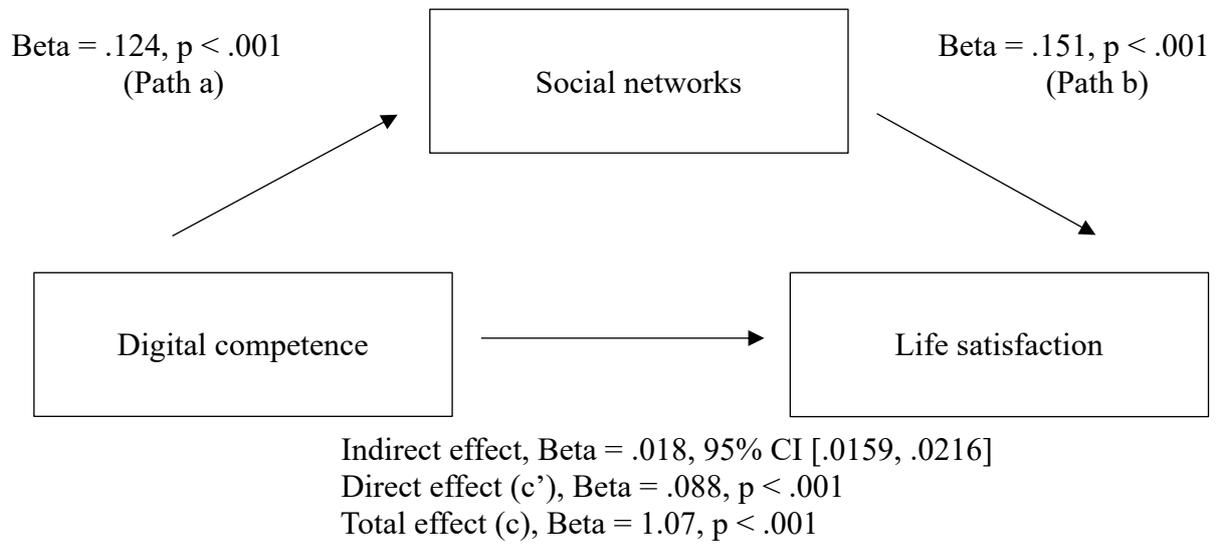


Figure 3. Regression analysis testing the mediated effect of social networks between digital competence and life satisfaction.



Appendix D

Regression analysis Syntax

FACTOR

```

/VARIABLES fampref famadvvs fampdf
/MISSING PAIRWISE
/ANALYSIS fampref famadvvs fampdf
/PRINT INITIAL CORRELATION EXTRACTION ROTATION
/PLOT EIGEN
/CRITERIA MINEIGEN(1) ITERATE(25)
/EXTRACTION PC
/CRITERIA ITERATE(25)
/ROTATION VARIMAX
/METHOD=CORRELATION.

```

RELIABILITY

```

/VARIABLES=fampref famadvvs fampdf
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE CORR
/SUMMARY=TOTAL MEANS VARIANCE CORR.

```

FACTOR

```

/VARIABLES socialnet socialpart strust
/MISSING PAIRWISE
/ANALYSIS socialnet socialpart strust
/PRINT INITIAL CORRELATION EXTRACTION ROTATION
/PLOT EIGEN
/CRITERIA MINEIGEN(1) ITERATE(25)
/EXTRACTION PC
/CRITERIA ITERATE(25)
/ROTATION VARIMAX
/METHOD=CORRELATION.

```

RELIABILITY

```

/VARIABLES=socialnet socialpart strust
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE CORR
/SUMMARY=TOTAL MEANS VARIANCE CORR.

```

DESCRIPTIVES stflife.

DESCRIPTIVES ppltrst.

DESCRIPTIVES inprdsc.

DESCRIPTIVES sclact.

DESCRIPTIVES hinctnta.

DESCRIPTIVES rlgblg.

RECODE stflife (77,88,99=SYSMIS).
FREQUENCIES VARIABLES=stflife
/ORDER=ANALYSIS.

RECODE ppltrst (77,88,99=SYSMIS).
FREQUENCIES VARIABLES=ppltrst
/ORDER=ANALYSIS.

RECODE inprdsc (77,88,99=SYSMIS).
FREQUENCIES VARIABLES=inprdsc
/ORDER=ANALYSIS.

RECODE sclact (7,8,9=SYSMIS).
FREQUENCIES VARIABLES=sclact
/ORDER=ANALYSIS.

RECODE hinctnta(77,88,99=SYSMIS).
FREQUENCIES VARIABLES=hinctnta
/ORDER=ANALYSIS.

RECODE rlgblg(7,8,9=SYSMIS).
FREQUENCIES VARIABLES=rlgblg
/ORDER=ANALYSIS.

RECODE agea (999=SYSMIS).
FREQUENCIES VARIABLES=agea
/ORDER=ANALYSIS.

RECODE health (7,8,9=SYSMIS).

```
FREQUENCIES VARIABLES=health  
/ORDER=ANALYSIS.
```

```
RECODE fampref (7,8,9=SYSMIS).  
FREQUENCIES VARIABLES=fampref  
/ORDER=ANALYSIS.
```

```
RECODE fampdf (7,8,9=SYSMIS).  
FREQUENCIES VARIABLES=fampdf  
/ORDER=ANALYSIS.
```

```
RECODE famadvs (7,8,9=SYSMIS).  
FREQUENCIES VARIABLES=famadvs  
/ORDER=ANALYSIS.
```

```
COMPUTE digitalcompetence = MEAN(fampref, famadvs, fampdf).  
EXECUTE.
```

```
COMPUTE nomiss = nmiss (digitalcompetence, stflife, ppltrst, inprdsc, sclact,  
hinctnta, rlgblg, agea, health) = 0.  
FILTER BY nomiss.
```

```
COMPUTE nomiss = nmiss (digitalcompetence, lifesat, socialnet, socialpart,  
strust, totalincome, religie, agea, subhealth, Leeftijdsgroep) = 0.  
FILTER BY nomiss.
```

```
DESCRIPTIVES digitalcompetence, stflife, ppltrst, inprdsc, sclact, hinctnta,  
rlgblg, agea, health.
```

```
RECODE health (1=5) (2=4) (3=3) (4=2) (5=1) INTO subhealth.
```

```
DESCRIPTIVES subhealth.  
FREQUENCIES subhealth.  
FREQUENCIES health.
```

```
REGRESSION  
/MISSING LISTWISE  
/STATISTICS COEFF OUTS R ANOVA CHANGE  
/CRITERIA=PIN(.05) POUT(.10)  
/NOORIGIN  
/DEPENDENT stflife  
/METHOD=ENTER digitalcompetence
```

```
/METHOD=ENTER digitalcompetence rlgdnm hinctnta agea gndr subhealth.
```

```
COMPUTE Leeftijdsgroep=TRUNC((agea -15)/10)*10+15.  
EXECUTE.
```

```
FREQUENCIES Leeftijdsgroep
```

```
CROSSTABS
```

```
/TABLES=fampdf BY Leeftijdsgroep  
/FORMAT=AVALUE TABLES  
/CELLS=COUNT  
/COUNT ROUND CELL.
```

```
RECODE agea (15 THRU 24 = 1) (25 THRU 34 = 2) (35 THRU 44 = 3) (45  
THRU 54 = 4)  
(55 THRU 64 = 5) (65 THRU 74 = 6) (75 THRU 84 = 7) (85 THRU 90 = 8)  
INTO agecat.  
EXECUTE.
```

```
FREQUENCIES agecat.  
SELECT IF NOT agecat = 8.
```

```
DESCRIPTIVES digitalcompetence, lifesat, socialnet, socialpart, strust,  
totalincome, religie, agea, subhealth, Leeftijdsgroep.
```

```
MEANS TABLES=digitalcompetence BY Leeftijdsgroep gndr  
/CELLS=MEAN COUNT STDDEV.
```

```
MEANS TABLES=digitalcompetence BY Leeftijdsgroep gndr totalincome  
religie  
/CELLS=MEAN COUNT STDDEV.
```

```
MEANS TABLES=digitalcompetence BY cntry  
/CELLS=MEAN COUNT STDDEV.
```

Appendix E

Ethical approval

P.O. Box 80140, 3508 TC Utrecht The Board of the Faculty of Social and Behavioural Sciences Utrecht University P.O. Box 80.140 3508 TC Utrecht		Faculty of Social and Behavioural Sciences Faculty Support Office Ethics Committee Visiting Address Padualaan 14 3584 CH Utrecht
Our Description Telephone E-mail Date Subject	23-1619 030 253 46 33 FETC-fsw@uu.nl 24 May 2023 Ethical approval	

ETHICAL APPROVAL

Study: The effect of digital competence on life satisfaction

Principal investigator: H.E. Fris

Supervisor: Noël Koster

The study is approved by the Ethical Review Board of the Faculty of Social and Behavioural Sciences of Utrecht University. The approval is based on the documents sent by the researchers as requested in the form of the Ethics committee and filed under number 23-1619. The approval is valid through 26 June 2023. The approval of the Ethical Review Board concerns ethical aspects, as well as data management and privacy issues (including the GDPR). It should be noticed that any changes in the research design oblige a renewed review by the Ethical Review Board.

Yours sincerely,

Peter van der Heijden, Ph.D.
 Chair

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