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The Digital Divide: Implications for Training and Education

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ABSTRACT

Anecdotal evidence resulting from an evaluation of a high school cybersecurity curriculum revealed a digital divide between middle and high school learners and Science Technology Engineering Mathematics (STEM) and non-STEM instructors (Gough et al., 2024). Repeatedly, we observed students without Computer Science experience swiftly obtaining proficiency in novel hardware and software used in cybersecurity curriculum while their teachers lagged. Similar digital competence gaps were cited among senior military officers and junior trainees regarding new media technology (Murphy, 2008). As the younger generation of learners is considered technologically inclined due to their early exposure and immersion in technology, we examined the often-cited concept of the digital divide between digital natives and digital immigrants, and its influence on digital competence. Prensky (2001a) distinguished digital competence based on the period of birth, that is, either before or after the digital age. However, research indicates that digital competence today is not exclusive to one's birth period and is influenced by various factors. Aiming to identify these factors, we systematically reviewed 204 scholarly articles related to digital competence, selecting 47 for inclusion and data analysis. Results revealed that although age still has influences on digital competence, 15 other factors influence digital competence, including demographics (sex, education level, career specialization, and past academic achievements), family background (parents' education, family cultural capital, socio-economic status, and language integration), experience with technology (social media use, technology use, and training), technology access (internet access and the number of digital tools), and attitudes (self-efficacy and mastery orientation). These findings suggest that the digital divide might persist long after pre-digital-age instructors retire and are of noteworthy discussion for preparing a future technologically driven workforce. Thus, training organizations must understand these factors, evaluate their impact on training and learning outcomes, and adapt. We present the methods, findings, and implications for training in technologically driven environments.

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Alita Regi is a Ph.D. student pursuing human-centered design. She holds an undergraduate degree in aerospace engineering and a minor in physics, and a master's degree in space sciences. Alita's research focuses on astronaut health and performance within the Deep Space Initiative's (DSI) Andromeda program, a comprehensive 12-month research endeavor. Additionally, she contributes her expertise as a part-time member of the Outreach Organizing Committee at the International Centre for Astronautical Development (ICAD) and is a member of the ATLAS Lab. Recognized for her dedication, she was appointed as Mars Society Ambassador in 2022 and Space4Girls Ambassador in 2023.

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INTRODUCTION

A digital divide has been cited as sometimes existing between instructors who did not grow up in the digital age (digital immigrants) and learners who grew up in the digital age (digital natives; Rikhye et al., 2009). Prensky (2001a) used these terms to distinguish individuals in K-12 and college students in the 20th century who were born into and grew up with new technology. Digital natives are the generation born after 1980 (Adjin-Tettey, 2020; Kobul, 2023) that speak the language of technology, utilize computers, video games, and the internet. Digital immigrants are individuals who have not been born into this digital age but have adopted some aspects of this new technology, however, not to the degree of a digital native (Prensky, 2001b). Digital immigrants are believed to typically have less digital competence or confidence to effectively use digital technology for information, communication, and basic problem-solving to optimize daily activities compared to digital natives (Grande-de-Prado et al., 2020). The digital divide thus occurs when digital native learners surpass digital immigrant instructors in the ability to use technology, often leaving instructors feeling inferior in technologically-centered learning environments due to limited confidence to teach digital native learners who seem more adept (Zenios & Ioannou, 2018). This can result in instructors utilizing outdated pedagogical tools in training environments and failing to account for how digital-native learners absorb and interpret information. Arkhipova et al. (2019) reported that 81% of the students surveyed considered classes with technological equipment more interesting, and 100% of primary school students preferred to study class material with a form of technological application rather than simply reading class material. Moreover, Guillén-Gámez & Mayorga-Fernández (2020) reported that learners perceived technology to improve the class experience significantly, but university faculty did not consider it important to improve their teaching practices and were reported to underuse Information and Communication Technologies (ICT) in the classroom. Further, Cao et al. (2023) stress that instructor digital competence correlates with learning outcomes, plays a vital role in smart education, and improves instructors' teaching when technology is proficiently leveraged in instructional methodologies and strategies.

Lázaro-Cantabrana et al. (2019) define digital competence among teachers as the ability to effectively apply and transfer knowledge, strategies, skills, and attitudes regarding educational technologies in practical, real-world situations. This proficiency enhances students' learning and acquisition of digital skills, supports implementing teaching innovations tailored to the digital age, and aligns teachers' professional development with societal and educational advancements. Similarly, Kennedy and Fox (2013) opined that students' digital competence is multifaceted, indicating that technology is deeply embedded in students' daily lives, impacting both social and educational spheres. In this effort, we operationally define digital competence as a comprehensive and transferable set of ICT knowledge skills and abilities (KSAs) such as problem-solving, communication, collaboration, content creation, and sharing) and the ability to integrate and apply these key KSAs efficiently, critically, creatively, and ethically within the digital economy.

In recent research developing and piloting a high school cybersecurity training curriculum, we first-hand observed the instructor-student digital divide. First, when evaluating some of the modules with high school students in a Junior Reserve Officers' Training Corps (JROTC) program, many of the students, who had minimal experience with Computer Science or cybersecurity, dove into the code in an attempt to compromise vulnerabilities in a remote-control (RC) car, whereas their instructors were reluctant to engage in the training materials, citing lack of technological savviness, impeding their understanding of the training material and ability to assist with the training module. At a

later date, a module exploring basic cryptography was delivered to a middle school honors Math class. Although the students quickly adapted to hacking into an RC car and were able to complete the cybersecurity challenge, the instructor voiced frustration with her lack of understanding, feeling she lagged behind the students in mastering the technology used in the hands-on activity (Gough et al., 2024). This observation provided anecdotal evidence for the existence of a digital divide between middle and high school learners and their STEM and non-STEM instructors. A similar digital divide has been cited by Murphy (2008) as being prevalent in the military, wherein junior officers utilize newer media and proactively exploit its capabilities, whereas some senior warfighters struggle to see the context of its use in military operations.

However, being a digital immigrant does not preclude the development of digital competence and instructors can enhance their digital competence through professional development (Cao et al., 2023). Further, the more frequently instructors use ICT in training, the more digitally competent they become (Blau & Shamir-Inbal, 2016). A more digitally competent instructor can improve their teaching, promote a more lifelong learning pedagogy, and increase the efficiency of education (Blau & Shamir-Inbal, 2016). Students' digital competence was also shown to improve learning outcomes such as a positive effect on students' academic performance, ability to solve problems by searching online, and scientific learning through digital media (Cabero-Almenara et al., 2023; Mehrvarz et al., 2021). Thus, this digital divide is important to address to achieve learning outcomes. It could be argued that this is a short-lived problem, and the digital divide should be waning as older generations retire and digital natives move into teaching roles. However, researching this phenomenon, we discovered that many factors impact digital competence beyond when an individual was born, and this problem is likely to persist. As such, this study aimed to examine the factors that influence digital competence and associated implications for training organizations and to provide insight into how to prepare future technologically driven workforces.

METHODS

Study Design and Procedures

A literature review was conducted to identify factors that influence student and instructor digital competence. First, we identified necessary primary keywords, including digital natives, digital immigrants, digital competence, ICT literacy, digital skills, ICT competence, online learning, and e-learning. Second, these keywords were input into several online databases to retrieve articles related to digital competence, including Google Scholar, Florida Institute of Technology library databases, International Journal of Emerging Technologies in Learning (iJET), ACM Digital Library, MDPI, ERIC, Nordic Journal of Digital Literacy, Journal of Education Research and Evaluation (JERE), Frontiers, Springer, Science Direct, Emerald Insight, Wiley Online Library, Taylor Francis Online, and Research Gate. Third, article abstracts were skimmed for relevance and stored in Zotero and SharePoint databases. Once a study was identified, additional studies were identified by utilizing the "cited by" tool within the search databases and reviewing the literature review sections of those studies, resulting in 204 studies. Fourth, the studies' abstracts were reviewed by an experienced researcher for topic relevance and to ensure they were within the scope of the current study, resulting in 183 studies that were added to an Excel spreadsheet in preparation for a comprehensive review. In the spreadsheet, each article's title, authors' information, abstract, study purpose, methods, findings, and key takeaways were extracted. The research team met and reviewed each article by row to ensure team consensus on relevance and eliminate outdated studies (i.e., published before 2010), resulting in 79 studies. Fifth, the team reviewed the 79 studies in detail to evaluate the level of support for factors influencing digital competence, and the decision was made to include only studies with quantitative data in the data analysis. This led to the exclusion of theoretical studies, resulting in 47 studies from which data was analyzed.

Data Analysis

The data was analyzed using the inductive thematic analysis approach by Braun and Clarke (2006). The data analysis process was concluded in five steps. First, the 47 empirical studies deemed relevant were added to a new tab in an Excel spreadsheet. All the studies' relevant information was included, and two senior researchers thoroughly examined them, their methods sections and results, and extracted factors verbatim as they were referenced by the original authors. The identified factors were added to an adjacent cell within the same row as the study. Second, the team met to review the extracted information and reach a consensus about the relevance of the factors and the context in which they were used in the original study. Third, as factors evolved from the original studies, they were transformed into codes which were then added to individual columns with a corresponding data point for each article that had reported

the said code as significant. Fourth, the data points for each code were summed to obtain frequencies for each code. Then, the codes were added to a new tab with their associated frequencies, and the team met and reviewed the codes, intending to remove redundancy. The team decided that some codes were very similar based on the context in which they were used in the original studies but had been labeled with different names by the primary author(s), for instance, computer experience and technology use and experience. As such, they were consolidated. Fifth, codes that had at least three frequency counts (supporting studies) evolved into themes, which were the factors that influence digital competence. Finally, themes were grouped into categories. The five categories and 16 influencing factors are shown in Table 1.

FINDINGS

The purpose of this effort was to identify the factors that influence digital competence. The thematic analysis resulted in 16 factors grouped into five high-level categories: demographic factors, family background, experience with technology, technology access, and attitudes (see Table 1). The sections below delineate these factors and how they influence digital competence.

Table 1. Factors Influencing Digital Competence

Demographics Factors (*n*)	Family Background (*n*)	Experience with Technology (*n*)	Technology Access (*n*)	Attitudes (*n*)
Age (12)	Parents' education (6)	Technology use and experience (8)	Internet access (3)	Mastery orientation (4)
Sex (26)	Socioeconomic status (5)	Training (3)	Number of digital tools (3)	Self-efficacy (3)
Education level (6)	Family cultural capital (3)	Social media use (3)		
Career specialization (4)	Language integration at home (3)			
Past academic achievements (3)				

Note. Several studies supported more than one factor, hence total *n* for all factors is greater than 47

Demographic Factors

Demographic factors are individual characteristics of a person or group that influence their digital competence. Five demographic factors were found to influence digital competence, including age, sex, education level, career specialization, and past academic achievements.

Age

Age, operationally defined as how many years an individual has been alive, was identified to influence digital competence in 12 empirical studies, which showed that age had a negative influence on digital competence. Teachers' age had a significant negative relationship with the ability to use technology in online learning during COVID-19 and digital competence (Anzari et al., 2021; Guillén-Gámez et al., 2021). Among students, age was also found to have a negative influence on digital competence (Cabero-Almenara et al., (2023). Findings from these and similar studies reviewed seem to concur with earlier scholars (Prensky, 2001a; Rikhye et al., 2009) that the digital divide is age-based and suggest that older individuals are more likely to be less digitally competent compared to younger individuals (Barboutidis & Stiakakis, 2023; Bikos et al., 2018; Claro et al., 2018; Grande-de-Prado et al., 2020; Guillén-Gámez et al., 2019; Krumsvik et al., 2016; Lucas et al., 2021; Orakova et al., 2024; Urbancikova et al., 2017). However, the findings of this effort reveal that although age is a factor, there are a myriad of other factors that play a part in the digital divide.

Sex

Sex, often referenced in studies as gender, is operationally defined as biological sex at birth (male or female) and was identified to influence digital competence in 26 studies. Sex has been shown to have equivocal effects on digital competence. Six studies reported females to have better digital competence than males (Aesaert & Van Braak, 2015;

Aydin, 2021; Hohlfeld et al., 2013; Krumsvik et al., 2016; Ritzhaupt et al., 2013; Tran et al., 2020) in areas (e.g., ethical and safe transmission of information, computer enjoyment, digital literacy, digital resilience). Seven studies reported that males superseded females in digital competence (Gui & Argentine, 2011; Guillén-Gámez et al., 2021; Kaarakainen et al., 2018; Kim et al., 2014; Liu & Sun, 2012; Samani et al., 2019; Tondeur et al., 2011) in areas (e.g., theoretical digital skills, computer attitudes, technical literacy). Interestingly, concerning self-reported digital competence, males were consistently reported higher than females in all six studies (Casillas Martín et al., 2020; Çebi, & Reisoğlu, 2020; Grande-de-Prado et al., 2020; Nguyen et al., 2024; Sipila, 2013; Vázquez-Cano et al., 2017). Further, six studies reported either males or females to have higher scores on elements of digital competence than the other (Casillas et al., 2017; Kaarakainen et al., 2017; Kubiatko et al., 2011; Maon et al., 2021; Orakova et al., 2024; Tsai & Tsai, 2010). For instance, Kubiatko reported males better in computer anxiety and females better in computer enjoyment. Finally, Lucas et al. (2021) reported sex as a significant predictor of digital competence but did not report group differences. Hence, the literature regarding the influence of sex on digital competence is inconclusive: in some cases, females have been found to exceed males in digital competence whereas in other cases males exceeded females.

Education Level

Education level, operationally defined as an individual's level of education (e.g., high school, bachelor's degree) was identified to influence digital competence in six studies that reported its positive influence on digital competence. The level of education had a positive effect on digital competence among Vietnamese citizens (Nguyen et al., 2024) and performance in digital content creation among trainees in Public Vocational Training Institutes in Greece (Barboutidis & Stiakakis, 2023). Urbancikova et al. (2017) also reported education level to have strong positive correlations with digital literacy among students at the Institute of Public Affairs. The findings from these and other studies reviewed consistently demonstrate that education level influences digital competence (Grande-de-Prado et al., 2020; Kaarakainen et al., 2018; Kubiatko et al., 2011).

Career Specialization

Career specialization, operationally defined as an individual's field of study or employment, was reported to influence digital competence in four empirical studies, reporting that individuals in domains with substantial use of technology reported higher digital competence than those in other fields. For instance, computer education and instructional technology (CEIT) teachers had greater digital competence than teachers in other fields (e.g., preschool teaching, psychology, and Turkish language; Çebi & Reisoğlu, 2020). Vietnamese public sector employees with digital transformation training who provided online services reported higher digital competence than employees in all other sectors (Nguyen et al., 2024). Iranian undergraduates in mathematical and experimental sciences reported significantly higher digital literacy compared to those in humanities (Samani et al., (2019). These and other studies reviewed suggest that individuals in domains that have technology prevalent are more likely to be digitally competent (Barboutidis & Stiakakis., 2023).

Past Academic Achievements

Past academic achievements, operationally defined as successes in previous academic engagements, were found to positively influence digital competence in three empirical studies. Norwegian secondary school students' average grades were a significant predictor of and positively correlated with digital competence (Hatlevik et al., 2015a; 2015b). Moreover, students with higher scores on standardized tests performed better on digital skills tests (Jara et al., 2015). These findings suggest that higher academic achievement is associated with higher digital competence.

Family Background

Family background includes four factors that influence digital competence based on an individual's culture and family characteristics including parents' education, socioeconomic status (SES), family cultural capital, and language integration at home.

Parents' Education

Parents' education, operationally defined as the level of education of the mother and father was reported to influence an individual's digital competence in six empirical studies, with higher parental education having a positive relationship with students' digital competence. Students whose fathers had a university education had a much higher probability of having a high digital competence (Cabero-Almenara et al., 2023) and students' ICT competence was positively associated with their mothers having higher education (Aesaert & Braak, 2015). Further, parents' higher level of education significantly predicted Chilean and Korean students' ICT literacy, achievement level, and skills

(Aydin, 2021). These and other studies reviewed suggest that the higher the level of education of the parent, the higher their children's levels of digital competence (Bikos et al., 2018; Gui, & Argentin, 2011; Tran et al., 2020).

Socioeconomic Status (SES*)*
SES, operationally defined as a family's social class based on level of income, type of school attended, and occupational prestige (Tondeur et al., 2011) was reported to influence digital competence in five empirical studies, which showed that students who come from families with a higher SES have higher digital competence. Middle school Floridian students who reported a higher SES also reported higher ICT literacy skills (Ritzhaupt et al., 2013) and secondary school Belgian students from families with a higher social status reported higher ITC competence compared to their counterparts (Tondeur et al., 2011). Tran et al. (2020) also reported that SES was positively associated with digital literacy. These and other studies reviewed suggest that the higher the family's SES the higher digital competence (Jara et al., 2015; Urbancikova et al., 2017).

Family Cultural Capital
Family cultural capital, operationally defined as the number of resources at home, (e.g., the number of books), was found to influence digital competence in three empirical studies that showed that students with a greater family cultural capital tend to have higher digital competence. Cultural capital had a positive correlation with and was a significant predictor of digital competence among upper and lower secondary students (Hatlevik & Christophersen, 2013; Hatlevik et al., 2015a; Hatlevik et al., 2015b). These findings suggest that the greater the family's cultural capital, the more likely the students will report higher digital competence.

Language Integration at Home
Language integration at home, operationally defined as the number of languages spoken in a home was found to influence digital competence in three studies, reporting that the more languages that are spoken in a home, the more likely the children will have a high digital competence. Language integration at home was a significant predictor of, or significantly correlated with digital competence among secondary school students (Hatlevik & Christophersen, 2013; Hatlevik et al., 2015a; Hatlevik et al., 2015b). These studies provide evidence that families that speak various languages at home are more likely to produce students with a higher digital competence.

Experience with Technology

Experience with technology includes factors that relate to an individual's or group's past use of technology and includes technology use and experience, training, and social media use.

Technology Use and Experience
Technology use and experience, operationally defined as the use of various technical tools like computers, smartphones, tablets, or wearables, and the amount of time spent using these tools, was found to influence digital competence in eight studies, which showed that higher levels of experience with digital tools are associated with higher levels of digital competence. Spanish and Finnish teachers' knowledge of and use of ICT tools was significantly positively correlated with their competent and frequent use of said ICT tools in education (Casillas Martín et al., 2020; Sipilä, 2013). For students, computer experience predicted achievement in Computer and Information Literacy (CIL; Aydin, 2021). These and other studies reviewed suggest that increased experience with digital tools is associated with increased digital competence (Barboutidis & Stiakakis, 2023; Claro et al., 2018; Hatlevik et al., 2018; Samani et al., 2019).

Training
Training, operationally defined as the educational and professional methods used to incorporate technology in teaching and professional careers (Reisoğlu & Çebi, 2020) was reported to influence digital competence in three empirical studies that showed training to have positive relationships with digital competence. For instance, pre-service teachers' digital competence was reported to improve after training (Reisoğlu & Çebi, 2020) and continuous ICT education was found to predict upper secondary school teachers' digital competence in Norway compared to teachers without formal ICT education (Krumsvik et al., 2016). Further, completing a computer course influenced ICT literacy among Korean elementary school students (Kim et al., 2014). These findings suggest that having more digital training will lead to higher levels of digital competence.

Social Media Use
Social media use, operationally defined as using social networks, accessing websites with personal accounts, chatting, and downloading media or software, was identified to influence digital competence in three empirical studies with frequent social media use being associated with higher digital competence. Students who used social networks every day and frequently reported higher digital skills than their counterparts (Jara et al., (2015) and teachers who used social media for teaching and in their daily lives were more likely to attain higher digital citizenship and digital competence (Cristol & Gimbert, 2018; Lucas et al., 2021). These findings suggest that the frequent utilization of social media and its incorporation in teaching is associated with higher digital competence.

Technology Access

Technology access includes three factors related to the ability of individuals or communities to have the necessary resources, opportunities, accessibility, and support to use and benefit from technology, including internet access and the number of digital tools.

Internet Access
Internet access, operationally defined as the ability of the local user or hardware to exchange data between the public internet using the connection provided by the service provider, was identified to influence digital competence in three studies, with greater technology access being associated with higher digital competence. Having internet access at home had a significant positive relationship with self-reported digital skills from adolescents in the Program for International Student Assessment in 2003 and 2006 (Zhong, 2011). Kenyan teachers and school administrators who lacked internet connectivity at their schools also reported limited use of ICT tools in their teaching (Bariu, 2020). Aydin (2021) also found that having an internet connection was a predictor for ITC literacy among Korean students. Together, these studies suggest that increased accessibility to the Internet, whether at home or in educational institutions, is associated with higher levels of digital competence.

The Number of Digital Tools
The number of digital tools, operationally defined as the quantity of physical tools (e.g., computers, laptops) and application software tools used for storing, creating, and sharing information digitally, was found to influence digital competence in three studies, which showed that the more digital tools available, the more likely individuals are to attain digital competence. The number of tools used for teaching and learning had a positive impact on teachers' digital competence (Lucas et al., (2021). Iranian undergraduate students who used more than one digital tool scored significantly higher in digital literacy than those who used only smartphones (Samani et al., 2019). Moreover, the number of PCs available per student positively affected students' ICT literacy scores among Korean elementary students (Kim et al., 2014). These findings provide evidence that an increased number of digital tools is associated with increases in digital competence.

Attitudes

Two attitudinal factors were found to influence digital competence, including mastery orientation and self-efficacy.

Mastery Orientation
Mastery orientation is a form of motivation that is characterized by an individual's focus on personal growth, striving to acquire and improve skills and understanding, and the development of academic competence (Karaseva et al., 2017), and was found to influence digital competence in four empirical studies, which showed that individuals who score high on mastery orientation tend to achieve higher digital competence. Mastery orientation was a positive predictor of, or correlated significantly with digital competence (Hatlevik et al., 2015a; Hatlevik et al., 2015b, Hatlevik & Christophersen, 2013). Teachers also reported significant ICT use and implementation in their work when they scored high on achievement-goal-orientation motivation (Karaseva et al., 2017). These studies suggest that individuals with stronger inclinations toward mastery orientation are more likely to report higher digital competence**.**

Self-efficacy
Self-efficacy, operationally defined as individuals' judgments of their capabilities to organize and execute courses of action required to attain designated types of performances (Hatlevik, et al., 2018), was reported to influence digital competence in three empirical studies, which showed that individuals with high self-efficacy tend to report higher digital competence. Teachers' internet self-efficacy and perceived digital competence were found to influence their

digital citizenship and digital competence (Çebi & Reisoğlu, 2020; Cristol & Gimbert, 2018), and upper secondary students' self-efficacy was found to significantly positively correlate with their digital competence (Hatlevik et al., 2015b). These studies provide evidence that higher levels of self-efficacy are associated with higher levels of digital competence.

DISCUSSION

The purpose of this effort was to identify factors that influence digital competence. The results of a systematic literature review and thematic analysis revealed 16 factors that influence digital competence and fall into five groups, including demographic factors (age, sex, education level, career specialization, and past academic achievement), family background (parents' education, socioeconomic status, family cultural capital, and language integration at home), experience with technology (technology use and experience, training, and social media use), technology access (internet access and the number of digital tools), and attitudes (mastery orientation and self-efficacy). These findings have practical implications for training organizations that aim to prepare future technologically driven workforces.

First, this study indicates several individual demographic and family background variables that are outside of the control of organizations but influence digital competence. These factors could be leveraged to identify instructors or learners in an organization that might have digital competence gaps and need targeted interventions. Training organizations can assess individual differences in digital competence to gauge the state of trainees or instructors pre-training and adapt training based on these gaps so that learners with varying digital competencies advance to the required skillset at adequate levels. Further, endeavoring to create avenues for parents to experience new technology with their children and share digital resources through outreach programs, summer camps, STEM events, and family days can support parents who lack demographic factors such as higher SES and higher education in exposing their children to digital tools that they might not traditionally have access to. This may indirectly ignite and promote parent-children discussions about digital technology and promote the students' likelihood of improving their digital competence. Second, attitudinal factors that influence digital competence could be the focus of training interventions; for instance, by integrating activities that bolster technology or digital self-efficacy of learners or instructors, such as increasing exposure of instructors to novel technologies (e.g., social media, new media tools), providing scaffolding when new technologies are introduced, and optimizing challenge-skill match during technology-related learning material. Also, instructor attitudes toward technology should be managed to stimulate intrinsic motivation concerning technology implementation. This can be achieved by providing instructor autonomy when introducing new digital tools such that they have control of their learning and how to use technology. Also, encouraging instructors to pursue excellence in digital training and ICT implementation rather than external rewards can help improve intrinsic motivation. Third, technology access influences digital competence. Organizations can increase access to technological tools by diversifying the number and type of digital tools and resources available to trainees to foster exposure, digital skill development, and experience with technology. Finally, it appears that experience with technology is associated with increased digital competence. Organizations could integrate or infuse technology within non-technology-related disciplines to increase technology exposure, help alleviate technology-related anxiety, and improve self-efficacy. Further, digital citizenship of instructors in less technologically oriented domains (e.g., humanities) must be accorded digital experiences to attain digital competence levels more consistent with instructors in technology-driven domains (e.g., engineering). Technology-focused training, such as professional development of instructors that integrates hands-on workshops, could be leveraged to ensure instructors are prepared to appropriately integrate technology into curricula.

Understanding the digital divide and the factors that influence it has implications for the military. The military is an extremely technologically driven sector with major influences of new media technologies such as the Internet, mixed reality tools, streaming media, Internet of Things (IoT) devices, and social media (Murphy, 2008; Pötzsch, 2013). The battlefield is now a technological battlefield in which cyber warfare is as prevalent as physical warfare. As such, there is a need to develop digital competence in all warfighters as their duties will likely require it. Key to this is ensuring military instructors of all ages have the digital KSAs necessary to impart digital competence to cadets that are needed to address today's new media technology-related challenges. Such KSAs must be up-to-date and relevant to the ever-changing digital age and newer ICT tools. Moreover, military instructors should aim to leverage technology tools that can make training, in general, more effective and efficient, and to build their skills and afford trainees experience with such technological tools. It is also important to devise strategic training interventions for military instructors that identify their digital competence gaps and influencing factors that might be unique to the military sector and to tackle

them accordingly. Such strategic interventions might help narrow the digital divide between instructors and trainees and ensure warfighters possess the digital competence necessary for future digital warfare.

CONCLUSIONS AND FUTURE RESEARCH

Through a systematic literature review and thematic analysis, this effort identified 16 factors that influence digital competence and associated implications for training organizations. These findings confirm that age has influences on digital competence; however numerous other factors influence the digital divide, including demographic factors, family background, attitudes, experience with technology, and technology access. As such, the digital divide will likely persist for the foreseeable future. Therefore, training organizations must consider these factors in their training and personnel processes and procedures. These findings should be interpreted with caution due to several limitations of the study. Specifically, the literature review may not have been comprehensive, the studies reviewed had limitations in themselves, and the majority of the studies reviewed were conducted in Europe and Asia, which may not be completely generalizable to the United States and other regions with fewer studies incorporated in this analysis. Additional research is needed to examine digital competence with respect to technical and practical skills with specific technologies rather than using pencil and paper tests. Further, more research is needed in other sectors beyond education, such as the military, and in additional regions, such as the United States.

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