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Early-age Digital Experience Helps Form IT Identity and Its Impact on Workplace Performance

Liping Chen
Guanghua School of Management, 1901110922@pku.edu.cn

Minya Xu
Guanghua School of Management, minyaxu@gsm.pku.edu.cn

Azadeh Savoli
Ieseg, a.savoli@ieseg.fr

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Completed Research Paper

Liping Chen
Peking University,
Guanghua School of Management
Beijing, China
chen-liping@pku.edu.cn

Minya Xu
Peking University,
Guanghua School of Management
Beijing, China
minyaxu@gsm.pku.edu.cn

Azadeh Savoli
IESEG, School of Management
Paris, France
a.savoli@ieseg.fr

Abstract

One of the most anticipated questions in the digital age is how the generation who grew up with digital technologies will behave in the workplace. We investigate the role of early-age digital experience on performance drawing on IT identity theory. Specifically, we hypothesized that early-age digital experience indirectly relates to job performance and work innovation sequentially via IT identity and digital creativity. Additionally, perceived managerial support amplifies IT identity's influences on digital creativity as well as the indirect effects of early-age digital experience on work results. Data collected via a multiple-source and multiple-wave survey from 281 employees in a large Internet company support the research model. This research enriches the understanding of what drives individuals' digital creativity and demonstrates that employees with early-age digital experience are critical resources for organizational competitive advantage in a digital economy. Practical implications for employees' early-age digital use and workplace management are discussed.

Keywords: Early-age digital experience, IT identity, digital creativity, job performance, work innovation, perceived managerial support

Introduction

Children born and raised in a digital world – i.e., "Digital natives" (Prensky 2001a) – are exposed to digital technologies from an early age. Early-age digital experience is believed to give them greater familiarity with technology than people who were exposed to technology later in life. Therefore, such an experience makes them more receptive and tech-savvy, changing the way they think, regard information, and interact with digital technology (Prensky 2001b). As the generation who grew up with digital technologies gradually enters the workplace, especially for those entering IT departments, one of the most anticipated questions is how they will behave in the workplace. Specifically, while getting employees to adopt and use technology is likely to become less prominent, how these new-generation employees can use technology to produce value becomes a more pressing issue (Vodanovich et al., 2010). Answering this question has important

implications for guiding talent cultivation and workplace management in the digital age. However, the existing IS literature, for the most part, does not appear to respond to the arrival of the new generation of employees with early-age digital experience. Investigation on how early-age digital experience influences individual workplace performance is urgently needed.

Information technology (IT) identity may be an appropriate perspective for understanding how early-age digital experience influences individual workplace performance. IT identity refers to the sense of oneness with IT (Carter and Grover 2015; Ogbanufe and Gerhart 2020). An individual identifies with IT, indicating that it has become an important part of his/her self (Ashforth et al. 2016). Reviewing the existing research exploring the antecedents of IT identity, although IT identity theory suggests that IT identity is a long-term outcome from a history of interacting with IT (Carter & Grover, 2015), existing research mainly focused on the short-term antecedents of IT identity—for example, individual use of information technologies that were adopted in prior work experience (Carter et al., 2020b), individuals' use of health apps or smartwatches in recent years (Balapour et al., 2019; Ogbanufe & Gerhart, 2020). The long-term impact of early-age digital experience has not been well developed. Moreover, IT identity literature reveals the impact of IT identity on individual behaviors of using technologies. For instance, IT features usage and exploratory usage (Carter et al., 2020b), rich forms of technology use including frequency and extent of use (Carter et al., 2020a), and IS infusion and its three related behaviors including extended use, integrated use, and emergent use (Hassandoust & Techatassanasoontorn, 2021). Given the fundamental and decisive impact of employee's productivity and innovation on organizations' sustainability, it is surprising that research on the effects of IT identity on employee work results (including in-role job performance and extra-role work innovation) is relatively silent. Motivated by these research gaps, we aim to investigate if early-age digital experience can impact individuals' identification with technologies, consequently, how such identification impacts their performance later in their workplaces.

We build upon IT identity theory to answer these questions. We conceptualize early-age digital experience as individuals' exposure to ITs during their early age, characterized by high levels of facilitating conditions, social support, perceived ease of use, perceived usefulness, and perceived enjoyment. According to IT identity theory, an individual's IT identity is shaped by preexisting experiences tied to IT and will induce richer forms of IT use (Carter and Grover 2015; Carter et al. 2020a; Reychav et al. 2019). Therefore, we argue that early-age digital experience may shape one's IT identity, and IT identity can impact individuals' performance by fostering their digital creativity. Moreover, since employees do not work in a social vacuum, their manifestation of IT identity leading to digital creativity will be influenced by "significant others" within their work environment (Carter and Grover 2015; Liu et al. 2021), we argue that the relationship between IT identity and digital creativity may be moderated by perceived managerial support for using IT (hereinafter referred to as perceived managerial support). To examine our theoretical model, we conducted a longitudinal survey research design with data collected via a multiple-source and multiple-wave survey.

Our research contributes to the current literature by conceptualizing early-age digital experience as a multifaceted construct (with five dimensions) which provides more depth to this concept compared to early studies that measured it through a unidimensional perspective (i.e., age). Moreover, by providing empirical evidence to support the positive influence of early-age digital experience on employees' identification with digital technologies in their workplace, our research contributes to extant research on IT identity. Finally, our research identifies mechanisms through which IT identity can lead to higher workplace performance.

Theoretical Background

IT Identity Theory

We use IT identity theory as a theoretical foundation of our research model. Underlying IT identity theory is identity, which refers to a set of meanings that a person applies to his or her self as a response to the question, 'Who am I?' (Balapour et al. 2019; Hassandoust and Techatassanasoontorn 2021; Stets and Biga 2003). To clarify the intertwinement of IT and identity, Carter and her colleagues put forth the construct of IT identity, which is defined as "the extent to which an individual views use of an IT as integral to his or her sense of self" (Carter & Grover, 2015, pp.932). IT identity is reflected in the relatedness, emotional energy, and dependence individuals feel when they think of ITs (Carter and Grover 2015). This study focuses on general IT identity, reflecting self-identification with IT across a wide range of hardware devices, software applications, and application environments (Carter & Grover, 2015).

Carter and colleagues proposed a theoretical model for IT identity to understand individuals' behavior with respect to IT in embedded social contexts. In this theoretical model, IT identity can be treated as both a consequence of preexisting behaviors and beliefs tied to IT and an antecedent of a wide range of related behaviors (Carter and Grover 2015). As a consequence, considering that humans need certain material resources and intrinsic gratifications to sustain the pursuit of their enterprises, having gained material support or emotional benefits from past use experience would probably enhance the strength of one's IT identity (Carter and Grover 2015; McCall and Simmons 1978). Following this logic, if a person has the material conditions and emotional support to use digital technologies as well as finds digital technologies easy to use and facilitate high performance and enjoyment at an early age, he or she may develop a tendency to associate with digital technology in terms of self-perception as he or she grows up. Thus, we conjecture that employees' early-age digital experience may help foster IT identity. As an antecedent, since IT identity often implies active mastery and control of IT (Dittmar 2011), and individuals need to self-identify themselves (Swann Jr et al. 2005), IT identity will evoke various IT behaviors, such as enhanced use and richer forms of use (Carter and Grover 2015; Carter et al. 2020a; Reychav et al. 2019). To manifest and bolster their IT identity at workplaces, individuals with a strong IT identity tend to use digital technologies creatively and actively. Therefore, employees' IT identity may trigger their digital creativity in the workplace. Further, we posit that digital creativity would help contribute to their job performance and job innovation.

What's more, considering that the probability of an identity being evoked depends on situational influences, the relationships between IT identity and the outcomes it leads to may be moderated by the social context, including opportunities and support (Carter and Grover 2015). Given managers' hierarchical position, managers have plentiful opportunities and the authority to reinforce or restrict digital creativity. Along these lines, we try to investigate the moderating effect of perceived managerial support for using IT on the relationship between IT identity and digital creativity.

Given the above recognition and derivations about IT identity theory, we hypothesized that early-age digital experience indirectly relates to job performance and work innovation sequentially via IT identity and digital creativity. Additionally, perceived managerial support amplifies IT identity's influences on digital creativity as well as the indirect effects of early-age digital experience on work results. Table 1 summarizes the definition of the key constructs in our research model. We next present the conceptions of and related literature about the key constructs in our research model.

Constructs	Definitions
Early-age digital experience	Individuals' exposure to ITs during their early age, which is characterized by high levels of facilitating conditions, social support, perceived ease of use, perceived usefulness, and perceived enjoyment.
IT identity	The extent to which an individual views the use of ITs as integral to his or her sense of self (Carter and Grover 2015).
Perceived managerial support	Employees' perceived support for using IT from the management (Leonard-Barton and Deschamps 1988).
Digital creativity	Employees' generation of fresh and useful ideas or plans through the use of digital technologies (Shao et al. 2021).
Job performance	Employees' adequately completing assigned duties (Williams and Anderson 1991).
Work innovation	Employees' solutions of problems and products in ways that are original (Farmer et al. 2003).
Table 1. Definitions of Study's Key Constructs	

Early-age Digital Experience

Early-age digital experience refers to the experience of regularly using digital technologies at an early age, usually under the age of 15 (e.g., Lipperman-Kreda & Grube, 2019). With the advent of the digital era,

various digital technologies (such as mobile phones, tablets, computers, etc.) are gradually integrated into people's lives. New generations of children have been exposed to digital technologies from an early age. For example, they are used to making calls and sending messages on mobile phones, doing homework and playing games on computers, and so on. Digital technologies are familiar companions for them, and they are considered more receptive and tech-savvy (Prensky 2001b).

A similar term to early-age digital experience in literature is "digital natives". Marc Prensky coined the phrase "digital natives" to refer to a generation of young people who have grown up in a world where the use of information and communications technologies is pervasive and ubiquitous (Prensky 2001a; Prensky 2001b). Existing research mainly uses "age" as a proxy of digital natives, that is, those born after a specific year (somewhere between the late 1970s and the late 1990s) were considered digital natives. However, this rigid dichotomy measure has been criticized (Brown and Czerniewicz 2010; Jones and Czerniewicz 2010). Researchers argued that age could not represent individuals' digital lives, for example, scholars have found that young people's technology experience and skills are far from uniform (Bennett et al. 2008). Instead, their familiarity with and experience using digital technologies are more relevant (Brown and Czerniewicz 2010). Following this line of thought, we propose the concept of early-age digital experience, which can be a better way to conceptualize the digital lives of individuals born into the digital age.

We conceptualize early-age digital experience as a five-dimension construct drawing on literature on technology acceptance. Early-age digital experience refers to the experience of individuals in the initial phase of contact with digital technology, which is consistent with the application scenario of technology acceptance literature (Carter et al. 2020a). Drawing on the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003; Venkatesh et al. 2012), we conceptualize early-age digital experience as the five-dimension experience of using information technologies at an early age, including facilitating conditions, social support, perceived ease of use, perceived usefulness, and perceived enjoyment. The five dimensions in UTAUT have been admitted as comprehensive, effective, and well-adapted measures of individual experience of using information technologies over several years (Venkatesh et al. 2016). IT identity theory suggests that the prior IT-related experience, as a precondition for the development of IT identity, includes embeddedness of IT, computer self-efficacy, and actualized rewards (e.g., net benefits, enjoyment, and satisfaction) (Carter & Grover, 2015), and these aspects can be captured by the experiences of the five dimensions mentioned above. The recollections about these dimensions of experience reflect the history of personal interaction with technologies (Carter et al. 2020a), which can provide a refined measurement of individual early-age digital experience from the angles of adoption cost, personal feelings, and environmental influence. We next describe each of the dimensions to conceptualize early-age digital experience.

Facilitating conditions mean the extent to which a person perceived the environment to be supportive of his/her use of technologies in early years (Venkatesh et al., 2003), such as the availability of digital devices at home and whether someone taught them to use them. Social support refers to what extent a person perceived that people important to him or her, such as teachers and parents, encouraged him or her to use technologies (Venkatesh et al., 2003). Facilitating conditions and social support reflect the embeddedness of digital technologies in one's early-age lives. Perceived ease of use describes the process and cost of individual using technology at an early age, which captures how smooth it was for an individual to use technology (Venkatesh et al., 2003). Also, to some extent, it reflects one's experience of beliefs about his or her capabilities of using technologies. Next, perceived usefulness and perceived enjoyment embody actualized rewards (Carter & Grover, 2015). Perceived usefulness means to what extent a person perceived that using technologies helped him or her achieve performance gains, as well as receive recognition and rewards in school or at home (Venkatesh et al., 2003). Perceived enjoyment measures an individual's direct positive emotional experience – the fun or pleasure of using digital technology at an early age. Enjoyment is important since it is an essential motivation for young people and affects their attitude towards technology (Venkatesh et al., 2012).

Early-age digital experience, or digital natives that are called traditionally, has spurred large amounts of research on its effects on individual skills or behaviors. Prior research suggests that early-age digital experience was associated with higher-level learning skills during school time, such as fast web search (Thompson 2013), using unfamiliar technologies to create valuable artefacts (Ng 2012), and confidence in their skills in using various computer technologies and applications (Jones et al. 2010). The bulk of the evidence also indicates that early-age digital experience is linked to interpersonal behaviors using online

services, including self-disclosure through social networks (Gentina and Chen 2019; Liu et al. 2019), online trust (Hoffmann et al. 2015), and protest participation (Hsiao 2018). According to existing studies, early-age digital experience makes individuals habitually trust and apply digital technology in learning and other life activities, where digital technology may have become a part of their self-recognition. Following the above logic, the influence of early-age digital experience on individuals may not be limited to the pre-work stage but also extends to workplace activities. However, scant research exists on the profound impact of early-age digital experience on individual workplace competence and performance, as well as its influence mechanism.

Digital Creativity

As the generation of tech-savvy digital natives enters the workforce, the previous concerns about getting employees to adopt and use technology are no longer a core concern, and how employees can use technology to produce value is a more pressing issue (Vodanovich et al. 2010). Hence, in the present study, we focus on digital creativity, which involves knowing how to engage with new technologies and producing things of significance with technologies.

As digital technologies (e.g., social media, Internet, email) rapidly penetrate business applications, and creativity becomes more important in the competitive business environment, the concept of digital creativity has gained increasing attention in recent years (Lee and Chen 2015; Shao et al. 2021). Digital creativity is defined as "employees' generation of fresh and useful ideas or plans through the use of digital technologies" (Shao et al. 2021, pp.3). Digital creativity demands the exploitation of digital technologies by proactive tech-savvy employees who understand the capabilities of digital technologies and are proficient in exploring ways of using them to create work value (Stephan et al. 2017). It is worth noting that creativity differs from innovation, as creativity happens at the stage of generating novel ideas, while innovation happens at the subsequent stage of idea implementation (Anderson et al. 2014; Nambisan et al. 2017).

Existing literature on digital creativity mainly focuses on how the use of technology fosters individual creativity in general. For example, creative job performance was found to relate to habitual use and task-technology fit for mobile enterprise applications (Chung et al. 2015). A laboratory experiment examined that the sketchy visual appearance of ideas on a virtual whiteboard prompts idea generation (McGrath et al. 2016). In addition, researchers investigated how employees' exploitative technology use and explorative technology use influence their digital creativity (Shao et al. 2021). These discussions informed us how the various types of outward technology use behavior improve digital creativity. However, few studies revealed whether employees' inward IT identity leads to digital creativity. Since employees with high IT identity have a great interest in directing attention and effort to interact with technologies, we speculate that employees with inward self-identification are fundamentally more likely to use digital technologies to produce creative and valuable ideas. Furthermore, whether digital creativity can indeed further help improve in-role and extra-role performance also urgently needs to be answered.

Hypotheses Development

Early-age Digital Experience and IT Identity

IT identity refers to the sense of oneness with IT (Carter and Grover 2015; Ogbanufe and Gerhart 2020), a multi-dimensional construct that reflects an individual's feeling of relatedness, dependence, and emotional value when they think of ITs (Carter and Grover 2015). Literature on IT identity has suggested that employees' IT identity is formed by their histories of interacting with IT instead of the expectations or goals of the organization (e.g., Burke and Stets 2009; Hassandoust and Techatassanasoontorn 2021). We envision that early-age digital experience helps shape one's IT identity.

We define early-age digital experience as individuals' exposure to technologies during their early age, characterized by high levels of facilitating conditions, social support, perceived ease of use, perceived usefulness, and perceived enjoyment. Employees with early-age digital experience have grown up accompanied by high facilitation and greater exposure to various ITs (e.g., hardware device, software application, or application environment) and have gained high support from important others of using ITs. They were passionately infused with ITs to conduct usual activities, such as learning, fulfilling tasks, and recreating. These employees are familiar and connected with ITs and rely on technologies for their personal

and social routines (Gong et al. 2021). Human early age is a unique human developmental phase, where unconscious potentials can be triggered by the support of an early-age surrounding environment (Danielsbacka and Tanskanen 2012). Substantial learning processes are located at an early age that eventually influences the individual adult with respect to behavioral patterns, skills, abilities, values, and defenses (Keller 2010). Hence, early-age life digital experience can be enduring, shaping an individual's perception and connection of IT throughout life (Campbell et al. 2019). As technologies become an inseparable part of their everyday lives, they are more likely to constitute IT identity.

Furthermore, for employees with early-age digital experience, various benefits from using technologies would make them consider using ITs as an intrinsic way of life. For example, they tend to obtain joy and energy from using technologies (Wang et al. 2019). Tangible benefits resulting from early-age technology use, such as usefulness, convenience, and effectiveness, would help build and consolidate individuals' capabilities and help increase a sense of relation with ITs (Carter and Grover 2015; Ogbanufe and Gerhart 2020; Rai et al. 2002). ITs could increase not only individuals' personal resources but also social resources (e.g., belongingness and connectedness with others), which would further help them perceive the use of ITs as integral to themselves (Carter and Grover 2015; Ogbanufe and Gerhart 2020). Hence, we propose the following hypothesis.

Hypothesis 1: Employee early-age digital experience is positively related to IT identity.

IT Identity and Digital Creativity

Digital creativity indicates employees' generation of ideas to improve workplace performance by using digital technologies, such as internet-of-things (IoT), cloud computing, and mobile applications (Shao et al. 2021). Scholars have realized the importance of digital creativity in the digital age since the benefits of technology use would hit a limit if employees no longer search for ways to apply digital technologies to improve their work (e.g., Carter et al. 2020b).

IT identity encompasses information about who an individual is and how he/she should behave in their interactions with technologies (Stets and Biga 2003). Identities would motivate individuals to define and create social environments that confirm and reinforce their identities (Swann Jr et al. 2005). Stronger IT identities are assumed to have strong reliance, dependency, and emotional attachment toward ITs in embedded social contexts, such as the workplace (Carter and Grover 2015). Employees with high IT identity have intrinsic interest, enjoyment, and passion for directing attention and resources to interact with digital tools and technologies at workplaces to enhance their work performance innovatively. To successfully manifest and bolster their IT identity at workplaces, they can proactively demonstrate their knowledge and control over the feature sets of ITs to improve their work, rather than passively implement or accept the routine use of technologies (Ogbanufe and Gerhart 2020). In addition, employees with high IT identity are experienced with technologies and have developed habits of use, which allow them to interact with technologies efficiently and create rich forms of technology use (Carter and Grover 2015; Carter et al. 2020a; Jasperson et al. 2005). They are equipped with the capabilities afforded by ITs and can utilize a high level of skills by integrating different features of ITs to deal with problems and improve their work quality by changing the way they work (Hassandoust and Techatassanasoontorn 2021). Furthermore, employees who are highly adept with digital technologies are good at utilizing them to gather a range of information and share, co-create, discuss and modify ideas in the borderless and limitless digital worlds (Bennett et al. 2008), which can enable them to galvanize support and leverage the benefits of ITs into new ideas for improving the workplaces (Hassandoust and Techatassanasoontorn 2021; Janse van Rensburg et al. 2021). In sum, we propose the following hypothesis.

Hypothesis 2: Employee IT identity is positively related to digital creativity.

Digital Creativity and Workplace Performance

The combined effect of employees utilizing digital creativity contributes to dynamic work improvement, which is more beneficial to organizations than the fixed practice of technology use (Dutton and Thomas 1984). Employees with high digital creativity indicate that they are competent in incorporating technologies to discover new methods to achieve work goals, allowing more value (e.g., productivity and innovation) derived from ITs.

Digital creativity occurs in concert with workplace technologies and organizational action. Employees of high digital creativity would actively improve current processes, products, or services through the use of ITs. Digital creativity can transcend increases in task efficiency, effectiveness, and accuracy, which contribute to the quantity and quality of tasks an employee completes (Hassandoust and Techatassanasoontorn 2021; Ogbanufe and Gerhart 2020).

In addition to improving current work, digital creativity can also help trigger changes in existing core processes, products, or customer interactions. As commented by Tyler and Steensma (1998), technology does not only drive business today but also changes business. For example, Kallinikos and Tempini demonstrated that digital technologies help generate innovation in medical work practices (Kallinikos and Tempini 2014). Cybulski et al. showed that employees can access information about potential customers and target market trends through using crucial digital resources, and interactively evaluate and implement creative ideas using digital media based on the obtained information (Cybulski et al. 2015). Hence, employee digital creativity can not only enhance job performance but also increase work innovation.

Hypothesis 3: Employee digital creativity is positively related to job performance (H3a) and work innovation (H3b).

Based on IT identity theory, the experience of growing up with technology that provides material and internal gratifications shapes individuals' different mental models related to technology than the workplace counterparts with a different upbringing experience. They tend to consider ITs as an indispensable part of their lives and have accumulated sophisticated knowledge of technology (Carter and Grover 2015). And these employees with a strong IT identity tend to use technologies to solve problems no matter at home or workplace (Wang et al. 2019). Hypothesis 1 proposes that employee early-age digital experience is positively related to IT identity. Hypothesis 2 expects that employee IT identity is positively related to digital creativity. Hypothesis 3 assumes employee digital creativity is positively related to job performance (H3a) and work innovation (H3b). Connecting these three hypotheses, we further summarize that the effect of employee early-age digital experience on job performance and work innovation is sequentially mediated by IT identity and digital creativity (i.e., mediation; Edwards and Lambert 2007).

Hypothesis 4: The effect of employee early-age digital experience on job performance (H4a) and work innovation (H4b) is sequentially mediated by IT identity and digital creativity.

Perceived Managerial support as a Moderator

Since the benefits IT identity can be evoked by situational influences at workplaces (Carter and Grover 2015), the influence of IT identity on digital creativity may be moderated by important ones (e.g., managers). Digital creativity indicates thinking of new ways to improve or change the existing work procedure using technologies. Though it can help pursue work goals, it would change the status quo and incur punishment (e.g., Harris et al. 2014). Employees' conducting digital creativity is driven by the belief that doing so will be advantageous in workplaces (Aron et al. 2003; Burke and Stets 2009). When managers support and reward IT use at workplaces, they send out signals that it is beneficial and appreciated for employees to act in accord with their IT identity, which promotes the manifestation and activation of employees' IT identity leading to more digital creativity. Furthermore, with high levels of perceived managerial support, employees are equipped with more formal or informal sources (e.g., IT infrastructure, expertise, and social networks) that are available when developing creative ideas (Oldham and Cummings 1996; Scott and Bruce 1994). Hence, we propose the following hypothesis.

Hypothesis 5: Perceived managerial support moderates the positive relationship between IT identity and digital creativity, such that the positive relationship is stronger when perceived managerial support is high.

Based on IT identity theory, employees' upbringing with technology may shape their tendency to view IT as a part of self, and employees' IT identity may affect their behavior and performance in the workplace. Hypothesis 4 proposes that the effect of employee early-age digital experience on job performance (H4a) and work innovation (H4b) is sequentially mediated by IT identity and digital creativity. Hypothesis 5 claims that perceived managerial support moderates the positive relationship between IT identity and digital creativity. Connecting these two hypotheses, we further expect that perceived managerial support moderates the indirect influence of employee early-age digital experience on job performance and work innovation sequentially through IT identity and digital creativity (i.e., moderated mediation; Edwards and

Lambert 2007). Specifically, when perceived managerial support is at a high level, the indirect impact of employees' early-age digital experience on job performance and work innovation is stronger.

Hypothesis 6: Perceived managerial support moderates the indirect effect of employee early-age digital experience on job performance (H6a) and work innovation (H6b) sequentially through IT identity and digital creativity, such that the indirect effect is stronger when perceived managerial support is high. Figure 1 presents our research model.

Figure 1. Research Model
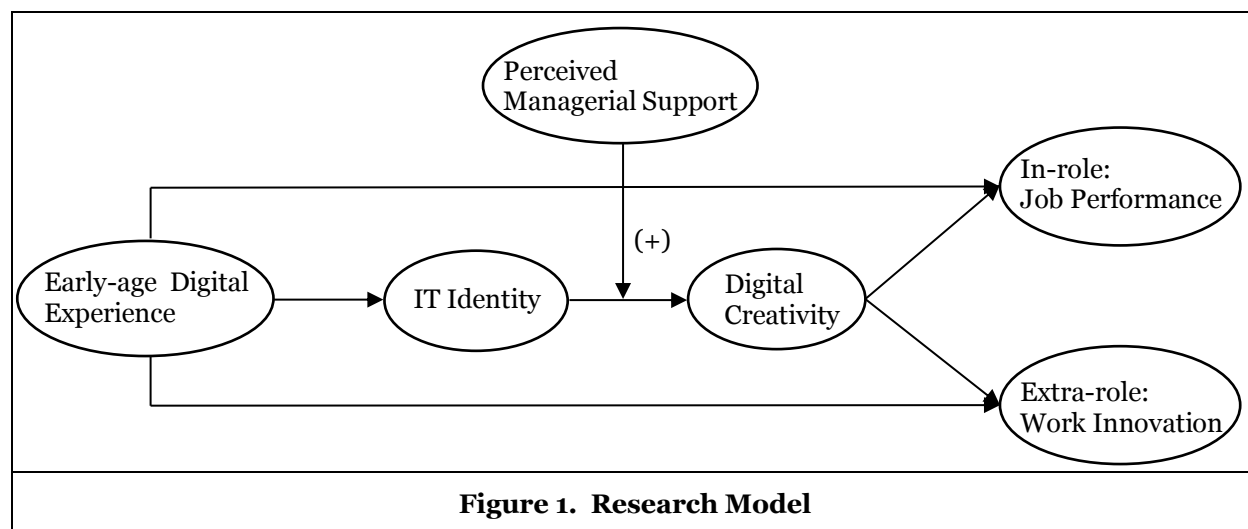
Research Method

Pilot Study

Given the nonexistent measures of early-age digital experience, we conducted a pilot study to develop and validate the new measure of this construct. Specifically, we built the scale of early-age digital experience based on the measures of Venkatesh et al. (2003) and Venkatesh et al. (2012). Venkatesh and colleagues focused on the individual experience of using information technologies in the present, while we considered individuals' experience of using information technologies at an early age. We adapted their scale by rephrasing the items to make them more suitable for rating early-age digital experience. We asked respondents to evaluate their early-age digital experience as a second-order construct that includes five aspects (the first-order constructs) – facilitating conditions, social support, perceived ease of use, perceived usefulness, and perceived enjoyment. A sample item of facilitating conditions is "When I was young (< age 15), I had the resources necessary to use digital technologies". A typical item of social support is "When I was young (< age 15), people who were important to me thought that I should use digital technologies". A typical item of perceived ease of use is "When I was young (< age 15), it was easy for me to become skillful in using digital technologies". A sample item of perceived usefulness is "When I was young (< age 15), using digital technologies enabled me to solve problems more quickly". And one sample item of perceived enjoyment is "When I was young (< age 15), using digital technologies was fun". We also asked them to evaluate their technology self-efficacy, intention to explore, and digital skill of problem-solving.

We surveyed 150 IT workers from Chinese Internet companies to assess the scale. Among this pilot sample, 60 (40.00 %) were male, and their average age was 29.5 (SD = 6.23) years. They had an average of 16.28 (SD = 1.29) years of education and 3.93 (SD = 3.12) years of job tenure. For both pilot and main studies, we adopted Brislin's (1980) repeated translation process to create Chinese versions of the measures. All statements were evaluated with a seven-point Likert scale in which 1 represents "strongly disagree" and 7 represents "strongly agree". Cronbach's alpha for early-age digital experience was .84. To validate our scales, we first conducted confirmatory factor analysis (CFA). A four-factor measurement model fitted data well (χ^2 /df = 1.60, p < .001; SRMR = .08, RMSEA = .06, CFI = .92, TLI = .91) and significantly outperformed all other alternative models (these results are available from the authors). These tests indicated high convergent and discriminant validity for our newly adapted measures (Hu & Bentler, 1999). Further, we examined the nomological network of early-age digital experience (Hinkin, 1998) by assessing how it relates

to technology self-efficacy, intention to explore, and digital skill of problem-solving. Correlation analysis further showed that early-age digital experience is related to technology self-efficacy (β = .16, SE = .05, p < .01), intention to explore (β = .14, SE = .06, p < .05), and digital skill of problem-solving (β = .17, SE = .05, p < .001). These results validated the early-age digital experience scale.

Sample and Procedures

We empirically examined the research model using a longitudinal survey design with data collected via a multiple-source and multiple-wave survey in a large Internet company. The Internet company offers millions of users with online services, including news, music, games, etc. After sending out the survey recruitment information with the help of human resource management department, 339 employees from 113 teams in IT department expressed interest in participating in the survey. In the survey recruitment information, we described the background of the study in clear detail to help respondents understand the study. We made it clear that all participants were voluntary and anonymous and that they would receive 20 RMB for completing each survey (there were four surveys, each with two weeks apart). At Time 1 (June 2021), all 339 participants completed the survey of early-age digital experience according to their experiences at an early age and also reported their demographics. At Time 2 (July 5, 2021), participants reported IT identity and perceived managerial support. At Time 3 (July 19, 2021), participants reported digital creativity. At Time 4 (August 2, 2021), we asked their corresponding supervisors to report the employees' job performance and work innovation. In the questionnaire filled out by the respondents, we provided definitions of important concepts to avoid cognitive bias of the respondents. After eliminating the unmatched, incomplete and missing questionnaires, we had 281 (total responding rate was 82.89%) valid employee responses and 106 valid leader responses. Of the 281 employees, 133 (47.33 %) were male. Participants' average age was 26.74 (SD = 2.15) years. They received an average of 15.41 (SD = 0.68) years of education. Their average job tenure was 3.93 (SD = 1.80) years. To detect potential non-response bias in the sample, we compared the means of the respondents with those of the non-respondents on their demographic characteristics. We ran t-tests for continuous variables and chi-square tests for categorical variables. No significant differences were detected for gender ($\chi^2(1)$ = .33, p = .57), age (t =.39, p = .69), education years (t = 1.08, p = .28), or job tenure (t = .22, p =.83) between respondents and non-respondents.

Measures

Early-age digital experience. We measured early-age digital experience with the scale developed in the pilot study. Cronbach's alpha was 0.95. We assessed IT identity using the six-item scale developed by Carter et al. (2020b). Example items are "Thinking about myself in relation to digital technologies, I am linked with digital technologies", "Thinking about myself in relation to digital technologies, I am energized", and "Thinking about myself in relation to digital technologies, I am linked with digital technologies". Cronbach's alpha was 0.86. We employed the three-item perceived managerial support scale from Elie-Dit-Cosaque et al. (2014). A sample item is "My boss is very supportive of technology use for my work". Cronbach's alpha was 0.92. Digital creativity was measured with a six-item instrument adapted from van Laar et al. (2019). An example item is "I think about using technology to execute my tasks creatively." Cronbach's alpha was 0.86. Job performance was assessed using a five-item instrument from Eisenberger et al. (2010) adapted from Williams and Anderson (1991). An example item is "This employee adequately completes assigned duties." Cronbach's alpha was 0.90. Work innovation was assessed using a four-item instrument adapted from Farmer et al. (2003) and Zhang et al. (2020). A typical item is "This employee implements ground-breaking ideas related to the field." Cronbach's alpha was 0.92. We included employees' gender, age, education years, and job tenure as control variables.

Results

Analyses

Table 2 presents the means, standard deviations, and correlations of the variables. Since our data are nested, as the teams being level 2 and the employees being level 1, we used Mplus 8 to conduct CFA to test the discriminant validity of the factors (early-age digital experience, IT identity, perceived managerial support, digital creativity, job performance, and work innovation) at level 1. The construct items and factor loadings of the confirmative factor analysis were shown in the appendix. The model fit for the six-factor model (χ^2

/df = 2.09, p < .001; $SRMR_{within}$ = .06, $RMSEA$ = .06, CFI = .92, TLI = .92) was superior to all other alternative models, lending support for discriminant validity (Hu and Bentler 1999).

Variables	M	SD	1	2	3	4	5	6	7	8	9	10
1. Gender	.47	.50										
2. Age	26.74	2.15	.06									
3. Education years	15.41	.68	-.02	.12								
4. Job tenure	3.93	1.80	.11	.85***	-.21***							
5. Early-age digital experience	4.95	1.09	.01	.21***	.19**	.05	.95					
6. IT identity	5.06	.71	-.06	.12*	.05	.06	.18**	.86				
7. Perceived managerial support	5.56	.93	.07	.12*	.11	.05	.64***	.12*	.92			
8. Digital creativity	4.90	.62	.02	.14*	.02	.06	.21***	.53***	.17**	.86		
9. Job performance	5.57	.79	.11	.31***	.06	.23***	.54***	.11	.40***	.24***	.90	
10.Work innovation	4.31	.94	.07	.18**	.04	.13*	.32***	.08	.22***	.23***	.43***	.92

Table 2. Descriptive Statistics, Correlations, and Reliabilities of Study Variables

Notes: Level 1: N = 281; Level 2: n = 106. *** p < .001, ** p < .01, * p < .05, two-tailed. Reliabilities are listed on the diagonal. Gender: 0 = female, 1 = male.

Hypothesis Testing

Given the nested nature of our data, we used structural equation modeling (SEM) via Mplus 8 to specify teams as level 2 and test our model at level 1. The overall mediation model fits the data well (χ^2 /df = 1.97, p < .001; $SRMR_{within}$ = .07, $RMSEA$ = .06, CFI = .92, TLI = .91). The estimates for the main paths were shown in Table 3. The results showed that early-age digital experience was positively related to IT identity (β = .13, SE = .05, p < .01) (see Model 1 of Table 3), thus, Hypothesis 1 was supported. IT identity is positively related to digital creativity (β = .40, SE = .06, p < .001) (see Model 2 of Table 3), indicating that Hypothesis 2 was supported. Also, Hypothesis 3a and 3b were supported since digital creativity was positively related to job performance (β = .37, SE = .13, p < .01) (see Model 3 of Table 3) and work innovation (β = .37, SE = .12, p < .01) (see Model 4 of Table 3).

	Model 1	Model 2	Model 3	Model 4
Predictors	IT identity	Digital creativity	Job performance	Work innovation
Gender	-.11(.09)	.06(.05)	.11(.08)	.06(.08)
Age	.04(.05)	.06*(.03)	.05(.05)	.00(.04)
Education years	-.04(.08)	-.06(.05)	-.04(.08)	.01(.07)
Job tenure	-.03(.06)	-.06(.04)	-.04(.05)	.04(.05)
Early-age digital experience	.13**(.05)	.00(.04)	.36***(.06)	.20***(.06)
IT identity		.40***(.06)	-.16(.09)	-.13(.08)
Perceived managerial support		.06(.04)	.07(.07)	-.01(.07)
Digital creativity			.37**(.13)	.37**(.12)

Table 3. Coefficients of Latent Structural Equation Model for Mediation

Notes: Level 1: *N* = 281; Level 2: n = 106. Standard errors (SE) in parentheses. *** *p* < .001, ** *p* < .01, * *p* < .05. Gender: 0 = female, 1 = male. AIC = 25,136.78.

Hypothesis 4a and 4b propose that early-age digital experience positively relates to job performance and work innovation via the chain mediators of IT identity and digital creativity. Since the indirect effect rarely meets the normal distributional assumptions and our samples are nested within teams, we used Monte Carlo simulations to generate confidence interval (CI) for the indirect effects based on 10,000 samples (e.g., Preacher and Selig 2012). The simulated CI did not contain zero, which confirmed the mediating effects of early-age digital experience on job performance (indirect =.019, 95% *CI* [.003, .042]) and work innovation (indirect =.019, 95% *CI* [.004, .042]). Therefore, Hypothesis 4a and 4b were supported.

We used latent moderated structural equations (LMS) method to model latent interactions (Cheung and Lau 2017; Maslowsky et al. 2015). The AIC for the moderated model (25,133.35) was lower than the mediation model (25,136.78), indicating an improvement in model fit (Sardeshmukh and Vandenberg 2017). Hypothesis 5 proposes that perceived managerial support moderates the positive relationship between IT identity and digital creativity. This hypothesis was supported as the interaction term of IT identity and perceived managerial support was significantly related to digital creativity (β = .15, *SE* = .06, *p* < .01) (see Model 2 of Table 4). We plotted this interaction effect in Figure 2, which depicts the significantly different simple slopes of IT identity on digital creativity when employees perceived low and high managerial support (β_{low} = 0.26, β_{high} = 0.51; *diff* = .25, p < .01).

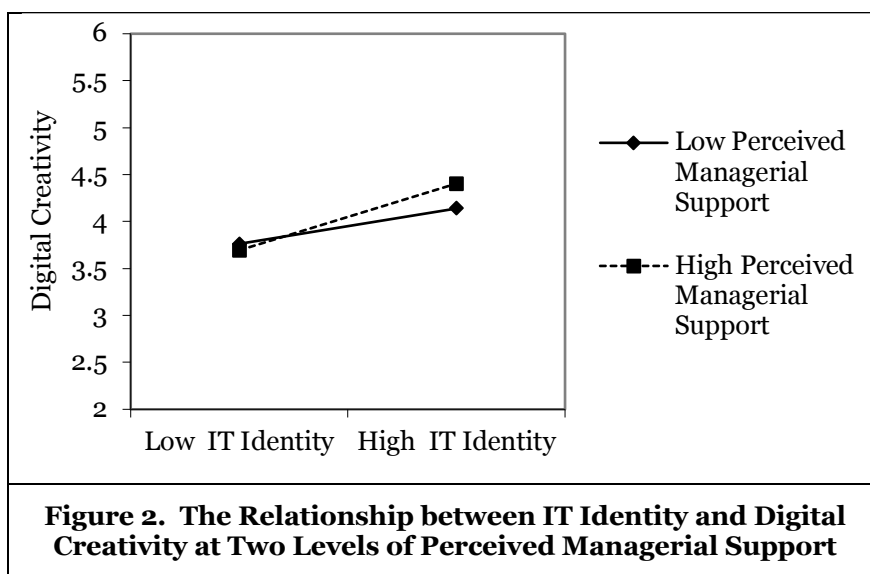|	Model 1	Model 2	Model 3	Model 4
Predictors	IT identity	Digital creativity	Job performance	Work innovation
Gender	-.11(.09)	.06(.05)	.11(.08)	.06(.08)
Age	.04(.04)	.05(.04)	.06(.04)	.01(.05)
Education years	-.06(.06)	-.05(.05)	-.04(.07)	.01(.08)
Job tenure	-.02(.05)	-.05(.04)	.03(.06)	.04(.06)
Early-age digital experience	.13**(.05)	.01(.04)	.35***(.06)	.20***(.06)
IT identity		.39***(.06)	-.16(.09)	-.13(.10)
Perceived managerial support		.06(.15)	.07(.11)	-.01(.09)
IT identity × Perceived managerial support		.15**(.06)	-.09(.10)	-.07(.08)

Table 4. Coefficients of Latent Structural Equation Model for Moderated Mediation

Notes: Level 1: *N* = 281; Level 2: n = 106. Standard errors (SE) in parentheses. *** *p* < .001, ** *p* < .01, * *p* < .05. Gender: 0 = female, 1 = male. AIC = 25,133.35.

Hypothesis 6a and 6b suggest that perceived managerial support moderates the indirect effect of early-age digital experience on job performance and work innovation, such that the indirect effects are weakened when perceived managerial support is at low levels. We used Monte Carlo simulations to generate confidence interval (CI) for the moderated mediation index (MMI). The results showed that the moderated mediating effects of early-age digital experience on job performance (MMI = .008, 95% *CI* [.001, .021]) and work innovation (MMI = .008, 95% *CI* [.001, .020]) were significant (Hayes 2015).

What is more, we conducted a post hoc analysis to investigate the effects of different dimensions of early-age digital experience on IT identity. We aggregate the five dimensions (facilitating conditions, social influence, effort expectancy, performance expectancy, and hedonic motivation) of early-age digital experience into a second-order construct in prior analysis because these five dimensions are colinear. The similarity between evaluations of the five dimensions of early-age digital experience may be due to that the experiences of using digital technologies in early years were relatively distant for participants and the experiences had become an overall impression in their memories. To confirm the effects of each of the five

dimensions of early-age digital experience on IT identity, we conducted a post hoc analysis by replacing early-age digital experience with one of the five dimensions. The results showed that facilitating conditions (β = .08, SE = .04, p < .05), social support (β = .11, SE = .04, p < .01), perceived ease of use (β = .09, SE = .03, p < .01), perceived usefulness (β = .10, SE = .04, p < .01), and perceived enjoyment (β = .13, SE = .05, p < .01) were all positively related to IT identity.

Figure 2. The Relationship between IT Identity and Digital Creativity at Two Levels of Perceived Managerial Support

Discussion

Drawing on IT identity theory, we investigate the role of early-age digital experience on job performance. Our research model revealed that early-age digital experience reinforces IT identity, which positively affects workplace in-role performance and extra-role performance–innovation through digital creativity. Additionally, perceived managerial support amplifies IT identity's influences on digital creativity and the indirect effects of early-age digital experience on in-role performance and innovation through IT identity and digital creativity. These findings offer several theoretical and practical implications, as discussed below.

Theoretical Implications

First, this research innovatively explores the profound effect of early-age digital experience on workplace digital creativity and subsequent in-role and extra-role performance through IT identity. Most information systems research has focused on technologies applied in work and how to promote employees to use these technologies where these employees are assumed to "resist" technology or at least have some difficulty in accepting it (e.g., Avgar et al. 2018; Robert and Sykes 2017; Zhang and Venkatesh 2017). As the new generation of employees regularly use information technologies from an early age, getting them to adopt and use technology is likely to become less prominent, and how they can use technology to produce value becomes a more pressing issue (Vodanovich et al., 2010). Despite the call for a new IS research agenda to cater to the rise of employees with early-age digital experience (Vodanovich et al. 2010), conclusive evidence on the effects of early-age digital experience on IT workers' workplace performance and influencing mechanisms is still quite scant. This paper contributes to IS research by providing empirical evidence to support the positive influence of early-age digital experience on IT workers' digital creativity and performance, which broadens the lens of the antecedents of employees' IS use and related performance from short-time effects to long-time effects.

Second, this research contributes to the literature on digital natives or digital experience by defining and measuring the early-age digital experience in a fine-grained way and broadening the consequences of early-age digital experience. On the one hand, instead of focusing on the unidimensional perspective – age, this study proposes measuring multifaceted construct (with five-dimension) – early-age digital experience (including experience of facilitating conditions, social support, perceived ease of use, perceived usefulness, and perceived enjoyment) (Venkatesh et al. 2003; Venkatesh et al. 2012). By conceptualizing early-age

digital experience and measuring it with a detailed scale, this paper responds to the claim of (Brown and Czerniewicz 2010) and (Jones and Czerniewicz 2010) to better conceptualize and understand the digital lives of individuals born in the digital age, as well as its contribution to the development of IT identity. On the other hand, although digital natives are considered addicted to and good at innovation (e.g., Bagur-Femenías et al. 2020; Baudier et al. 2020; Mizrachi and Bates 2013), no systematic body of empirical evidence has been presented on how this happens. This paper contributes to existing studies by revealing how early-age digital experience influences employee digital creativity and work innovation from the perspective of IT identity. Furthermore, existing studies on digital experience primarily focus on the effects of digital experience on individual learning skills at school and behaviors in using online services (e.g., Gentina and Chen 2019; Liu et al. 2019; Ng 2012; Thompson 2013), this research broadens the consequences of early-age digital experience to employees' workplace domain and links them with digital creativity and related performance.

Third, this work extends the nomological network associated with IT identity, particularly as it reveals that early-age digital experience drives IT identity and that individual workplace in-role and extra-role performance results from IT identity-enabled digital creativity. While existing research considers short-term factors as the antecedents of IT identity (e.g., Balapour et al., 2019; Carter et al., 2020b; Ogbanufe & Gerhart, 2020), we expand it by incorporating the long-term effect of early-age digital experience on building IT identity. Further, though scholars have reached a consensus that "IT identity holds promise for offering organizations' guidance on encouraging IT-enabled value creation" (Carter et al., 2020b, pp.984), what utility and how it brings out has yet to be established. We found that individuals with IT identities are more likely to demonstrate digital creativity at workplaces. Although creative technology use has become crucial in the competitive environment in the digital age and has gained increased attention (Lee & Chen, 2015; Shao et al., 2021), relevant empirical evidence is limited. Our finding also offers an understanding of the antecedents and consequences of digital creativity. By examining in-role job performance and extra-role work innovation as the ultimate dependent variables, this paper goes beyond examining the traditional benefits of IT identity and digital creativity, such as the behavior of IS use and intentions to use technologies (e.g., Carter et al., 2020a; Carter et al., 2020b; Hassandoust & Techatassanasoontorn, 2021). In sum, our theoretical model advances our understanding of IT identity formation (Carter & Grover, 2015) and helps us get a better understanding of its beneficial results for workplaces in an increasingly digital world.

Fourth, in addition to personal factors, social factors may play a significant role in leveraging or inhibiting the magnification of IT identity. In the present study, we add a more fine-grained understanding of how to transform an employee's IT identity into actual beneficial behavior at the workplace through investigating perceived managerial support. Specifically, perceived managerial support strengthens the influence of IT identity on digital creativity and the indirect effect of early-age digital experience on workplace performance. Our research provides detailed empirical evidence to support the claim of Carter and Grover (2015) that organizations could create contexts that help strengthen the influence of IT identity on productive behaviors.

Finally, this paper adopts a four-wave longitudinal design and multi-source data collection method, which helps to strengthen the results by reducing bias. Specifically, we conduct four surveys with two-week intervals to reduce the risks of common method bias (Doty & Glick, 1998). Besides, we collect data not only by surveying employees, but also asked their leaders to evaluate the in-role and extra-role performance of these employees, which allowed us to assess employee performance much more precisely and further reduce the potential common method bias.

Practical Implications

Our findings have several key practical implications. First, parents and teachers should understand the developmental value of children using technology, instead of regarding early-use digital products as harmful. In addition to the content of technology use, the timing of digital practice is also critical. Early age can be the "easy learning" life stage that helps build and refine the mental algorithms critical for success in our later life. Parents can guide children to employ digital products to engage in learning and develop their digital skills, rather than banning children from accessing digital products. Our research provides empirical evidence supporting that early-age digital experience can not only help build one's IT identity but also has the potential to better prepare him/her for later success when entering workplaces. Thus, proper early-age digital experience helps children achieve better IT development in the digital age. In addition, our post hoc analysis suggested that it is not enough to create an environment to support children to access technologies.

In family and school education, children should be encouraged to use digital technologies to solve problems, serve personal and social goals, and experience the enjoyment of using them, by which children's IT identity can be more effectively cultivated.

Second, although digital technology does contribute to increasing business value, mere implementation and acceptance are insufficient to maintain an organization's competitive edge (Mata et al. 1995). Competitive advantage is achieved by developing IT-enabled creative processes, products, and services (Mandel and Swanson 2017). Our model demonstrates that organizations can benefit from employees' technology skills and passion cultivated at an early age. Hence, when recruiting new employees, in addition to assessing other work skills, organizations can also consider the evaluation of their early-age digital experience, which would help bring new ways of working to the workplace through the utilization of their sophisticated IT skills and knowledge.

Third, we suggest that managers build an appropriate work environment that is amenable to IT identity verification. "Tech-savvy" employees are knowledgeable about the capabilities of organizational ITs. Managers should value these employees and encourage them to explore novel ways of using ITs to improve performance and achieve innovation. Organizations can put formal structures and systems in place that support digital creativity. Furthermore, managers should put effort to create organizational norms, values, and rituals that embody a culture of deployment of IT to achieve higher levels of performance.

Limitations and Future Directions

There are several limitations of this study, which provide opportunities for future research to validate and extend our findings. First, we measure the early-age digital experience by asking employees to recall their early-age experience, which may be biased since the memory from a long time ago may become hazy. Future research could conduct a longitudinal follow-up investigation to acquire more accurate measures. Second, to gain a more fine-grained understanding of the influences of early-age digital experience, future studies could examine whether digital experience in various age ranges (e.g., between 5-10 years, 10-15 years, and so on) cause different effects. Third, future research could include employee characteristics in our research model to provide a more detailed understanding of the conditions under which the early-age digital experience influences employees' IT identity, digital creativity, and performance, which would better help organizations recruit and cultivate suitable employees. For example, initiative and goal orientation may relate to the development of one's digital creativity (van Laar et al. 2019). Fourth, though we reveal that early-age digital experience influences employee workplace performance through IT identity and digital creativity, and perceived managerial support strengthens the relationship, we appeal to future studies to explore other influencing mechanisms and moderators.

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