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DIGITAL OR INNOVATIVE: UNDERSTANDING "DIGITAL LITERACY – PRACTICE – INNOVATIVE WORK BEHAVIOR" CHAIN

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Abstract

Digital transformation has put tremendous pressure on employees to innovate with the use of information technology (IT). This paper explores the extent to which digital literacy and personal innovativeness contribute to individual's innovative work behavior (IWB). To test our hypotheses, we apply double bootstrapping chained mediation analyses paired with relative importance analysis on a dataset collected from employees (N = 167) in a pharmaceutical company. The results showed the existence of a double-mediation chain whereby digital practices and attitude toward digitalized innovation mediate the positive relationship between digital literacy and IWB. Surprisingly, said chain was not supported for personally innovative individuals, indicating that digital literacy plays a relatively more important role in stimulating attitudes toward digitalized innovation and IWB. Our findings add further specificity to research on digital natives and may help organizations understand the role of digital literacy and personal innovativeness in organizationally-relevant outcomes, such as IWB.

JEL Code: *03*

Keywords: *Digital literacy; Personal innovativeness; Attitude toward digitalized innovation; Innovative work behavior*

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1. INTRODUCTION

Fostering digitalization of contemporary work and organizations has become a norm (Singh and Hess 2017). The growing importance of digital transformation increases the importance of the employees' attitudes towards embracing new and different working practices (Tomat and Trkman 2019). This is why employees are increasingly required to familiarize themselves with digital tools and use them in the workplace (Martin 2005). Employees need to apply modern digital technology and use it to perform various tasks at work (Margarjan, Littlejohn, and Vojt 2011; Derks et al. 2016) while being innovative at the same time (Trantopoulos et al. 2017). Digital literacy and innovativeness are two important aspects of 21st-century skills (Kong 2014).

Technology is changing the workplace, and as a result, employees must develop their skill sets in order to continue their careers successfully. In organizational settings, possessing digital skills has been shown to result in several positive consequences for employees and their organizations (e.g. Mohammadyari and Singh 2015; Yu, Lin, and Liao 2017), and capitalizing on digital technologies have been shown to act as an enabler of innovation and growth (Nambisan et al. 2017; von Briel, Davidsson and Recker 2018).

In addition to digital literacy, personal innovativeness is argued to be a characteristic that leads to beneficial outcomes in organizations (cf. Carlsen, Clegg, and Gjersvik 2012). Personal innovativeness is believed to be an important construct to facilitate understanding of the processes by which new a digital technology is used (Agarwal and Prasad 1998; Thakur, Angriawan, and Summey 2016). However, the extant literature fails to adequately assess the link between digital literacy and innovativeness. This is unfortunate since both digitalization (e.g., Fieseler, Meckel, and Ranzini 2015) and innovative work behavior (IWB) (e.g., Černe et al. 2017) have received plenty of attention in recent research on employees at the individual level. We have learned from these studies that employees' digital literacy is fostered by the digital environment and their cognitive processing skills (Eshet-Alkali and Amichai-Hamburger 2004) and leads to an increase in individual task performance (Mohammadyari and Singh 2015).

Conversely, IWB can be promoted by highly-developed information systems in organizations, by serving as a platform for evaluating shared ideas and tracking the implementation of such ideas (Sandstrom and Bjork 2010). Nonetheless, understanding the process of how digital literacy leads to employees' IWB at the individual level and to what extent digital literacy serves as an attribute for one to use digitalized means to innovate at work compared to personal innovativeness, remains unaddressed.

This paper aims to explore if and how employees' digital literacy and personal innovativeness shape employees' probability of embracing the IWB. Specifically, we investigate whether digitally literate or personally innovative employees are more likely to transform their digital know-how and digital practices into IWB. The idea is that an employee who is more familiar with digital tools and uses them in practice would tend to have a more positive attitude toward digitalized innovation, subsequently leading to higher levels of innovative behavior. We thereby intend to contribute to the extant research by bridging the management information systems literature on digital literacy (e.g.; Van Laar, van Deursen, van Dijk, and de Haan 2017; Yu et al. 2017) with the areas of innovation management within the organizational behavior/psychology domains (e.g. de Jong and Den Hartog 2010; Černe et al. 2017). We do so by conceptualizing and testing the chain of constructs linking both digital literates and personally innovative individuals to IWB, stipulating the components and linkages among them.

In what follows, we propose three hypotheses explaining the double-mediation chain among digitalization and innovation constructs at the individual level. We test these with a field study of 167 working professionals in a large pharmaceutical organization where varied levels of employee digital literacy are present and discuss the theoretical and practical implications of our research for the fields of digitalization/management information systems and micro-innovation.

2. LITERATURE REVIEW

The term digital literacy initially appeared in the 1990's, and represents a crucial skill in an information society (Eshet-Alkalai 2006). Digital literacy (sometimes called digital competence, familiarity or digital skills (Bates 2013)) can be defined as the ability to use state-of-the-art tools to achieve goals, involving the confident and critical use of digital technologies for work, leisure and communication (Punie and Cabrera 2006). It is the ability to understand and use information in multiple formats from a wide variety of sources when it is presented via computers and, particularly, through the Internet (Gilster 1997). It is perceived as a prerequisite for active and equal participation in society (Ferrari 2012). Other researchers have tried to explain the term as profoundly as possible to reflect all of its attributes. According to Eshet-Alaklai (2006), digital literacy is a "combination of technical-procedural, cognitive and emotional-social skills."

Digital literacy includes a complex set of skills, and as explained by Eshet-Alakali (2006), plays an integral role in doing business, as the use of digital technologies significantly contributes to advancing workplace performance (Dewett and Jones 2001). Vast research in previous decades focused on examining the characteristics and attributes that affect one's attitude toward accepting and using technology, paving the path for digital literacy. Several authors have concluded that early technology adopters tend to be persons with higher education levels, higher incomes and higher positions within their companies (Adcok et al. 1977; Cimperman, Makovec, Brenčič, and Trkman 2016; LaBay and Kinnear 1981). Moreover, youth tend to use digital technologies and therefore may require better digital skills compared to their older colleagues (Weel 2002; Friedberg 2003; Schleife 2006; Koning and Gelderblom 2006).

Ilomäki and colleagues (2011) and Trkman and Trkman (2009) further explain that passive, consumer-type of use of digital technologies, instead of active use for personal creation and development, affects the quality of use, and respectively, one's digital literacy. In other words, a person who has access to digital technologies and uses it actively builds up his/her digital literacy to a larger and stronger extent compared to those who use digital technologies less actively or whose access to digital technologies is limited. The findings of this study are reflective of some previous research addressing similar relations between the frequency of digital technologies use and level of digital literacy. Hargittai (2001) emphasizes the shift in research to another level that focuses on differences in how people use digital tools. This second-level of digital divide describes digital inequality issues as being comprised of five different dimensions, one of which is skill level (DiMaggio and Hargittai 2001).

However, the advancement of one's skills and competence is subject to many other factors. While investigating those, Agarwal and Prasad (1998) introduced the concept of personal innovativeness in digital technologies as a specific dimension that explains how individuals form their attitude toward digital technologies. Innovativeness is "the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system" (Rogers and Shoemaker 1971; Rogers 1995). Therefore, individuals' attitude towards the use of digital technologies in innovation processes is related to personal innovativeness (Gough 1979; Kirton and De Ciantis 1986). More precisely, attitude towards the use of digital technologies is the next step in understanding digital literacy and reflects an individual trait that explains "the degree to which an individual is willing to try out any new digital technologies" (Agarwal and Prasad 1998; Gu, Zhu, and Guo 2013). Hence, attitude towards the use of digital technologies plays a significant role in defining one's behavioral intentions (Yi, Fiedler, and Park 2006; Jackson, Yi, and Park 2013) in such a way as to have a strong positive effect on technology use (Agarwal and Karahanna 2000; Lewis, Agarwal, and Sambamurthy 2003; Thompson and Cupples 2008). That effect is manifested through a strong positive influence of attitude towards the use of digital technologies on the technology acceptance process (Jackson et al. 2013), making it an antecedent of technology acceptance (Turan, Tunc, and Zehir 2015). These findings lead us to the assumption that attitude towards the use of digital technologies is positively related not just to digital literacy, but also to IWB.

Moreover, it seems that the relationship among attitude towards the use of digital technologies, digital literacy and IWB is twofold. Digital literacy acts as a predictor of one's performance, with performance expected to increase with an individual's digital literacy (Kang, Song, Lee, and Ku 2010; Kang et al. 2011; Lee, Moon, and Cho 2015). As being digitally literate stimulates participation in the learning process and enhances one's learning outcomes (Lee et al. 2015), digitally literate employees are expected to adjust better in the ever- changing business environment, and therefore potentially exhibit higher levels of IWB.

3. HYPOTHESES DEVELOPMENT

This research paper aims to conceptualize and test the chain of constructs linking more digitally skilled persons to their IWB. The literature review revealed a bridge between digital literacy, practice, attitude towards the use of digital technologies and work behavior; hence, the research hypotheses are defined as follows.

Hargittai (2001) and Ilomäki and colleagues (2011) stressed that there is a positive relationship between digital literacy and digital practice. Several researchers argued that people master digital skills through practice—meaning through trial and error (de Haan, Huysmans, and Steyaert 2002; Van Dijk 2005; Van Deursen, Van Dijk, and Peters 2011). Even beyond the digital world, it is generally recognized that superior performance comes with experience, and the effect of practice on overall work performance is strong and powerful (Chi, Glaser, and Farr 1988; Ericsson and Smith 1991; Ericsson 1993). Developing digitally literate employees is thus crucial, but the vast majority of employees argue that their company does not

provide them with the resources or opportunities to obtain the right skills (Kane et al. 2015). We will thus investigate the relationship existing between employees' experiences in using technology and their perceptions of knowledge and skills in using that technology:

H1: *Digital literacy is positively related to digital practice.*

In addition to the basic relationship between digital literacy and digital practice, this research paper also strives to provide a clearer picture of the effect of attitude towards digitalized innovation on digital literacy. Most of the previous research defines this effect as strong and positive (Agarwal and Karahanna 2000; Lewis et al. 2003; Thompson and Cupples 2008; Jackson et al. 2013), meaning that a more innovative person in digital technologies is more digitally skilled. Employees thus need an appropriate grounding in digital technologies in general and digital innovation in particular (Fichman, Dos Santos, and Zheng 2014). Moreover, it has been stressed that a highly innovative person is not just an active information seeker, but also as someone who adapts easily to technological changes (Turan et al., 2015). We therefore propose:

H2: *Digital practice mediates the positive relationship between digital literacy and attitude toward digitalized innovation.*

Digitally literate persons make a more attractive workforce (Becker, Pasquini, and Zentner 2017), because they have the technical skills and the IWB flourished by their digital literacy. Following said assumption, we argue there is a twofold positive relationship between digital literacy and general IWB emphasized throughout previous research in the field:

H3: *A double-mediation chain exists whereby digital practice and attitude toward digitalized innovation mediate the positive relationship between digital literacy and innovative work behavior.*

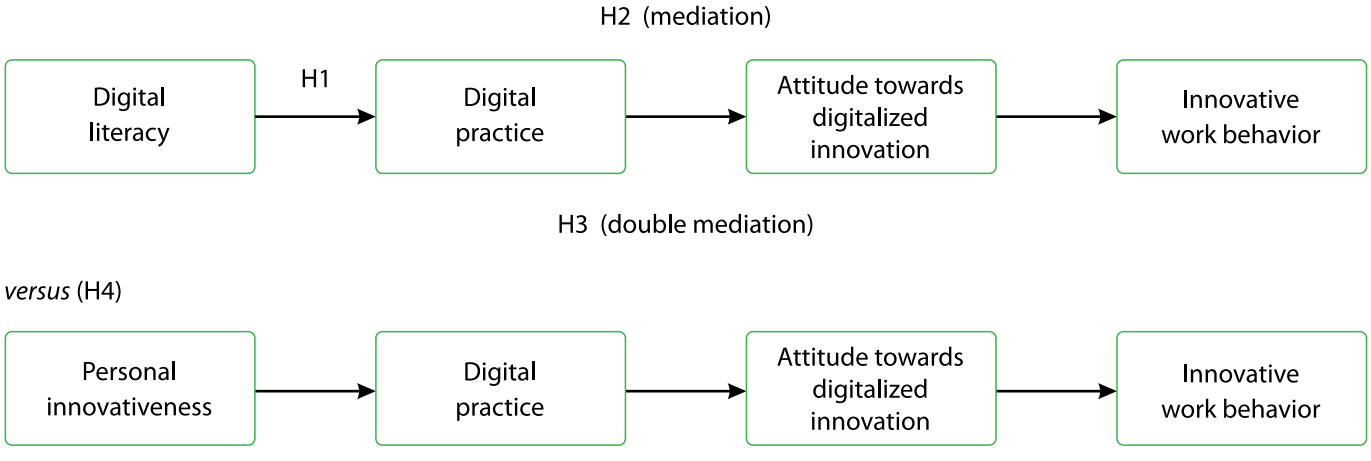
Digital literates are primarily differentiated from others by the extent of their exposure to digitization: digital tools, means and gadgets (Bennett and Maton 2010). Experience with and exposure to a specific object or technology has been shown to promote creativity (Zevenbergen 2007). This phenomenon does require some domain-based knowledge to flourish (Amabile 1983).

Digital literates would likely use digital means for generating ideas; for example, via digital ideation systems or online platforms within organizations. Personal innovativeness as an individual trait has even been shown by meta-analytic evidence to be less important for IWB than individual characteristics that one can learn or acquire, such as creative self-efficacy (Hammond et al. 2011). This further speaks to the importance of familiarity with one's tools, as these also increase self-efficacy in the digital context (Durndell and Haag 2002, Eastin and LaRose 2000). An employee who is more familiar with digital tools and uses them in practice would thus tend to increase their positive attitude toward digitalized innovation, subsequently leading to higher levels of innovative behavior.

H4: *Digital literates are more likely to (a) use digital means to innovate and (b) ultimately exhibit innovative work behavior than personally innovative individuals.*

A conceptual model with hypotheses is shown in Figure 1.

Figure 1. Alternative Double Mediation Chain Models with Hypotheses



4. METHODS

4.1 Sample and data collection

The empirical research was conducted on one company in two of its offices in Bosnia and Herzegovina. The company deals with production and wholesale trade of pharmaceuticals, veterinary medicine products, disinfectants and similar products. All 350 employees were invited to participate in the survey using an employee list containing e-mail addresses. The data collection took place- from May until September 2017. The scales were translated from English to Bosnian using the back-translation procedure (Brislin 1986). The 167 responses received were screened for unusually short time respondents took to answer the survey and potential flat- lining in responses. Finally, 125 useful responses were obtained, accounting for a 35.7% response rate.

The majority of respondents were female (72%), and 50.7% of the respondents had higher education (bachelor's-level degree). A total of 63% of the respondents had been employed at the organization for more than five years.

4.2 Measures

Digital literacy was assessed with a scale adopted from Van Laar et al. (2017) – α = .78. A sample item includes "*In terms of your Internet skills, how skilled do you consider yourself to be?*"

Digital practice was measured with a scale adopted from Hargittai (2005) – α = .65. It is a set of binary "yes" and "no" questions asking for information about respondents' use of digital means, and the final measure was aggregated by counting the number of positive responses. Sample items include "*Do you know how to open an attachment someone sent you via email?*" and "*Do you know how to use emoticons (e.g., smileys, emojis or text speak)?*"

Attitude toward digitalized innovation was assessed with a scale adopted from Lu and Yu (2005) – α = .87. Sample items include "*Among my peers, I am usually the first to explore new information technologies*" and "*I like to experiment with new information technologies.*"

Innovative work behavior was measured with a scale developed by Zhou and George (2001) that taps into idea exploration, generation, championing and implementation phases of employees' individual innovativeness – α = .90. Sample items include "*I often have new and innovative ideas*" and "*I develop adequate plans and schedules for the implementation of new ideas.*"

Personal innovativeness was assessed with four items adopted from Lu, Yao and Yu (2005) – α = .90. The scale asks about individuals' personality, and sample items include "*I have an active imagination*" and "*I have few artistic interests.*"

Control variables. We controlled for ***age***, ***gender***, ***education,*** and ***organizational tenure*** in all analyses. The age of a respondent could be particularly crucial. Namely, it has been argued that younger employees have grown up with digital media and therefore possess certain distinctive traits such as visual orientation, multi-tasking and active learning. They are supposed to be inductive learners with the ability to switch attention rapidly and give quick responses (Schulmeister 2013). Some consider individuals who were born in an age of digital media (usually called digital natives) to be fundamentally different from previous generations with different cognitive processing (Kirschner 2017) while being empowered, active contributors to innovation (Pangrazio 2016). Generational differences are seen as the cause of wide shifts in our ability to engage with technologies (Helsper and Enyon 2010).

However, early exposure to digital technologies does not automatically guarantee the actual usage of the available information or resources (Park 2012). In any case, young people are likely not a homogeneous group (Boonaert 2011). Rather than a rigid dichotomy between digital natives and digital immigrants, there is a continuum (Wang 2013). Another common misconception is that those who are exposed to digital media early in their lives naturally acquire the necessary skills to navigate the digital world (Park 2017). Even more, some argue that there is no such thing as a digital native who is information-skilled simply because (s)he always lived in a digital world (Kirschner 2017).

Gender, education and organizational tenure were also controlled for, as those variables can be important in explaining the digital literacy and innovativeness (Gui and Argetin 2011; Helsper and Enyon 2010).

5. RESULTS

Descriptive statistics are shown in Table 1. Given the cross-sectional and single-source nature of our research (data were collected from the same respondents for all variables at a single point in time), we conducted two additional analyses to alleviate the potential issues related to common method bias

Table 1. Means, standard deviations and correlations among variables

	Variables	M	SD	1	2	3	4	5	6	7	8
1	Gender	.717	.45	-							
2	Age	35.42	7.73	-.08	-						
3	Organizational tenure	.63	.48	-.07	.45**						
4	Digital literacy	26.06	5.71	-.03	-.34**	-.05	(.78)				
5	Digital practice	30.60	4.46	-.04	-.25**	-.15	.49**	(.65)			
6	Attitude toward digitalized innovation	3.31	61	-.13	-.08	-.19	.09	.33**	(.87)		
7	Innovative work behavior	3.95	.54	-.21*	-.10	.02	.20*	.29**	.39**	(.90)	
8	Personal innovativeness	3.47	.84	-.19*	-.11	-.10	.22*	37**	.91**	.49**	(.90)

Note: N = 167-125, depending on missing data. †p <.10; *p < .05; **p < .01. For gender, 0 = male, 1 = female. For organizational tenure, 0 = less than five years with the organization, 1 = more than five years with the organization. Reliability indices (Cronbach's alphas) are on the diagonal in parentheses where applicable.

(Podsakoff, MacKenzie, and Podsakoff 2012). First, we conducted Harman's single factor test (Harman 1976; Podsakoff and Organ 1986), a principal component analysis on all items of our constructs extracting only one factor and using no rotation method. No dominant factor emerged; the overall variance explained by the extracted factor was below the threshold of 50% (specifically, it was 35.29%) thus providing no evidence that common method variance might be an issue.

Second, we applied Lindell and Whitney's (2001) marker variable test using a theoretically unrelated variable (i.e., marker variable) to adjust the correlations among the principal constructs in the model. Any high correlation of the marker variable with any other of the study's principal constructs would indicate potential common method bias. For robustness, we separately repeated the marker variable test with two variables that are not included in the model (the use of smartphones, based on Hargittai's (2009) measure; and the Big 5 personality trait of neuroticism, tapped by a short measure presented by Rammstedt and John (2007)) for which we have little to no theoretical basis to expect a relationship with the study's principal constructs. The average correlation between the study's principal constructs for the use of smartphones (r = .09) and neuroticism (r = -.04) was low and non-significant, providing no evidence of common method bias.

Despite using items from previously validated scales, we conducted additional validity testing and applied confirmatory factor analysis with maximum likelihood estimation to examine the measurement model and how it fits the data that were gathered in our research context. We used the AMOS 21 software package. The CFA tested the factor structure of the model and demonstrated an adequate fit of the expected five-factor solution of our focal constructs (personal innovativeness, digital literacy, digital practice, attitude towards digitalized innovation, innovative work behavior) with the data (chi-square [df = 517] = 1063.597, CFI = .86, RMSEA = .084). Alternative model specifications were tested to investigate whether a more parsimonious model achieved an equivalent or better fit, but chi-square difference tests indicated that they all achieved worse fit.

To test the hypotheses, we used mediated hierarchical regression analyses procedures using the PROCESS macro (Preacher and Hayes 2004) in SPSS version 22. Drawing 5000 random samples using replacements from the full sample, we constructed bias-corrected confidence intervals for the model using Models 4 and 6 from the proposed templates to examine the relationship between digital literacy and digital practice – Hypothesis 1; the mediating role of digital practice in the relationship between digital literacy and attitude toward digitalized innovation – Hypothesis 2; and a double-mediation chain whereby digital practice and attitude towards digitalized innovation mediate the positive relationship between digital literacy and IWB – Hypothesis 3.

The results are presented in Table 2. First, examining digital practice as the outcome variable, the coefficient of digital literacy was positive and significant (.32, s.e. = .06, $p < .01$), supporting Hypothesis 1. Second, the mediating analysis revealed that the 95% confidence intervals of the indirect effect of digital

Table 2. Results of the mediating analyses with the PROCESS macro (Models 4 and 6)

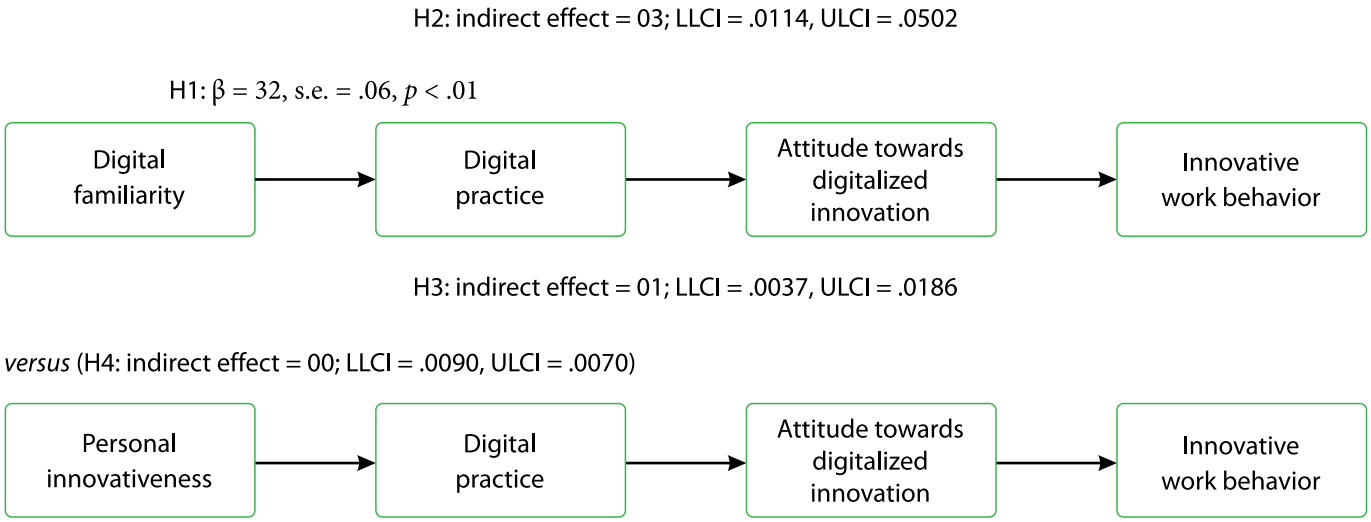
Dependent variable:	Digital practice: Model 4	Attitude toward digitalized innovation: Model 4	Innovative Work Behavior: Model 6	Innovative Work Behavior: Model 6
Constant	25.07 (2.42)**	1.26 (.56)*	2.94 (.52)**	3.23 (.46) **
Gender	-.25 (.61)	-.22 (.10)	-.20 (.10)	-.14 (.09)
Age	-.03 (.04)	.00 (.01)	-.01 (.02)	-.00 (.01)
Organizational tenure	-1.55 (.63)	-.06 (.11)	.05 (.10)	.03 (.10)
Digital literacy	.32 (.06)**	-.01 (.01)	.02 (.01)	
Digital practice		.08 (.02)**	-.01 (.02)	.01 (.01)
Personal innovativeness				.42 (.13) **
Attitude towards digitalized innovation			.33 (.08)**	-.24 (.18)
Indirect effect of digital practice in the relationship between digital literacy and attitude towards digitalized innovation (95% bootstrapped confidence intervals)		.03 (.01) (LLCI: .0114, ULCI: .0502)		
Double indirect effect of digital practice and attitude towards digitalized innovation in the relationship between digital literacy and innovative work behavior (95% bootstrapped confidence intervals)			.01 (.00) (LLCI: .0037, ULCI: .0186)	
Double indirect effect of digital practice and attitude towards digitalized innovation in the relationship between personal innovativeness and innovative work behavior (95% bootstrapped confidence intervals)				.00 (.00) (LLCI: -.0090, ULCI: .0070)

Note. N = 167-125, depending on missing data. *p < .05; **p < .01; unstandardized coefficients are reported along with standard errors in parentheses. LLCI: lower level confidence interval, ULCI: upper level confidence interval.

practice in the relationship between digital literacy and attitude toward digitalized innovation excluded zero (the lower bound = .0114 and the upper bound = .0502), thus supporting Hypothesis 2. Model 6 of the proposed templates in the PROCESS macro revealed that the 95% confidence intervals of the double indirect effect of digital practice and attitude toward digitalized innovation in the relationship between digital literacy and IWB also excluded zero (the lower bound = .0037 and the upper bound = .0186), thus supporting Hypothesis 3.

To test Hypothesis 4, we first tested the double-mediation chain leading from personal innovativeness to IWB via digital practice and attitude toward digitalized innovation. The results could not support this model, as the confidence interval for the indirect effect included zero (the lower bound = -.0090 and the upper bound = .0070). Personal innovativeness is positively related to IWB, but not through digital practice and attitude toward digitalized innovation. To provide a definite test of this hypothesis, which juxtaposed personal innovativeness with digital literacy in relating to digital practice, we further conducted the relative importance analysis (LeBreton, Tonidandel, and Krasikova 2013; Tonidandel and LeBreton 2011), which statistically supported (p < .05) that digital literacy was indeed, in relative terms, a more important predictor. All tests of hypotheses are summarized in Figure 2.

Figure 2: Research Model Results



6. DISCUSSION

The results of our bootstrapping double-mediation analysis supported our hypotheses. It first revealed that digital literacy is positively related to digital practice. Digital practice, then, mediates the positive relationship between digital literacy and attitude toward digitalized innovation. Finally, the link to IWB was established, as our results supported the existence of a double-mediation chain whereby digital practice and attitude toward digitalized innovation mediate the positive relationship between digital literacy and IWB. We have also shown that individuals who score high on digital literacy exhibit a more positive attitude toward digitalized innovation and IWB than those who score high on personal innovativeness; these personally innovative employees tend to take a different, more direct path toward IWB, not via digital practice.

6.1 Theoretical contributions

Our study bridges the information systems and organizational behavior/psychology domains by adding to the understanding of the process by which digital literacy leads to employees' IWB. The extant research has focused on the characteristics of digital natives and their behavior at work (e.g., Navaz and Kundi 2010; Bennett et al. 2008). We go a step beyond by conceptualizing and testing the chain of constructs linking individuals with high levels of digital literacy and practice to their IWB, stipulating its components and linkages among them.

Specifically, we show that an employee who is more familiar with digital tools tends to improve his or her attitude toward digitalized innovation in the workplace. A key mechanism in this chain is employees' attitudes toward workplace digitalization and exhibiting innovation using digital means. Digital literates at work thus tend to capitalize on their digital skills and opportunities to use them at work to search for, generate, champion and implement ideas using digital means. This finding extends research on micro-innovation (cf. Ramos et al. 2016) into the digital field and shows that this process can first occur through digital means before manifesting in general IWB.

Researchers of digital natives can thus learn from our study that IWB is an outcome of digital literacy and that managers can expect higher levels of individual innovation when employees are made familiar with digital means and enabled to apply them in practice. In turn, this provides organizations with the basis for firm-level innovations (Amabile et al. 1996; Levitt 2002).

The expression "digital native" itself is being criticized in the literature (Bennett et al., 2008) for being oversimplistic and too dependent on individuals' ages rather than taking a more measured and detailed approach focusing on personal characteristics regarding digital technologies attitudes, use and experience. To address this, we have conducted a post-hoc t-test and compared the digital practices of younger (below the mean age of the sample) and older (above the mean age) respondents in our study. The results did not reveal significant differences (t-test statistic = 1.655, p = .10) between the two groups. This finding further aligns with studies that emphasize the fact that it is not age, but experience and literacy that are important (e.g. Helsper and Eynon 2010).

6.2 Practical implications

This study also informs the practice of managers in several ways. First, it is evident that digital literacy contributes to enhancing individuals' and potentially firms' innovative endeavors. Therefore, organizations should strive to build this capacity in their workforce to encourage innovative pursuits. Organizations can do so through recruitment and selection processes (by attracting and employing digitally literate candidates) or by focusing on their training and development efforts. These processes are becoming increasingly important in light of digital transformation penetrating all aspects and types of organizations (Westerman and Bonnet 2015). However, companies should not form a faulty assumption that younger employees are necessarily more digitally literate. Based on our study, the recruitment and selection of digitally- literate employees is a better option than employing personally-innovative individuals to stimulate a positive attitude toward digitalized innovation (and ultimately, IWB).

The process supporting the transformation of digitally-literate individuals' skills to their IWB requires not only digital technologies in place (Butler 2015), but even more so, an understanding that they can use digital means to be innovative in their work. Innovative job requirements or at least an understanding of experimentation and trial-and-error should be put in place (Rui, Cuervo-Cazurra, and Un 2016), along with initiatives to develop a working climate that would support individuals to translate their innovations using digital means into IWB.

Hence, the research has important implications to managers in designing job. In order to enhance innovation performance of employees, managers should support use of digital means and create environment that will foster employees' innovation behavior. Specifically, managers can expect higher levels of individual innovation when employees are made familiar with digital means and enabled to apply them in practice. In turn, this may lead to greater firm-level innovation performance.

6.3 Limitations with future research directions

As with any research, our study is not immune to limitations. The most important one relates to the use of cross-sectional single-source data collection. We have applied all possible remedies to alleviate concerns of potential common method variance (Podsakoff et al. 2012), including the post-hoc marker variable test, which did not reveal any issues with common method bias. However, another consequence of such an approach to data collection is that, although we have derived from theory in our conceptual build-up of the hypotheses explaining the double- mediation chain, we cannot establish causality with certainty.

Another limitation of our study is related to the use of research instruments for digital practice and attitude towards digitized innovation, which are more than 15 years old. While this might be considered problematic in light of fast-paced changes digitalization is inducing, the research instruments are also generic enough that they relate to individuals' experiences and attitudes towards technology, generally, and might still be sufficient to capture these constructs. Nevertheless, use or even development of appropriate research instruments that would be specific to latest trends and adaptations of technology is warranted by future research.

Our study is also limited to employees from one organization. While this enabled us to control or rule out any potential influences related to different systems and contexts, our results are nonetheless not generalizable across all settings for employees of different firms, industries and nationalities. Additional studies should be conducted to test the hypothesized chain of constructs transforming working professionals' digital literacy into IWB. Also, the questionnaire for measuring digital literacy should be upgraded with new items measuring more advanced skills, as the average digital literacy of the workforce is increasing. It is also possible that with newer generations entering the workforce, the difference in their digital literacy will decrease, and the role of personal innovativeness will become stronger.

Future research should also examine the boundary conditions of the proposed chain of relationships. We have already mentioned some of them in the practical implications section; it would be interesting to examine the moderating roles of an innovation-supportive climate (cf. Wallace et al. 2016), supportive supervision (cf. Škerlavaj, Černe, and Dysvik 2014) or specific contextual or job-design characteristics (Černe et al. 2017). Equally interesting could be an analysis of individual traits, and such research could further deepen the investigation of digital natives and digital immigrants, their characteristics and individual differences (Nelissen and Van den Bulck 2018).

Such an approach has the potential to add further specificity to research on digital natives, particularly regarding the investigation of the outcomes of digital literacy that is lacking in extant research (Warschauer 2009; Warschauer and Matuchniak 2010). Such research may help in understanding the roles of digital literacy and personal innovativeness in obtaining organizationally-relevant outcomes for the future of (corporate) entrepreneurship and innovation.

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