Do digital literacies matter in employee engagement in digitalised workplace?

Ai Joo Chan, Lai Wan Hooi and Kwang Sing Ngui

Abstract

Purpose – *This study aims to understand the role of digital literacies as a moderator between employee engagement and its antecedents, namely, workplace digitalisation and innovative culture.*

Design/methodology/approach – *A total of 256 valid samples were used in the analysis. The respondents were individuals used as management-level executives in companies located in Selangor/ Kuala Lumpur. The model was tested using structural equation modelling.*

Findings – *The findings reveal that there exists a significant association between employee engagement and its antecedents, namely, workplace digitalisation and innovative culture. Digital literacies are found to moderate the relationships between workplace digitalisation-employee engagement and innovative culture-employee engagement.*

Practical implications – *This paper provides new insight to the practitioners about the role of digital literacies in raising employee engagement in the digital workplace.*

Originality/value – *These findings enrich the literature on employee engagement, whereby, improving employee digital literacies strengthens employee acceptance to workplace digitalisation and benefit from the innovative culture to stay engaged.*

Keywords *Employee engagement, Digital literacies, Innovative culture, Workplace digitalisation*

Paper type *Research paper*

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1. Introduction

Employee engagement has been linked to the various positive organisational outcome and individual employee outcomes, such as productivity, innovation (Slåtten and Mehmetoglu, 2011); organisational commitment (Hanaysha, 2016); financials, customers, safety and quality (Gallup, 2017), creativity, proactivity, productivity, well-being (Albrecht, 2010) and employee well-being (Bakker and Demerouti, 2018; Hakanen *et al.*, 2018; Pogrebtsova *et al.*, 2017). Albeit the perceived benefits of employee engagement, the volatile economic climate has made efforts to improving employee engagement more challenging. Organisations continue to explore various initiatives to reduce costs and improve profitability for survival. One of the ideas is workplace digitalisation.

Workplace digitalisation taps on digital technologies (Lilja, 2020) as supporting tools or automating tools in the businesses. Digitalisation at the workplace alters the job design, job resources and job expectations of employees, hence, are believed to influence employee engagement (Bridger, 2018; Ellis, 2019; Guillot, 2017; Oldham and Da Silva, 2015; Raj, 2018).

The Covid-19 pandemic intensifies workplace digitalisation (Lund *et al.*, 2020) as business survival as various unprecedented restrictions on travel, physical interactions and change of consumer behaviours forcing organisations to operate in the contactless environment. Despite that employees have been forcefully or voluntarily accepting the changes consequential to workplace digitalisation, the concern if employees remain motivated and engaged at work, is significantly less investigated (Lilja, 2020; Silic and Back, 2016). To our knowledge, the few

studies mentioned earlier (Bridger, 2018; Ellis, 2019; Guillot, 2017; Oldham and Da Silva, 2015; Raj, 2018) produced mixed results, which warrant continuous exploration of how workplace digitalisation influences employee engagement.

In the reality, efforts to improve employee engagement are falling short (Bridger, 2018) globally. Besides puzzling and struggling to engage employees effectively (Bridger, 2018), organisational culture is named hindering the efforts to boost employee engagement (Bridger, 2018). Bridger (2018) commented that the organisations tend to focus to deliver financial results in meeting the expectation of investors and little wonder how the employees feel at work.

Plenty of literature put up that organisational culture (Cameron and Quinn, 2011; Harper, 2015; Imperatori, 2017; Schaufeli and Bakker, 2004) influence employee engagement. As organisational culture is reported to hinder efforts to improve employee engagement in the practice (Bridger, 2018), together with workplace digitalisation, this study revisits the relationships between innovative culture and employee engagement. Workplace digitalisation, being a form of technology innovation (Griffith and Rubera, 2014), is the embodiment of innovative culture, a culture that promotes innovation.

Studies have also acknowledged the gap in understanding the moderating factors of employees' acceptance of digitalisation (Hwang *et al.*, 2016) and the post-adoptive behaviours with new job design Bala and Venkatesh, 2016). Therefore, there is a call to examine the dynamic nature of employees' well-being (in this study, the employee engagement) through the acceptance of digital technologies, as well as how individual differences are related to the acceptance of technology tools (Lilja, 2020). Individual differences arising from the digital literacies difference play a significant role in interacting with how positive employees accepting digital technologies and the perceived benefits of digital technologies in supporting their work, for them to stay engaged at work. This is especially more important when the workforce today is made up of digital natives (who are born in the digital age) and digital immigrants (who adopts and adapts to digital tools at the later stage of their lives), who have different digital literacies.

Hence, this paper sets out to study the interaction of digital literacies on employee engagement in the working environment of workplace digitalisation and innovative culture-centric workplace. This study aims to address the research objective as follows:

■ to examine the relationship between workplace digitalisation – employee engagement and innovative culture – employee engagement; and

■ to investigate whether digital literacies moderate the relationship between workplace digitalisation – employee engagement and innovative culture – employee engagement.

The study findings contribute significant knowledge to the discipline of employee engagement by enriching the existing body of literature if workplace digitalisation influences employee engagement. Secondly, this study explores the effect of innovative culture on employee engagement. Finally, this study ascertains if digital literacies moderate the relationship between workplace digitalisation, innovative culture and their engagement. The findings of this study help organisations to leverage workplace digitalisation and optimise innovative culture to improve employee engagement. Engaged employees are likely to focus on their work, low turnover intention and positive to do better jobs towards organisational excellence and sustainabilities.

2. Theoretical underpinnings and hypotheses

2.1 Job demand-resources model

This study used the job demands-resources (JD-R) model (Bakker and Demerouti, 2017; Schaufeli and Bakker, 2004) to develop the hypotheses and build the research model. The

framework conceptualises relationships between workplace digitalisation, innovative culture, employee engagement and digital literacies.

The JD-R model is a heuristic framework that describes how burnout and employee engagement may be produced by two specific sets of work characteristics in the organisation, namely, job demands and jobs resources (Bakker and Demerouti, 2018; Schaufeli and Bakker, 2004; Schaufeli et al., 2009). Job demands are the aspects of work that strain energy, such as workload, complex tasks and conflicts (Bakker and Demerouti, 2018). When job demands increase, employees mobilises the physiological and psychological costs such as increased sympathetic activity, fatigue and irritability to maintain the performance level (Schaufeli et al., 2009). Continuous mobilisation of these compensatory efforts may lead to negative emotional and job outcome such as turnover intentions, burnout, low job satisfaction (Pattnaik and Panda, 2020), chronic exhaustion and physical health problems (Bakker and Demerouti, 2018).

In contrast, job resources are the aspects of work, such as performance feedback, social support and skill variety that support employees to alleviate job demands and facilitate them towards achieving their goals (Bakker and Demerouti, 2018). Work environments that offer abundant resources foster the willingness of employees to dedicate their efforts and abilities to the work task (Schaufeli et al., 2009), hence, become more engaged at work. In such environments, it is likely that the task will be completed successfully and that the work goal will be attained (Schaufeli et al., 2009). Hence, job resources are likely to foster employee engagement (i.e. a fulfilling state of vigour, dedication and absorption; Schaufeli and Bakker, 2004) through a motivational process that satisfies basic needs for autonomy, relatedness and competence and that increases the likelihood of attaining one's work goals (Schaufeli et al., 2009).

In brief, the central tenet of the JD-R model is that irrespective of the occupation involved, job demands may evoke a strain or health impairment process, while job resources induce a motivational process (Bakker and Demerouti, 2017). These outcomes, in turn, influence employee engagement and a host of other relevant positive and negative outcomes.

2.2 Relationship between workplace digitalisation and employee engagement

Workplace digitalisation involves the application of digital tools, range from the basic technologies such as mobile devices (for remote information management), tools for information processing and visualisation (Fischer and Pohler, 2018), the human-machine collaboration augmented reality and improved information processing (Fischer and Podhler, 2018), to the more advanced cloud solutions, artificial intelligence and robots, in the business processes. Workplace digitalisation could relief employees from the repetitive mundane work and hazardous tasks, thereby, transforms the job design, work routine (Lilja, 2020) and expected skillset (Morris and Venkatesh, 2010) of employees. Despite that low-skilled employee may risk losing the jobs to digital technologies, employees may have more opportunities to involve in work roles that require creativity, analytical and decision-making skills, which are perceived to be more meaningful and valuable work to employees.

However, workplace digitalisation blurs the boundary of the work-life and the social life of the employees (Ismail, 2017; Ramarajan and Reid, 2013; Reyt and Wiesenfeuld, 2015; Worrall et al., 2016). Employees remain connected to work outside of office hours, such as responding to emails or attend to personal needs during working hours. Employees working beyond the normal working hours become angry, frustrated, exhausted, stress and even burnout. They tend to become less engaged and detach from their work.

In this instance, the JD-R model provides an explanatory framework to clarify how employee perceptions of workplace digitalisation are linked to employee engagement. The JD-R model describes that job demands and job resources could predict employee behaviour (such as employee engagement) (Imperatori, 2017; Pattnaik and Panda, 2020;

Schaufeli and Bakker, 2004). Job demands strain employees' energy, increases stress, burnout and lower engagement, but job resources provide employees with the basic needs and motivation to employees to focus their energetic and cognitive resources at work, thus, positive to employee engagement (Pattnaik and Panda, 2020).

Workplace digitalisation may be viewed as job demands in the new cyber-physical business model for it poses job insecurity to the low-skilled employees or job expectation for taking up new roles such as the ability to apply the digital tools for more productive work performance. Secondly, the digital presenteeism makes employees working longer hours, thus, result in stress and burnout. On the contrary, digital technologies at the workplace can be perceived as job resources invested in employees by the organisation in helping employees to alleviate job demands and motivates employee personal development accomplishment. When workplace digitalisation is viewed as job resources, employees tend to demonstrate positive traits to invest themselves (Ashforth and Humphrey, 1995, p. 110), involve emotionally in the workplace (Frank, 2016), stretch their talents towards the organisational outcome (Shuck and Wollard, 2010, p. 103; Smith and Markwick, 2009). Schaufeli *et al.* (2002, p. 74) subscribe that employee engagement is a positive and fulfilling work-related state of mind, with vigorous (energetic), dedication (perseverance) and absorption (concentration).

There have been inconclusive findings by the practitioners and academicians in examining the relationship between workplace digitalisation and employee engagement (Chopra, 2017; Imperatori, 2017; Ismail, 2017; White, 2016; Worrall *et al.*, 2016). Premises the JD-R model, we argue that employees' perceptions of workplace digitalisation affect their engagement, thus we hypothesise that:

H1. There is a relationship between workplace digitalisation and employee engagement.

2.3 Relationship between innovative culture and employee engagement

Although a wide range of studies have examined how organisational culture influence employee engagement (Cameron and Quinn, 2011; Harper, 2015; Imperatori, 2017; Meng and Berger, 2019; Schaufeli and Bakker, 2004), more recently the industry practitioners (Bridger, 2018) argue that organisational culture is a barrier to employee engagement (Bridger, 2018). Bridger (2018) posits that organisations are too often focus on the short-term immediate financial results, instead of paying attention to how the people feel working in the organisations or how to engage employees. Besides, organisations tend to reward outdated leadership skills such as order, control and toughness (Bridger, 2018). These are not aligned to the key aspects of engagement such as building autonomy and mastery (Bridger, 2018). Along a similar vein, questions raised as to why organisations fail to benefit from the abundance of research knowledge on organisational culture and what are the barriers that must be overcome (Meng and Berger, 2019)?

The work of Singh and Atwal (2019) reiterate that organisational culture could act as a catalyst or as a hurdle to engage employees in the digital age. A culture of innovations (Clark, 2018), promotes and supports technology usage (Curtin, 2018) are linked to the success of digital adoption. Hence, our study focusses on the innovative culture, in associating with employee engagement, in the digital era.

Innovative culture promotes openness, flexibility, supportive, risk-taking, creativity, open and transparent communication (Attridge, 2009; McBain, 2007; Suharti and Suliyanto, 2012) and continuous innovations. Under the JD-R model, employees could see these characteristics as job resources provided by the organisations, thus, motivated to explore new ideas for better work performance. Employees are more willing to dedicate their hearts and soul to engross at work. Accordingly, in line with an innovative culture, job resources and dedication at work, a relationship between innovative culture and employee engagement is predicted.

On the other hand, innovative culture that provokes continuous innovations creates job stressors such as vague job scope or direction, job insecurity and higher work-role expectation. Underpinning the JD-R model, job demands could lead to fatigue, stress and burnout.

We add to the literature by introducing the specific narrow concept of innovative culture that inherently influences employee engagement. Following the preceding discussion, we expect that employees who positively appraise innovative culture in their organisations are more engaged with their work. Thus, we hypothesised that:

H2. There is a relationship between innovative culture and employee engagement.

2.4 The moderating role of digital literacies in the workplace digitalisation-employee engagement and innovative culture-employee engagement relationships

Recently, studies have emerged which suggest that there are gaps in understanding the moderating factors of employees' acceptance of digitalisation (Hwang et al., 2016) and the post-adoptive behaviours with new job design (Bala and Venkatesh, 2016). In this study, we attempt to answer the call of the researchers to explore the moderating effect of digital literacies on the relationship between workplace digitalisation/innovative culture and employee engagement. Although the research evidence is convincing that higher positive perception of workplace digitalisation and innovative culture leads to positive employee engagement, the literature is only beginning to uncover how these relationships vary as a function of individual differences are related to the acceptance of technologies (Lilja, 2020). This study, then, contributes to this more nuanced view of the effects of positive employees' acceptance of digitalisation on employee behaviour.

Most research has focussed on the direct effects of digital literacies (Marsh, 2018; Mohammadyari and Singh, 2015; Robson et al., 2015) and research has revealed that digital literacies have a direct effect on employee attitudes and behaviours, leading, for example, to higher levels of engagement (Rich et al., 2010). However, scholars have focussed less on analysing the different mechanisms through which these benefits occur. Hence, although we acknowledge that there is empirical evidence to support a direct relationship between digital literacies and employee attitudes and behaviours, we propose that this is not the only way through which digital literacies can unfold its positive consequences and suggest that digital literacies may, in fact, act as a moderator in the relationship between workplace digitalisation/innovative culture and employee engagement. This contention is supported by Baron and Kenny (1986) who stated that a variable can be treated as either a mediator or a moderator depending on the theoretical framework adopted.

Riding on the JD-R model that attributes job resources as the motivational process and job demands as the energy impairment process, employees who positively value workplace digitalisation and innovative culture are expected to be engaged by devoting their time, effort and resources to strive at work. However, there is no guarantee that these employees translate their energy into behaviours directed towards the organisation uniformly. Employees may vary in the extent of exhibiting the positive and fulfilling traits of engagement, and we propose that digital literacies are one of the reasons for such variation.

Digital literacies enable employees who possess the digital-technical skills to critically evaluate, analyse and synthesise information from various perspectives using digital tools to solve problems when partnering with technologies and optimise the functions of digital technologies for analytically-informed decision-making (Eshet-Alkalai, 2004). Digital literacies could vary between individuals, job functions and the organisational setting (Shrestha, 2018). An individual who is digitally literate in an organisation may be digitally illiterate in another organisation with a different digital pace. Despite the subjective

interpretations, digital literacies are crucial to surviving in the digital era (Eshet-Alkalai, 2004). Being void of digital literacies is parallel to handicap in the digital era (Jones and Flannigan, 2006).

In this paper, we argue that employees who are digitally literate are more likely to leverage workplace digitalisation and innovative culture to stay engaged at work. Digitally literate employees have the intention to use digital devices, platforms and tools to perform their daily tasks. Digital literacies are believed to lighten the consequential impact of flexibility and seamless accessibility of digital tools that blur the work and non-work domains of employees, through mindful usage of digital tools. In contrast, employees who are less competent in handling digital technologies at the workplace, although accepting workplace digitalisation and innovative culture as the new workplace norm, are less motivated to demonstrate engagement.

Therefore, although workplace digitalisation and innovative culture have a relationship with employee engagement, digital literacies strengthen the extent to which employees demonstrate engagement. Thenceforth, this study put up that:

H3a. Digital literacies moderate the relationship between workplace digitalisation and employee engagement and

*H3b.* Digital literacies moderate the relationship between innovative culture and employee engagement.

The hypothesised model is illustrated in Figure 1 below.

3. Methodology and sample

3.1 Sample and data collection

The population of this study was the individuals used as management-level executives in companies located in Selangor/Kuala Lumpur (KL). According to the Statistics Department of Malaysia (2020), Selangor and KL were the main contributors to Malaysia's economy (31%). In Malaysia, Selangor pioneered the digitalisation efforts and the primary state that ventured into e-commerce in 2015 (Priya, 2020). Selangor pledges to intensify the digitalisation efforts (Aziz, 2020) following the Covid-19 pandemic. KL, being the capital of Malaysia, acts as the head office or regional office for conglomerates, multi-national companies, key digital infrastructure and telecommunication players, certain Malaysian authorities and supporting bodies that are leading national digitalisation.

In total, 100 companies were randomly picked, using the "lottery" method (Jerome, 2013; Sathian *et al.*, 2015), from the list of Selangor/KL based companies that are listed in the FMM Directory 2017 (FMM, 2017). An invitation to participate in the survey was sent to 100

Figure 1 The hypothesised model
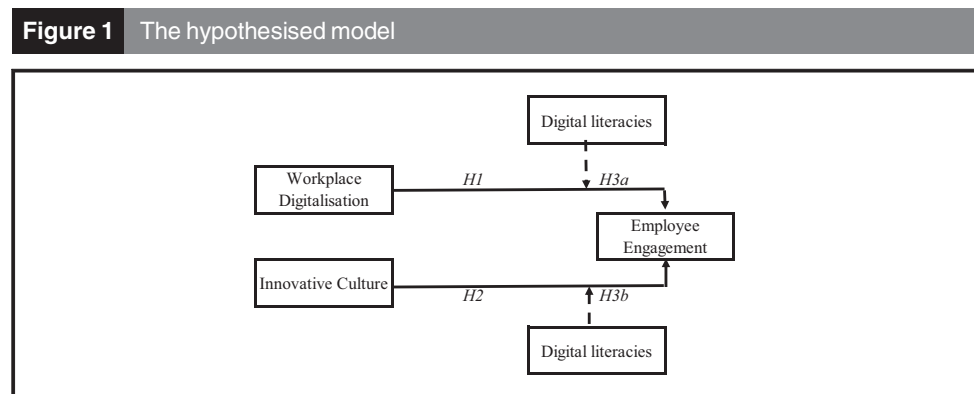
companies identified via email. The email describes the purpose of the survey and requests the company's contact person to circulate the invitation to all full-time management-level executives. The email also provides details on the procedures for indicating informed consent and for completing the survey's online questionnaire. Assurances of anonymity and confidentiality were also stated (Hooi, 2017). Follow-calls were made to verify whether the invitation was received and to seek the contact persons' cooperation. To improve the likelihood of attaining a sufficient number of respondents, the researcher also attempted to recruit participants through LinkedIn and professional contacts that fulfil the sampling criteria, namely, full-time management-level executives of companies based in Selangor/KL. In total, the invitation was sent to 540 LinkedIn profiles and network contacts over four months.

Overall, 256 valid cases were used for the analysis. Of the 256 respondents, 57% were women and 43% were men. Respondents aged 18–38 years old and 39–54 years old were both at 47%. The majority of the respondents (60%) were married and received tertiary education of at least a bachelor's degree level (77%). Half of the respondents (50%) had working experience of 15 years and above and they were based in the back-room office. About two-thirds of the respondents had been with their current organisation for more than two years (71%) and 55% of the respondents were managerial staff (55%).

3.2 Social desirability bias

This study used self-report surveys to generate responses from different employees. There is an innate risk (Larsson and Viitaoja, 2017) that information provided was biased on answers being socially desirable (Ghadi et al., 2013), where the interviewees may over-report "positive behaviour" while under-report "negative behaviour" (Barger, 2002; Larsson and Viitaoja, 2017). Social desirability bias could mislead the relationships of research variables and result in invalid theoretical or practical conclusions (Fisher, 1993).

Accordingly, this study used direct methods to minimise the social desirability bias. Firstly, the questionnaire was accompanied by the consent information statement indicating that participation is voluntarily and assurance of anonymity of the survey participants (Larson, 2019; Larsson and Viitaoja, 2017). Maintaining anonymity could reduce faking and boost honesty, thus could reduce the social desirability bias (Larson, 2019).

Secondly, this study used an online survey. It is believed that internet survey gives respondents the perception of more anonymous (Lautenschlager and Flaherty, 1990; Lim, 2002), thus, poses lower social desirability bias (Caputo, 2017; Liu et al., 2016; Soubelet and Salthouse, 2011; Szolnoki and Hoffmann, 2013). Further, we examined the potential of common method variance (CMV) and found no evidence of bias in the sample (please see Section 3.5 below).

3.3 Measures of constructs

Items for all the constructs were measured using Likert scales ranging from (1) strongly disagree to (5) strongly agree. Workplace digitalisation was measured using 16 items adapted from the unified theory of acceptance and use of technology (UTAUT) model of Venkatesh et al. (2003), where the internal consistency was greater than 0.70. UTAUT has been demonstrating profoundly steady results with the previous research. The Cronbach α for the current study was 0.872.

The innovative culture was measured using four items from a scale developed by Ogbonna and Harris (2000, p. 777), advancing from the work of Campbell and Freeman (1991), Deshpande et al. (1993) and Quinn (1988). The Cronbach α was 0.76. The Cronbach α for the current study was 0.907.

Employee engagement was measured using the shortened nine-item questionnaire (UWES-9) 24 items developed by Schaufeli *et al.* (2006), with Cronbach's α between 0.85 and 0.92. The Cronbach α for the current study was 0.905.

Digital literacies were measured using the 10 items eliciting the technical, cognitive and social-emotional aspects of digital literacies, adapted from the work of Ng (2012), which was used in the context of a university. The Cronbach α for the current study was 0.925.

3.4 Reliability and validity analysis

According to Tabachnick and Fidell (2013), data set with correlations at least $r = 0.3$ or greater, Bartlett's test of sphericity ("Bartlett's test") statistically significant at $p < 0.05$ and the Kaiser-Meyer-Olkin measure of sampling adequacy ("KMO") of at least 0.6 or above are considered suitable for exploratory factor analysis. All the four factors in this study met the threshold, hence, fit for exploratory factor analysis.

A factor analysis rotated with direct oblimin was conducted to examine the factor structure of the scales. With eigenvalues set at 1.00, items with factor loadings below 0.40 and communalities below 0.30 (Pallant, 2016) and cross-loadings items were removed.

Based on these guiding rules, four factors were obtained, namely, the innovative culture (six items, total variance explained of 68.3%), workplace digitalisation (10 items, total variance explained of 48.9%), employee engagement (6 items, total variance explained of 68.2%) and digital literacies (10 items, total variance explained of 61.0%). According to Hair *et al.* (2014, p. 107), in the social sciences, where information is often less precise, it is not uncommon to consider a solution that accounts for 60% of the total variance (and in some instances even less) satisfactory.

The variables were then subject to the reliability test using the Cronbach's α and correlations test. Cronbach's α value for all the variables exceeded 0.7 (Nunnally, 1978), ranging from 0.872 to 0.925, thus, all the constructs have good reliability. The correlations test shows that all variables had a significant positive relationship with other variables, hence, there are direct associations between the variables.

3.5 Common method variance

This study collected used the self-report method with a cross-sectional approach to collect an adequate number of respondents. This data collection method is posed to potential CMV (Podsakoff *et al.*, 2003). Following the recommendation of Podsakoff *et al.* (2003), this study conducted the Harman single-factor test. An exploratory, unrotated factor analysis was performed by entering all the 22 items of the constructs under study in SPSS.

The results showed three distinct factors accounting for 61.0% of the total variance. The first unrotated factor captured only 40.5% of the variance in data. Thus, there were no single factors or general factors that capture most of the variances. Therefore, CMV is not an issue in this research.

4. Results

4.1 Measurement model analysis

The variables retained during the exploratory factor analysis were fed into IBM SPSS analysis of moment structures (AMOS) 26.0 program for confirmatory factor analysis (CFA). CFA validates how well the measured variables come together to represent latent variables (i.e. constructs) in the measurement model. Five fit indices, namely, chi-square (χ^2), goodness-of-fit index (GFI), Tucker-Lewis index (TLI), comparative fit index (CFI) and root mean square error of approximation (RMSEA) were used in this study to provide evidence of the model fit.

In total, three variables with low loadings (below 0.6) (Awang, 2015) from the workplace digitalisation construct were dropped to improve the model fit. Four pairs of measurement errors were covariate (Hair *et al.*, 2014) to ensure sufficient items to represent the constructs fairly. The refined measurement model exhibited an acceptable fitting model with $\chi^2 = 368.259$; $p < 0.001$; GFI = 0.868; TLI = 0.920; CFI = 0.932 and RMSEA = 0.078.

The refined measurement model was subject to convergent and discriminant validity tests. All items in the model were significantly loaded into their intended factors with standardised loadings of more than 0.50, confirming the convergent validity (Hooi, 2017). Besides, the constructs reported average variance extracted (AVE) and construct reliability (CR) (Hair *et al.*, 2014) above 0.5 and 0.7, except the AVE for workplace digitalisation at 0.48 (just below 0.5), thus, confirming convergent validity.

Discriminant validity assesses the extent to which a construct is different from other constructs and that the individual measured items represent only one latent construct (Hair *et al.*, 2014). The discriminant validity for all constructs is achieved when a diagonal value (in bold) is higher than the values in its row and column. The discriminant validity index summary (Table 1) below evidenced discriminant validity.

4.2 Summary of findings on hypothesised relationships

H1. Workplace digitalisation-employee engagement relationship.

H2. Innovative culture-employee engagement relationship.

The direct hypotheses, namely, *H1* and *H2* were tested using the standardised regression weights of the structural model, based on the refined measurement model. As summarised in Table 2 below, workplace digitalisation positively influenced employee engagement at a significant level ($p < 0.05$), supported *H1*. Likewise, innovative culture reported a significant positive relationship with employee engagement. *H1* and H2 were supported.

4.2.1 Testing of the moderating variable in the model

H3a. The role of digital literacies in the workplace digitalisation-employee engagement relationship.

This study applied the multi-group CFA (Awang, 2015) to assess the effect of a moderator variable. The respondents were grouped into low digital literacies (mean scale 1.0 to 3.50)

Table 1	The discriminant validity index summary		
Factor	WD	IC	EE
Workplace digitalisation (WD)	*0.7*		
Innovative culture (IC)	0.3	*0.8*	
Employee engagement (EE)	0.3	0.7	*0.8*

Table 2	Standardised regression weight for *H1* and *H2*							
Factors			Std loadings	S.E.	C.R.	P	Hypothesis	Decision
Employee engagement	<—	Workplace digitalisation	0.137	0.086	2.284	0.022	*H1*	Supported
Employee engagement	<—	Innovative culture	0.631	0.056	7.325	***	*H2*	Supported

Note: ***Significant at 0.001 level (two-tailed)
Source: Own research

and high digital literacies (mean scale > 3.50). These two groups of the data set were saved as two different files.

Next, we developed two separate AMOS models, namely, the constrained model and the unconstrained model. For the contrained model (Figure 2), the path of interest, which is the path of workplace digitalisation-employee engagement is set to "1". The path of interest for the uncontrained model (Figure 3) was left as it is without any contraints.

Figure 2 Constrained model where the path of workplace digitalisation-employee engagement is constrained to "1" using the low digital literacies data set group
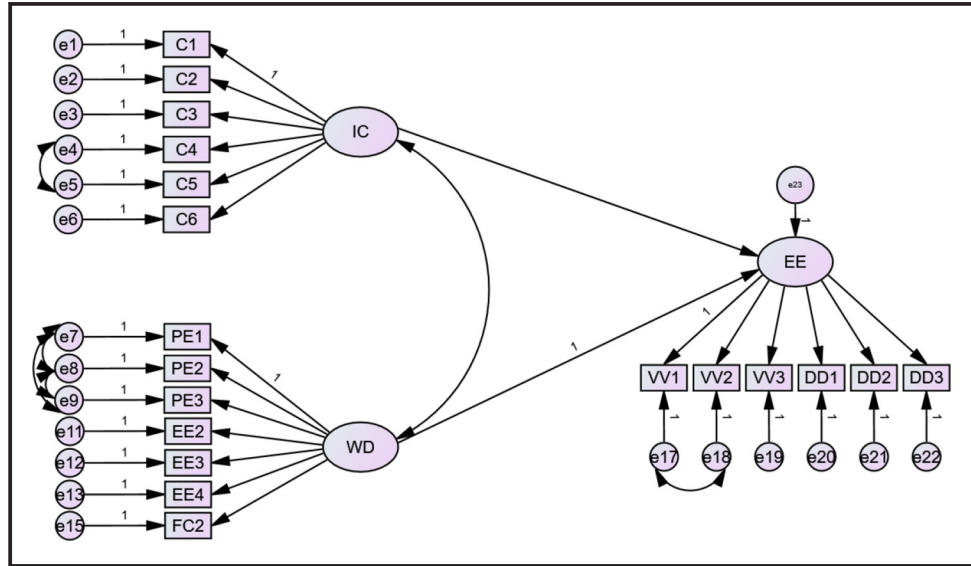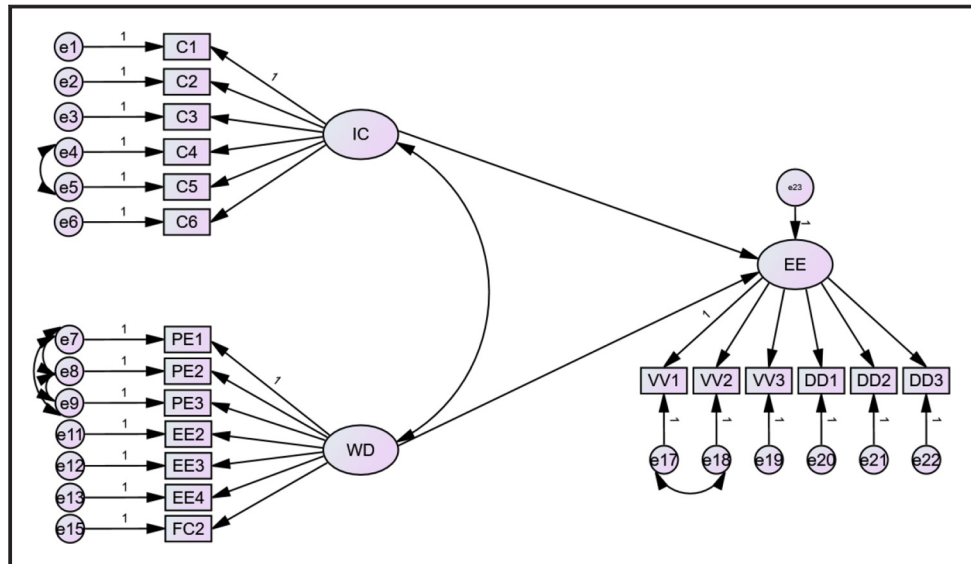

Figure 3 Unconstrained model where the path of workplace digitalisation-employee engagement is not constrained using the low digital literacies data set group

Using the data set for low digital literacies group, estimation was generated for the constraint model and unconstrained model separately to obtain the χ^2 value and degrees of freedom for each model. The χ^2 values for both models were compared. Moderation occurs when χ^2 differs more than 3.84, of which the moderation is significant (Awang, 2015). This is consistent with the suggestion by Hair $et\ al.$ (2014, p. 588) that a relationship is significant at 0.05 level when the difference in χ^2 with one degree of freedom is 3.84 or more. The same steps were repeated using the high digital literacies group.

Tables 3 and 4 show that for both the low digital literacies group and high digital literacies group, the difference in χ^2 value between the constrained and unconstrained model were larger than 3.84, with 1 degree of freedom. This meant the moderation tests were significant. Thus, hypothesis $3a$ was supported:

> $H3b.$ The role of digital literacies in the innovative culture-employee engagement relationship.

The similar procedures used in testing the hypothesis $H3a$ were used for the testing of hypothesis $H3b$. For this hypothesis testing, the path of interest for contraint and uncontraint was innovative culture-employee engagement. Two data sets, which is the low digital literacies group and high digital literacies group were applied to repeatedly to the contrained model and the uncontrained model.

Tables 5 and 6 show that for both the low digital literacies group and high digital literacies group, the moderation tests were significant as the difference in χ^2 value between the constrained and unconstrained model were larger than 3.84, with 1 degree of freedom. Thus, $H3b$ was supported.

5. Discussion

The primary objective of this study was to investigate the impact of digital literacies as a moderator between employee engagement and its antecedents, which is, workplace digitalisation and innovative culture. The results of structural equation modeling (SEM) analysis supported $H1$ that there is a relationship between workplace digitalisation and employee engagement. This finding is consistent with the arguments of past research such as Chopra (2017) and Ismail (2017). Our study findings illuminate that digital literacies significant to moderate the relationship between workplace digitalisation and employee engagement, thus, supporting hypothesis $H3a$. Employees with adequate digital skills and

Table 3 Low digital literacies group

Measures	Constrained model	Unconstrained model	$\Delta\chi^2$	Result on moderation	Decision
χ^2	348.361	339.022	9.339	Significant	Supported
df	145	144	1		

Source: Own research

Table 4 High digital literacies group

Measures	Constrained model	Unconstrained model	$\Delta\chi^2$	Result on moderation	Decision
χ^2	279.585	272.513	7.072	Significant	Supported
df	145	144	1		

Source: Own research

Table 5	Low digital literacies group				
Measures	Constrained model	Unconstrained model	$\Delta\chi^2$	Result on moderation	Decision
χ^2	368.203	339.022	29.181	Significant	Supported
df	145	144	1		
Source: Own research					

Table 6	High digital literacies group				
Measures	Constrained model	Unconstrained model	$\Delta\chi^2$	Result on moderation	Decision
χ^2	308.868	272.513	36.355	Significant	Supported
df	145	144	1		
Source: Own research					

know-how are perceived to accept new digital tools sooner and have a more positive attitude towards new tools (Lilja, 2020).

The SEM analysis also exhibited a significant relationship between innovative culture and employee engagement, thus *H2* was supported. The study findings also supported *H3b* that digital literacies moderate the relationship between innovative culture and employee engagement.

In summary, the results findings supported all the hypotheses laid-out in our conceptual framework. The findings solidify our argument in the hypothesis development for *H1, H2, H3a* and *H3b*, using the JD-R model (Schaufeli and Bakker, 2004). The emergence of digitalisation at workplace resulted the organisations operate in a volatile, uncertain, complex and ambiguous environment. The Covid-19 pandemic accelerates the pace of workplace digitalisation as a new business model in minimising physical contacts. In this climate, the sustainability of organisations depends on how fast the organisations adapt to changing technologies and innovations. In this regard, engaged employees who stretch their efforts towards the organisational goals are inevitable critical to drive organisational sustainability in the digital era. Improving digital literacies allow employees to stay engaged while accepting workplace digitalisation. The innovative culture lay the resources for employees to strengthen their engagement at work.

Earlier literature demonstrated that job resources are able to raise employee engagement, even though in the presence of job demands (Imperatori, 2017; Schaufeli and Bakker, 2004). Therefore, promoting job resources may be a possible future remedy for compensating the negative job demands arising from digital tools. Negative perceptions towards new digital solutions appear amongst some employees initially due to the digital literacies gap, however, as the findings of this study suggested, employees can be more open to digitalisation and stay engaged as long as they gain sufficient skills to use the new digital tools.

6. Theoretical contribution

The study contributes to the theory in several ways. Firstly, this research enriches the well-established antecedents of employee engagement, by examining empirically the roles of workplace digitalisation and innovative culture. The findings of this study depict that workplace digitalisation has a relationship with employee engagement. Workplace digitalisation uplifted employees from mundane and repetitive work, hence, employees are more focussed on interpretative work to create more values for the organisations. When

employees see that their work is meaningful, valuable and align with their needs, they are engaged to accomplish the organisational goals. Thus, the study advances the JD-R model in the literature for employee engagement that workplace digitalisation and innovative culture are antecedents for future research model. Finally, the findings of this study provide an empirical confirmation that digital literacies moderate the relationships between workplace digitalisation, innovative culture and employee engagement. To sum up, it can be said that the study provides new evidence of the relationship between the studied variables and validates the known association amongst them in an integrated approach.

7. Practical implications

In practical terms, our results indicate that organisations need to be aware that, although employees who have positive perceptions of workplace digitalisation and innovative culture in their organisation demonstrate higher levels of engagement, the extent of their digital literacies influences the extent to which they enact more engagement. Thus, it is insufficient merely cultivate the innovative culture at the workplace and promote workplace digitalisation, improving employees' digital literacies helps optimising the benefits of employee engagement in the context of a workplace that adopts digitalisation and/or innovative culture.

In this regard, the industry practitioners and leadership teams in the organisations should not underplay the employee's digital literacies when design an effective employee engagement program in the digitalised workplace and organisational culture that is rich in innovations. Amongst others, adopt the digital tools such as social media, mobile device or the internet of things that employees are exposed in their day to day lives (Ng, 2012), introducing the perceived benefits of digital tools so that employees, especially the digital natives, have a purpose to learn for the digital tools (Ng, 2012), organise training or coaching sessions to improve the competencies of employees (Haruna and Marthandan, 2017) or adopts the gamification approach towards learning of new technologies (Robson et al., 2015).

8. Limitations and future research

Although our research provides new evidence pertaining to the moderating effect of employee digital literacies on the relationship between workplace digitalisation, innovative culture and employee engagement, our results should be assessed against the background of the limitations inherent in our study. Firstly, we relied on individual employees' self-reports for all variables in our model which raises the concern of possible common method bias. However, our statistical analyses posited that common method bias did not cause major concern in our study.

Moreover, the focus in our current study was on employee perceptions of their organisations, so we would argue that self-report measures could actually be the most appropriate measurement method for most of our variables, as employees are best placed to report their own levels of engagement, their perceptions of workplace digitalisation and innovative culture. Hence, the only construct which could have been measured by multiple data sources is employee digital literacies. Nevertheless, we recommend future research to consider collecting data from multiple sources to investigate our findings further.

Secondly, we collected data at one point in time, which could limit the conclusions that can be made regarding the causal order of our relationships, such as digital literacies of employees may differ over time. We would, therefore, suggest future longitudinal study to substantiate the causality of our hypotheses. For instance, employees could be assigned to the innovative culture environment group (experimental condition) or non-innovative culture group (control condition). The engagement measure could be taken for groups with different digital literacies. Based on the findings of this study, we would expect that

employees with strong digital literacies would increase employee engagement in the experimental, relative to the control condition.

Thirdly, this research is confined to workplace digitalisation and innovative culture, which are believed the prominent antecedents of employee engagement in the context of a digital workplace. The constrained view is to limit the complexity of the model and to focus on what has been accepted as the more important influences. Accordingly, this model may preclude relevant antecedents such as digital readiness in organisations, rewards and recognition, digital leadership that may influence employee engagement in a digitalised workplace.

Future research may formulate more specific hypotheses breaking down each dimension of employees' perception of workplace digitalisation, innovative culture and digital literacies. The elements for each construct may signify different relationships, hence, refine the literature of these disciplines.

9. Conclusion

This study presented an analysis of the workplace digitalisation-innovative culture-employee engagement relationship with digital literacies as a moderator to provide a solid perspective of the associations between workplace digitalisation, innovative culture and employee engagement. The study findings illustrated the significant role of digital literacies on employee engagement in the digital-driven and/or innovative culture-centric workplace, thus warrant attention to the correlations between these constructs. Practitioners may have to strategise to improve employees' digital literacies to raise employee engagement in the digital era. We argue that improving employees' digital literacies could enhance employees' willingness to accept digital technologies. It is believed that when employees are willing to embrace new technology, making computing resources and knowledge support more accessible to employees in a pro-innovation culture will strengthen employee engagement through the feelings of empowerment and ownership (Donaldson, 2015). Therefore, organisations would have to raise employees' digital literacies, in tandem with workplace digitalisation and cultivate a strong foothold of innovative culture, to amplify employee engagement.

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