The current issue and full text archive of this journal is available on Emerald Insight at:
https://www.emerald.com/insight/0143-7720.htm

Received 9 October 2023
Revised 18 March 2024
2 July 2024
25 September 2024
22 December 2024
26 February 2025
27 April 2025
Accepted 28 April 2025

Employee engagement in homeworking ecosystem: the role of e-leadership, virtual communication and shared understanding

Lai Wan Hooi
College of International Management, Ritsumeikan Asia Pacific University, Beppu, Japan, and
Ai Joo Chan
Swinburne University of Technology – Sarawak Campus, Kuching, Malaysia

Abstract

Purpose – Remote working is becoming a new trend affecting most employees since the COVID-19 pandemic. Employee engagement (EE) studies in the context of remote working are emerging but remain inconclusive. Building on the social exchange theory (SET), this study aims to examine the effect of e-leadership on EE, considering virtual communication as a mediator and shared understanding as a moderator.

Design/methodology/approach – A total of 257 valid samples were collected online from employees of Malaysian organizations using snowball sampling. The data were analyzed using structural equation modeling tests: confirmatory factor model, correlation analysis, path analysis, bootstrapping analysis and multi-group confirmatory factor analysis.

Findings – The findings show the positive relationships between e-leadership and virtual communication and virtual communication and EE. Further, e-leadership directly affects EE and indirectly through virtual communication. The moderating role of shared understanding to strengthen or weaken the virtual communication–EE relationship is also supported.

Practical implications – This study suggests that organizations wishing to foster EE in the remote working environment can cultivate e-leadership to facilitate virtual communication for higher EE. Furthermore, a shared understanding alongside e-leadership enhances the role of virtual communication in shaping EE.

Originality/value – This study enriches the EE literature by offering insights into how e-leadership, virtual communication and shared understanding influence EE based on the employer–employee relationship in remote working, which has been widely practiced since the COVID-19 pandemic and shall remain valid in the post-pandemic era.

Keywords E-leadership, Virtual communication, Shared understanding, Employee engagement

Paper type Research paper

Introduction

The widely examined employee engagement (EE) literature has generally associated EE with favorable outcomes, such as improved retention, productivity, and employee well-being (Mer and Srivastava, 2023). EE represents an employee's vigor, dedication, and absorption at work (Schaufeli *et al.*, 2002). Engaged employees tend to be passionate, energetic, and positively connected to their jobs (Kossyva *et al.*, 2023) and do better work than their disengaged peers (Hooi, 2021). As such, engaged employees are crucial in helping organizations stay afloat in a crisis business environment, such as the COVID-19 pandemic (Sulistiana and Darma, 2023).

The global shift into remote working to mitigate physical interactions since the COVID-19 pandemic has introduced mixed employee experiences, which affect employees physically, psychologically, and emotionally, and ultimately, their engagement (Boccoli *et al.*, 2024). The global state of EE in 2022, where remote working is still mainly in practice, despite varying intensity, is reportedly low at 23% due to high work stress (Gallup, 2023). As remote working will likely prevail in the post-COVID-19 pandemic, improving EE should top the agenda for organizations seeking business recovery (Gallup, 2023). Indeed, some organizations that rely on the support of talented employees in the post-COVID-19 pandemic business landscape are

International Journal of Manpower
Vol. 46 No. 8, 2025
pp. 1418-1437

e-ISSN: 1758-6577
p-ISSN: 0143-7720
DOI 10.1108/IJM-10-2023-0585

making concerted efforts to foster EE. Accordingly, understanding ways to foster EE in remote working is pivotal.

While EE literature in this new context of remote working is emerging (Wang *et al.*, 2024), the studies offer mixed results (Pass and Ridgway, 2022). Boccoli *et al.* (2024) validated positive EE in remote working. In contrast, Wang *et al.* (2024) empirically found that EE is negatively affected in remote working setup. Hence, more research is needed (e.g. Kossyva *et al.*, 2023) to unpack EE in remote working settings (Chamakiotis *et al.*, 2021; Pass and Ridgway, 2022). Additionally, despite EE being a critical performance driver in today's dynamic business environment (Hooi, 2021), EE levels remain low (Gallup, 2023). Scholars, most notably Boccoli *et al.* (2024), suggested that organizations address this issue by considering key EE antecedents, including leadership and communication. While existing EE literature supported the roles of leadership and communication in predicting EE in traditional settings, would digitally mediated leadership and communication remain effective in fostering EE in remote working ecosystems? Anchored in the SET, this study explores the effect of e-leadership on EE and the mediating role of virtual communication in the remote working environment. Additionally, the interactive effect of virtual communication and shared understanding on EE is investigated.

E-leadership uses digital technologies to influence employees' behaviors, emotions, thoughts, and performance (Van Wart *et al.*, 2019) toward attaining organizational goals. With few exceptions (e.g. Kandil and Moustafa, 2021; Maheshwari *et al.*, 2024), studies linking e-leadership and EE are limited, exploratory, and inconclusive. Scholars (e.g. Newman *et al.*, 2020) proposed investigating how leadership through communication influences EE in virtual work settings. Several studies (e.g. Hurtienne *et al.*, 2022; Santoso *et al.*, 2022) highlighted the importance of leaders' communication to elicit EE, hinting that communication is a medium between leadership and EE.

With a few exceptions (e.g. Bulińska-Stangrecka *et al.*, 2021; Rabiul *et al.*, 2023), studies on the mechanisms linking leadership and EE are limited and under-explored (Santoso *et al.*, 2022). Our study proposes virtual communication, which is the creation and exchange of information digitally (Lartey and Randall, 2021), as the missing link connecting e-leadership and EE in the context of remote working. Thus far, no published studies have examined e-leadership – virtual communication – EE relationships. We argue that in remote working, e-leaders interact with employees through different facets of communication: behaviors, skills, tools, or technologies (e.g. Rabiul *et al.*, 2023; Woods, 2021) instead of physical interaction (Santoso *et al.*, 2022). Hence, virtual communication can be a more relevant organizational support for e-leadership to stimulate employee reciprocal exchange in EE.

While e-leadership may employ effective communication to influence EE, the extent to which employees demonstrate engagement may vary subject to the shared understanding between the leader and the employees (Agredo-Delgado *et al.*, 2022; Hurtienne *et al.*, 2022; Morgan *et al.*, 2014). Shared understanding refers to the extent to which the leader and employee share some common ground about their expertise, assigned tasks, context, and preferences (Burkus, 2021). With a few exceptions (e.g. Peter, 2003), limited studies have explored shared understanding as a moderating variable, thereby warranting more examinations to understand the profound roles of shared understanding (Agredo-Delgado *et al.*, 2022; Morgan *et al.*, 2014). In this study, we propose to investigate how shared understanding moderates the virtual communication-EE relationship. We argue that when employees perceive a shared understanding alongside virtual communication as organizational support, employees are more likely to reciprocate the benefits by being more engaged at work than employees who view a low shared understanding in remote working.

Our study is important and relevant in several ways. Firstly, this study offers a better understanding of the concept of e-leadership and its influence on EE in the new remote working norm. Second, this study examines virtual communication, a black box that is relatively under-explored in the EE studies (e.g. Stranzl *et al.*, 2021; Tate *et al.*, 2019). Third, this study considers the interactive effects of shared understanding on EE, a moderating path that has received little attention before the remote working environment. Practically, this study provides valuable insights into the significance of e-leadership, virtual communication, and shared understanding in engaging employees in remote working ecosystems. Lastly, using Malaysian data, this study contributes to the EE research in the Asian context to complement the existing Western-dominated remote EE studies.

Literature review and hypotheses development

Theoretical background

This study employed the SET (Blau, 1964; Homans, 1958) to develop the hypotheses. SET, together with Kahn's (1990) theory and the Job Demands-Resources ("JD-R") model (Bakker and Demerouti, 2017), are popular EE theories in the literature (Saks and Gruman, 2014). Kahn's (1990) theory describes that employees who experience more psychological meaningfulness, safety, and availability will engage more in their work role (Saks and Gruman, 2014). This theory provides theoretical rationale explaining various EE and its antecedents but relatively rarely tested (Saks and Gruman, 2014). The JD-R model links job demands to burnout and job resources to engagement. However, the JD-R model has not explained the most important resources for EE and why employees engage differently when every employee has the same job (Mayuran and Kailasapathy, 2022). The SET offers an alternative yet effective tool to understand the factors influencing the extent of EE (Kisi, 2023). The SET works on the norm of reciprocal exchange – employees who receive economic and socioemotional resources from their organizations feel obliged to repay for the benefits received, often in EE. Generally, the more benefits and resources employees receive from the organization, the more motivated they are to engage in return. With the increasing growth of technologies in the workplace, scholars (e.g. Tate *et al.*, 2019) have called for further research on how exchange orientation shapes organizational relationships.

In a remote working context, the extent of support employees expect to stay engaged may vary. Organizations can use e-leadership, virtual communication, and shared understanding to improve remote working environments. When employees perceive these as support in remote working, employees feel obligated to repay for the support received. This aligns with the SET which suggests that organizations that cultivate a climate of reciprocity will likely elicit positive attitudinal and behavioral outcomes from employees. E-leadership, virtual communication, and shared understanding support, therefore signal that organizational leaders value and care for the employees working remotely. Hence, we put forth the SET as the underpinning theory for this study.

Remote working

Remote working has characteristics and components uniquely different from those of a traditional brick-and-mortar workplace. Employees who work remotely tend to rely on technology to interact and digital skills to carry out work tasks off-site (Hajjami and Crocco, 2023). Before the COVID-19 pandemic, remote working was discretionary and confined to specific job types or employees (Pass and Ridgway, 2022). The COVID-19 pandemic resulted in many organizations transitioning into various forms of remote work (Boccoli *et al.*, 2024; Chamakiotis *et al.*, 2021; Wang *et al.*, 2024). The sudden swift into remote working, which is likely to stay even post-COVID-19 pandemic (Contreras *et al.*, 2020), has presented challenges in how leaders lead (Bieńkowska *et al.*, 2023). Low leadership support may hinder remote working (Boccoli *et al.*, 2024), emphasizing the significance of technological tools in developing effective leadership in remote work settings. To this end, scholars (e.g. Chamakiotis *et al.*, 2021) called for examinations of how leadership can be exercised to enable organizations to lead effectively in remote work settings.

E-leadership in remote working

The rise of digital technologies-enabled remote working environments creates a new context for leadership (Contreras *et al.*, 2020; Oh and Chua, 2018). Leaders must adapt their leadership style to foster employees' collaboration, engagement, and productivity (Maheshwari *et al.*, 2024). Accordingly, leaders in remote working settings need to streamline the organizational structure to be less hierarchical, establish trustworthy relationships with employees, and foster employee well-being to maintain competitiveness (Contreras *et al.*, 2020). Specifically, studies (e.g. Kandil and Moustafa, 2021) postulated that a remote working environment requires e-leadership as a new type of leadership to improve team performance and effectiveness. However, research on e-leadership is relatively scarce (Van Wart *et al.*, 2019; Avolio *et al.*, 2014), as management scholars and practitioners continue applying conventional leadership frameworks in remote work settings (Bieńkowska *et al.*, 2023). However, during the COVID-19 pandemic, e-leadership started gaining relevance (Bieńkowska *et al.*, 2023; Maheshwari *et al.*, 2024) as a social and organizational support (Contreras *et al.*, 2020) to improve employee performance.

E-leadership is the interaction between leaders and employees through various digital means in different geographical locations or time zones without face-to-face contact (Busse and Weidner, 2020). Scholars generally accepted e-leadership as "a social influence process embedded in both proximal and distal contexts, mediated by advanced information technology to bring about a change in attitude, feelings, thinking, behavior and/or performance in individuals, groups and/or organizations" (Avolio *et al.*, 2014, p. 107). E-leadership is not about any specific communication events or tools but rather about creating a digital environment that leads to high levels of effectiveness (Bieńkowska *et al.*, 2023). Hence, an e-leader is not necessarily a technical expert but should know how to benefit from technology and lead efficiently (Ahuja *et al.*, 2023).

The existing e-leadership literature has demonstrated several gaps requiring further attention. Firstly, scholars (e.g. Avolio *et al.*, 2014) highlighted that e-leadership is not merely an extension of traditional leadership. In remote working, the performance of virtual teams and organizations is influenced by trust, coordination, and communication (Maheshwari *et al.*, 2024). Therefore, e-leaders adapt to new situations by supplementing conventional resources with virtual resources that transcend geographical and time boundaries (Maheshwari *et al.*, 2024). They also focused on employee development, support, and nurturing (Contreras *et al.*, 2020) to build trust and foster high-performing teams in a virtual environment. Thus far, literature on how e-leadership builds effective remote teams is limited, and how e-leadership influences employees remains inconclusive (Contreras *et al.*, 2020). However, e-leaders who lead with more understanding and empathy through computer-mediated environments can increase employees' commitment, respect, trust, and satisfaction (Oh and Chua, 2018). This signals the significance of virtual communication and shared understanding in remote work settings to improve employees' behavior.

Secondly, while e-leadership and various traditional leadership theories have been studied, it may not be sufficient for leading a virtual team (Oh and Chua, 2018). As e-leadership implies a change in the leader-employee relationship (Contreras *et al.*, 2020; Oh and Chua, 2018), e-leaders need to develop different practices to enable the functioning of organizations in remote work settings. Therefore, developing and validating a genuine e-leadership theory is needed to help organizations design, structure, and manage remote working ecosystems. Lastly, empirical evidence on e-leadership is primarily Western-driven (Oh and Chua, 2018). Increased remote working in most contexts and complex digital technologies have accentuated the need for a more comprehensive understanding of e-leadership.

E-leadership and EE

Extant literature generally links traditional leadership, such as transformational, transactional, or passive/avoidant leadership styles of full-range leadership (Bass, 1997) to EE. With the advancement of digital technologies, scholars (e.g. Chamakiotis *et al.*, 2021) advocated the importance of effective leadership in a digitally mediated environment to keep employees engaged. While Mutha and Srivastava (2023) identified the significant impact of leaders on EE in remote working, Klebe and Felfe (2023) claimed that studies linking traditional leadership effectiveness in the digital context are inconclusive. Closely related, contemporary scholars called for examinations of other emerging leadership styles because traditional leadership may not be effective enough in the digital age (Maheshwari and Yadav, 2020).

Remote working supported by workplace digitalization since the COVID-19 pandemic (Chamakiotiset *et al.*, 2021) has initiated e-leadership to support employees in remote working environments (Maheshwari *et al.*, 2024). Existing literature on e-leadership is scarce (Garcia, 2020; Oh and Chua, 2018), exploratory, qualitative, and mainly focuses on leaders' points of view and less on employees' perceptions (Oh and Chua, 2018). Several limited studies (e.g. Kandil and Moustafa, 2021; Maheshwari *et al.*, 2024) have empirically established a positive relationship between e-leadership and EE. Specifically, Maheshwari *et al.* (2024) showed that e-leadership predicts EE in the working-from-home setting during the COVID-19 pandemic. The authors assert that e-leadership is about blending conventional and virtual media to enhance effectiveness in the remote working environment.

In this study, we argue that e-leadership is a form of social support for employees working in a digitally mediated remote working environment. Following the principles of SET, when employees perceive support as beneficial, they feel obliged to reciprocate by actively engaging in their work. Hence, employees' perception of e-leadership can significantly influence the organization-employee exchange relationship, thus inducing EE (Hai *et al.*, 2020). In essence, we posit that employees' positive perception of e-leadership results in higher EE. Accordingly,

H1. E-leadership positively influences EE.

Virtual communication and EE

While considerable studies demonstrate how various communication perspectives influence employee behaviors and outcomes within an in-person setting (Muzee *et al.*, 2021), researchers call for further examination of how virtual communication impacts EE (Lartey and Randall, 2021; Layng, 2016). Effective face-to-face communication that enhances leader-employee interaction and engagement does not necessarily produce the same outcomes for virtual teams (Newman *et al.*, 2020) spanning different locations (Newman *et al.*, 2020). Unlike traditional in-person communication, virtual communication relies on screen-to-screen digital interaction in text, voice, or video formats (Layng, 2016). When working remotely, employees digest non-verbal messages without physical cues in the virtual environment, which can create confusion and misinterpretation (Layng, 2016). Furthermore, virtual communication is perceived as task-oriented rather than socially relational-oriented, making employees feel isolated and lonely (Muzee *et al.*, 2021). The communication gap and quality of communication may lower EE. Therefore, effective virtual communication is imperative for EE, especially in remote working organizations. Tate *et al.* (2019) verified that some virtual communication techniques, such as expressiveness, attentiveness, and motivation, predict EE in teleworking arrangements.

In this study, we argue that effective virtual communication delivered through appropriate modes can be a social resource for leaders to reinforce the employer-employee relationship in virtual environments. Consistent with the SET, employees who perceive benefits from virtual communication are likely to reciprocate with positive behaviors such as increased engagement at work. Employees' perception of virtual communication influences the employer-employee exchange relationship, thus inducing EE in reciprocity (Hai *et al.*, 2020). Succinctly, we argue that employees who perceive virtual communication positively demonstrate higher EE. Accordingly,

H2. Virtual communication positively influences EE.

E-leadership, virtual communication, and EE

More scholars have sought to explore the mechanism linking leadership-EE (e.g. Bulińska-Stangrecka *et al.*, 2021; Rabiul *et al.*, 2023), as studies examining the mechanism are limited and inconsistent, especially in the remote working context. Additionally, existing scholarships (e.g. Rabiul *et al.*, 2023; Woods, 2021) suggested that leadership plays a vital role in different facets of communication in engaging employees. Hence, we argue that virtual communication may better explain the nexus between leadership and EE. Virtual communication encompasses technologically aided communication techniques that leaders employ to effectively engage remote employees (Newman *et al.*, 2020) to achieve organizational outcomes. In response to this call, we propose virtual communication as a potential mediator linking e-leadership and EE.

While evidence supports that virtual communication mediates e-leadership and positive individual/organizational outcomes, no published empirical study demonstrates how virtual communication mediates the relationship between e-leadership and EE in a remote context. For instance, communication influences social exchange relationships (Homans, 1958) while leaders' communication competency (Rabiul *et al.*, 2023) and social-media communication (Bulińska-Stangrecka *et al.*, 2021) are associated with leadership positively, and in turn, mediate the leadership-EE relationships. Santoso *et al.* (2022) posit that transformational leaders use digitally oriented internal communication to interact with employees. However, this is not in a remote working context. Our study hypothesizes that e-leadership that leverages virtual communication will likely experience better EE than those lacking this job resource in the remote working context.

Employing multiple facets of digitally mediated communication and collaboration strategies (Wood, 2021), e-leaders create a comfortable remote working environment to clarify work roles and increase employee participation, morale, collaboration, cooperation, and sharing, ultimately raising EE. Drawing on the SET, we argue that employees view virtual communication as a form of support offered by the e-leaders to facilitate their transition to remote work. When employees appreciate e-leadership and view virtual communication as a social benefit in remote working, it fosters a better leader-employee exchange relationship. In return, employees are likely to demonstrate higher engagement to repay for the social benefits received (Hai *et al.*, 2020; Muzee *et al.*, 2021; Rabiul *et al.*, 2023). Thus,

H3. E-leadership positively influences virtual communication.

H4. Virtual communication mediates the relationship between e-leadership and EE.

Moderating effect of shared understanding

Because remote working often connects leaders and employees from different disciplines, functions, and geographies, shared understanding is imperative to promote cooperation and employees' willingness to work together towards mutual goals (Peter, 2003). Similarly, scholars (e.g. Agredo-Delgado *et al.*, 2022) attributed shared understanding to the success of heterogeneous groups. Following the rise of technologies in the workplace, contemporary information system scholars (e.g. Agredo-Delgado *et al.*, 2022; Windeler *et al.*, 2015) called for a more profound understanding of the role of shared understanding, such as technological interventions-shared understanding relationships in the understanding of human behavior (Windeler *et al.*, 2015). Hence, this study examines the moderating role of shared understanding in the association between virtual communication and EE. This analysis is relevant as remote working and digitally mediated communication have become a norm since the COVID-19 pandemic (Mutha and Srivastava, 2023), making communication in a heterogeneous group more challenging.

Existing literature demonstrates that communication, as a means of perceived organizational social support (Turner, 2021), is associated with shared understanding in each other's roles, expertise, and expectations (Agredo-Delgado *et al.*, 2022; Peter, 2003;

Turner, 2021), leading to higher EE (Turner, 2021). Employees tend to demonstrate more commitment when they see their values aligned with their leaders, implying the contingency role of shared understanding. Nonetheless, shared understanding had received relatively little scholarly attention before remote working (Peter, 2003). While several studies linked shared understanding to positive organizational outcomes, such as team engagement (Sinval *et al.*, 2020) and team effectiveness (Windeler *et al.*, 2015), thus far, no published studies examine shared understanding as a moderator in the relationship between virtual communication and EE. Peter (2003) studied the moderating effect of shared understanding on the association between functional diversity and team effectiveness.

In remote working contexts, leaders and employees often lack awareness of each other's work environment conditions, resources, beliefs, and values. Similarly, leaders differ in what they can provide remote employees, including communication tools/techniques. Building on the SET, developing a shared understanding can be considered a high-quality exchange to foster employee outcomes, as seen in relational organizational constructs like perceived organizational support and trust (Cropanzano and Mitchell, 2005). Even without tangible benefits, a high-quality exchange relationship rooted in shared understanding is valuable in influencing EE. Shared understanding serves as a typical frame of reference governing leader and employee roles, responsibilities, and work (Windeler *et al.*, 2015). This shared understanding benefits remote employees by fostering alignment and clarity. When shared understanding is congruent with virtual communication and orients employees toward common organizational goals, employees are more likely to exhibit higher engagement (Jiang and Shen, 2023).

In essence, this study hypothesized that employees expect a strong shared understanding to support their remote work. Employees who positively perceive virtual communication should be more satisfied and engaged if a solid shared understanding is reinforced, as opposed to low shared understanding. That means the relationship between virtual communication and EE is strengthened by high shared understanding. Accordingly,

H5. Shared understanding moderates the relationship between virtual communication and EE.

Figure 1 shows the theoretical model summarizing the hypothesized relationships.

Methodology

Sample and data collection

The study focused on employees working in organizations located in Malaysia. Malaysia declared the movement control order in the form of a nationwide lockdown on 18 March 2020. As a result, assembly and international travel were restricted, and the closure of onsite businesses, industries, government, and educational institutions were mandated to contain the

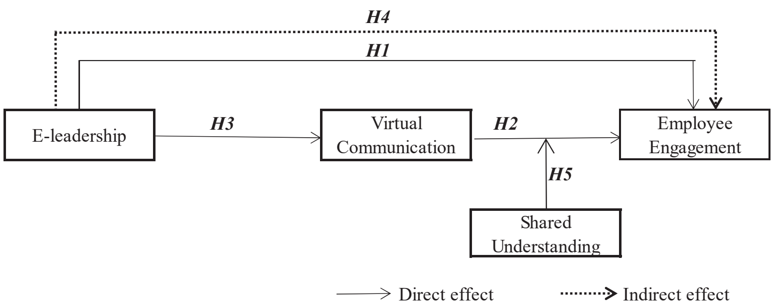

Figure 1. Theoretical model. **Source:** Authors' own work

COVID-19 pandemic. The Malaysian organizations were forced to transition to remote working setups to keep the businesses running. The lockdown measures were periodically relaxed and strengthened throughout the subsequent months in response to the changing epidemiology of the COVID-19 pandemic. In this context, the lockdowns were also localized to specific states or smaller areas based on the severity of cases. In October 2021, the Malaysian government lifted the movement control restrictions for vaccinated people, followed by the transition of the COVID-19 pandemic to an endemic. Employees generally experienced several months of remote working following the COVID-19 pandemic lockdown. Our study collected data from late August 2021 to early October 2021, during which organizations and employees continued to experience remote working arrangements, albeit to varying degrees of intensity.

Following the snowball sampling procedure, this study first identified and contacted the potential respondents within our career network (Wiroko, 2021) who worked in Malaysian organizations during the lockdown period. These individuals were invited to participate voluntarily, and a questionnaire web link, accompanied by a cover letter assuring confidentiality (Hooi, 2021), was shared with those who agreed to participate. We then sought their assistance in recruiting additional respondents from their extended networks who also worked in Malaysian organizations during the lockdown period, following the same procedure outlined by Wiroko (2021). In six weeks till early October 2021, this study obtained a final usable sample of 257 responses. Of the 257 valid cases (Table 1), 59% were females, and 41% were males. Most respondents aged 18–54 years, earned a Bachelor's degree, held executive to senior management positions, and used digital tools for daily virtual communication when working remotely.

In controlling for common method variance, this study gave clear response guidelines and guaranteed confidentiality (Hooi, 2021) to motivate respondents to provide authentic self-expression to the survey (Podsakoff *et al.*, 2012). Additionally, the scales were presented in simple, specific, concise statements without double-barreled items. To reduce method bias in the construction of the questionnaire, several terms were explained with relevant examples (Podsakoff *et al.*, 2012).

All the variables were subject to Harman's single-factor test (Podsakoff *et al.*, 2012). An exploratory, unrotated factor analysis of 26 items showed that the first factor captured only 37.2% of the variance, suggesting that common method bias (CMB) does not pose a significant concern in this study. Additionally, we employed the common latent factor method (Soto-Acosta *et al.*, 2018) to estimate CMB. The squared unstandardized loading of 18% provided evidence that CMB is not substantial.

Measures

The four constructs in this study were measured using Likert scales, from (1) strongly disagree to (5) strongly agree, to gauge the respondents' perceptions of the constructs as employees. The survey items were adapted from previous empirical studies and modified to fit the current context based on feedback from three active researchers in the field of management. The questionnaire was pilot tested online on 32 samples before being administered to the respondents.

The e-leadership construct adapted all three items from Liu *et al.* (2018) (Cronbach's $\alpha = 0.90$) and two of the four items from Wu *et al.* (2019) (Cronbach's $\alpha =$ not available). An example is "eLS4: My immediate superior empowers me to use technology innovatively." The respondents were asked to indicate their level of agreement or disagreement with their immediate superior on the usage and integration of digital tools within a digitally mediated setting.

To measure virtual communication, this study adapted 12 items from Newman *et al.* (2020) with a Cronbach's α of 0.90. In consultation with the active researchers, four items relating to leaders' responsiveness (i.e. (1) expect prompt responses from the leader to work-related questions, (2) the leader provides responses to the team in a timely matter, (3) the leader

Table 1. Demographic data of 257 respondents

No	Category	Description	Frequency	Percent (%)
1	Gender	Female	152	59
		Male	105	41
		Total	257	100
2	Age	18–38	151	59
		39–54	98	38
		55 and above	8	3
		Total	257	100
3	Marital status	Divorced	7	3
		Married	125	49
		Single	124	48
		Widow (er)	1	0
		Total	257	100
4	Educational level	Primary School	1	0
		Secondary School	1	0
		Certificate/Diploma	32	12
		Degree	101	39
		Masters	92	36
		Doctoral	30	12
		Total	257	100
5	Working experience	Less than 1 year	44	17
		1–2 years	13	5
		3–5 years	33	13
		6–10 years	37	14
		11–15 years	46	18
		More than 15 years	84	33
		Total	257	100
6	Position	Assistant	53	21
		Executive	77	30
		Senior Manager/Manager/Assistant Manager	117	46
		CEO and above	10	4
		Total	257	100
7	Department	Accounting/Finance/Audit/Tax/Treasury/Legal	41	16
		Human Resource	34	13
		IT/MIS/Digital	10	4
		Manufacturing/Operations/Engineering	36	14
		Research and Development	29	11
		Sales/Customer Service/Marketing	26	10
		Top Management/Corporate	9	4
		Others	72	28
		Total	257	100
8	Current working mode	Working from Home	100	39
		Working from Office	65	25
		Hybrid (Home and Office)	92	36
		Total	257	100
9	Hours working from home/week	Below 20 h	101	39
		21–40 h	88	34
		Above 40 h	68	26
		Total	257	100
10	Usage of digital tools in virtual communication	Daily	196	76
		Weekly	43	17
		Monthly	16	6
		Quarterly	1	0
		Yearly	1	0
		Total	257	100

Source(s): Authors’ own work

provides predictable responses to work-related queries, and (4) the leader is responsive to communication requests) were modified as “the leader provides prompt responses virtually”. Similarly, two items on mode of communication (i.e. (1) leader chooses modes of communication, such as telephone, e-mail, video conference, etc. that are most effective to provide work-related information, and (2) communicates using an appropriate level of frequency) were modified as “leader uses both asynchronous and synchronous online communication,” and we argued that the modified items were more specific in the current study context. Respondents indicated their level of agreement or disagreement with each of the eight statements regarding the use of virtual communication tools and techniques by their immediate superior. This variable measures the frequency, predictability, responsiveness, clarity, and mode of virtual communication (Van *et al.*, 2019). An example is “VC1: My immediate superior encourages the use of various modes of virtual communication.”

This study adopted all nine items from the widely used UWES-9 (Schaufeli *et al.*, 2002) (Cronbach’s $\alpha = 0.90$ to 0.95, Schaufeli *et al.*, 2019) to measure EE. An example of the item is “VV1: At my work, I feel bursting with energy.” Lastly, shared understanding was measured using four items adapted from Peters (2003), with a Cronbach’s α of 0.84. Respondents evaluated their level of agreement or disagreement regarding the shared understanding they had with their immediate superior taking into consideration perspectives on roles, expertise, tasks, responsibilities, and the strategic directions of the organization. An example is “SU1: My immediate superior and I understand the role we are expected to assume.” Higher scores indicate a stronger alignment and agreement between the employee and their immediate superior in their shared understanding.

Control variables

We have included gender, age, working experience, educational level, current working mode, hours working from home/week, and usage of digital tools in virtual communication as control variables in this study to rule out alternative explanations for our findings.

Analysis

Prior to the multivariate analysis using IBM SPSS version 26.0 and IBM AMOS version 24.0, we examined the possibility of violating multivariate assumptions. The four variables reported skewness within ± 2 and kurtosis within ± 7, suggesting data normality. Moreover, the variables reported correlations within 0.90 (Hooi, 2021), indicating multicollinearity is not an issue. The statistical analysis did not reveal any violation of linearity and homoscedasticity assumptions. Hence, it was possible to proceed with the factor analysis.

We conducted an exploratory factor analysis (EFA) following the guidelines of Hair *et al.* (2019). Using Direct Oblimin rotation, we identified factors with eigenvalues greater than 1.00 to examine the scales’ factor structure. Items with factor loadings below 0.60, communalities below 0.30, or significant cross-loadings were excluded from the analysis. Four factors were obtained: e-leadership (five items), virtual communication (eight items), shared understanding (five items), and EE (eight items). The Cronbach’s α for these factors ranged from 0.85 to 0.91, demonstrating strong reliability and suitability for further analysis.

This study employed a two-stage structural equation modeling (SEM) (Awang, 2015; Hooi, 2021) involving the measurement and structural model to test the hypothesized relationships. Items retained from the EFA were fed into the AMOS 24.0 program for the confirmatory factor analysis (CFA) to analyze the relationships between the indicator variables and the theoretical constructs (Hooi, 2021) in the measurement model. CFA validates the constructs for unidimensionality, validity (construct, convergent, discriminant), and composite reliability (Awang, 2015). This study estimated model fit using the indexes of *p*-value, Root Mean Square Error of Approximation (RMSEA), Tucker-Lewis Index (TLI), comparative fit index (CFI), and Chi-Square/*df* (χ^2/df). The second stage assessed the structural model, where the hypothesized relationships were tested.

Results

Measurement models

In the measurement model, we removed items with factor loadings below 0.60. These were VV1 (At my work, I feel bursting with energy.), VC3 (My immediate superior often uses various online meeting tools, e.g. Zoom, MsTeams.), VC1 (My immediate superior encourages the use of various modes of virtual communication.) and VC2 (My immediate superior mostly communicates using "live" techniques, e.g. mobile communication Apps, online meetings, etc.). From Table 2, all the other items from e-leadership, virtual communication, shared understanding, and EE reported acceptable factor loadings of at least 0.60 (Hair *et al.*, 2019; Hooi, 2021). Three pairs of measurement errors (i.e. e7e21, e10e20, and e14e15) were covaried (Hair *et al.*, 2019) to improve the model fit.

The refined hypothesized model showed an acceptable fit (χ^2/df = 2.145; TLI = 0.932; CFI = 0.941; RMSEA = 0.067; $p < 0.001$). The hypothesized model appeared more superior to alternative models: one-factor model (χ^2/df = 8.303; TLI = 0.566; CFI = 0.613;

Table 2. Psychometric properties of overall hypothesized model

Dimension	Item	Standardized loading	Measurement error
E-leadership (eLS)	eLS5	0.653	0.114
	eLS4	0.806	0.102
	eLS3	0.776	0.102
	eLS2	0.720	0.100
	eLS1	0.685	
Virtual communication (VC)	VC4	0.687	
	VC5	0.758	0.105
	VC6	0.893	0.107
	VC7	0.918	0.117
	VC8	0.882	0.102
Shared understanding (SU)	SU1	0.836	
	SU2	0.874	0.062
	SU3	0.816	0.064
	SU4	0.884	0.061
	SU5	0.710	0.076
Employee engagement (EE)	VV2	0.732	
	VV3	0.741	0.103
	DD1	0.846	0.099
	DD2	0.864	0.098
	DD3	0.779	0.081
	AA1	0.635	0.085
	AA2	0.612	0.114

Model fit index Index	χ^2/df	p	RMR	GFI	AGFI	NFI	IFI	TLI	CFI	RMSEA
Benchmark	1 to 3	>0.00	<0.05	>0.90	>0.80	>0.90	>0.90	>0.90	>0.90	<0.08
Four-factor model	2.145	0.000	0.039	0.869	0.834	0.896	0.941	0.932	0.941	0.067
One-factor model	8.303	0.000	0.115	0.517	0.407	0.584	0.615	0.566	0.613	0.169
Two-factor model	6.095	0.000	0.083	0.613	0.522	0.696	0.733	0.697	0.731	0.141
Three-factor model	5.479	0.000	0.076	0.634	0.544	0.730	0.768	0.734	0.766	0.132

Source(s): Authors' own work

RMSEA = 0.169; $p < 0.001$), two-factor model (χ^2/df = 6.095; TLI = 0.697; CFI = 0.731; RMSEA = 0.141; $p < 0.001$), and three-factor model (χ^2/df = 5.479; TLI = 0.734; CFI = 0.766; RMSEA = 0.132; $p < 0.001$) (Table 2), indicating construct distinctiveness or discriminant validity. Hence, the refined hypothesized model is the best-fit model for hypothesis testing. The constructs' correlations were below 0.85 (Awang, 2015), suggesting no multicollinearity issue.

Based on Table 3, all three constructs reported Average Variance Extracted (AVE) and Construct Reliability (CR) above benchmark values of 0.50 and 0.70 respectively (Awang, 2015; Hair *et al.*, 2019), indicating convergent validity. Further, the diagonal value (in italic) established discriminant validity. The CFA results confirmed that the theoretical measurement model was valid. Thereafter, the structural model was used to test the hypotheses.

Structural model analysis

E-leadership, virtual communication, and EE. Table 4 shows that e-leadership and virtual communication significantly and positively impact EE, thereby supporting hypotheses H1 and H2. Additionally, e-leadership positively influences virtual communication, lending credence to hypothesis H3. The control variables – gender, age, work experience, educational level, current working mode, and the use of digital tools in virtual communication – did not play a significant role in the model. Although hours working from home per week has a significant effect on EE (−0.182*), it did not change the hypothesized direct effect relationships.

E-leadership-virtual communication-EE relationship. This study employed a bootstrapping method with 5,000 samples to test the mediation effect of virtual

Table 3. The AVE, CR, and discriminant validity index summary

Factor	AVE	CR	eLS	VC	SU	EE
E-leadership (eLS)	0.533	0.850	*0.728*			
Virtual communication (VC)	0.693	0.918	0.403	*0.828*		
Shared understanding (SU)	0.683	0.915	0.681	0.467	*0.824*	
Employee engagement (EE)	0.562	0.898	0.525	0.397	0.363	*0.744*

Note(s): The diagonal values (in italic) are construct variances, and values below the diagonal are bivariate correlation estimates among constructs
Source(s): Authors' own work

Table 4. E-leadership, virtual communication, and employee engagement

Path	Std. Loading	S.E.	C.R.	*p*
E-leadership → employee engagement	0.217*	0.102	2.007	0.045
Virtual communication → employee engagement	0.261*	0.099	2.623	0.009
E-leadership → virtual communication	0.722***	0.084	8.14	0.000
Gender → employee engagement	−0.036	0.076	0.598	0.550
Age → employee engagement	0.012	0.091	0.146	0.884
Working experience → employee engagement	0.108	0.028	1.322	0.186
Educational level → employee engagement	0.118	0.110	1.944	0.052
Current working mode → employee engagement	−0.015	0.093	0.231	0.817
Hours working from home/week → employee engagement	−0.182*	0.050	2.833	0.005
Usage of digital tools in virtual communication → employee engagement	−0.065	0.060	1.028	0.304

Note(s): *$p < 0.05$, ***$p < 0.001$
Source(s): Authors' own work

communication. The analysis revealed a significant indirect effect of e-leadership on EE through virtual communication, with an effect size of 0.189* and a 90% bias-corrected confidence interval of [0.073, 0.334]. Additionally, the direct effect of e-leadership on EE was found to be insignificant ($\beta = 0.217$, $p =$ n.s.), indicating a full mediation relationship. Therefore, hypothesis H4 is supported.

Moderating role of shared understanding to the virtual communication-EE relationship. This study utilized Multi-Group CFA (Awang, 2015) to examine the moderating effect of shared understanding. Two AMOS models were set up for this purpose: a constrained model and an unconstrained model. In the constrained model, the path of interest, virtual communication-EE was set to "1". The analysis was conducted separately for two groups: the high shared understanding group (mean scale 4.01 and above) and the low shared understanding group (mean scale up to 4.00). A chi-square (χ^2) difference test was then performed to compare the constrained and unconstrained models for each group. Moderation occurs when χ^2 differs by more than 3.84 for 1 degree of freedom (Awang, 2015; Hair *et al.*, 2019). As shown in Table 5, the high and low groups reported χ^2 differences larger than 3.84 for 1 degree of freedom. Therefore, moderation tests were significant in supporting hypothesis H5. Figure 2 demonstrated that virtual communication's positive effect on EE was weaker for lower (−0.64) and stronger for higher (0.64) shared understanding.

Table 5. High and low shared understanding dataset groups

Group	χ^2 and *df*	Constrained model	Unconstrained model	Change in χ^2	Result on moderation
1. High Group	χ^2	321.049	300.971	20.078	Significant
	df	219	218	1	
2. Low Group	χ^2	431.304	415.414	15.890	Significant
	df	219	218	1	

Source(s): Authors' own work

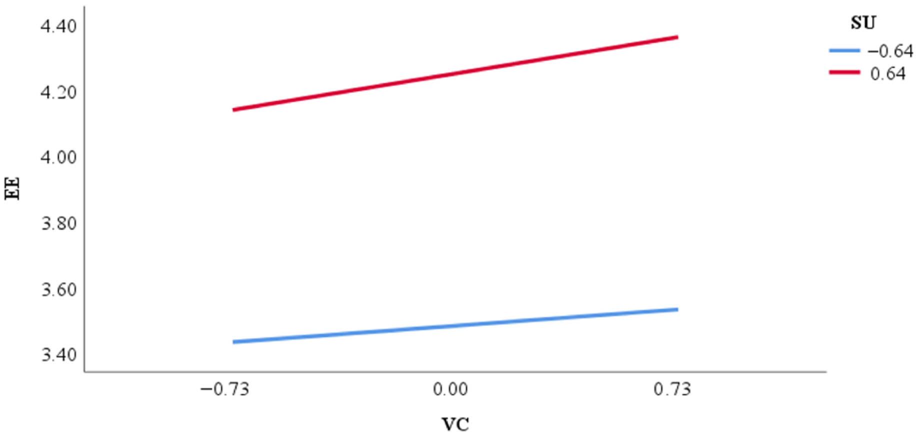

Figure 2. Interaction between virtual communication and shared understanding predicting employee engagement. **Source:** Authors' own work

Discussion

The proposed study explores how e-leadership influences EE by considering the roles of virtual communication and shared understanding. The proposed model attempts to understand EE in the new digitally mediated virtual workspace norm. Keeping employees engaged has become increasingly challenging in the context of involuntary remote work arrangements introduced during the COVID-19 pandemic. These changes may have altered employees' job designs and expectations, potentially jeopardizing EE. However, organizations need highly engaged employees, those who are more passionate and dedicated than ever, to recover from various setbacks and navigate the uncertain, turbulent business climate of the post-COVID-19 pandemic.

Our findings add to the limited studies on the positive effects of e-leadership (Kandil and Moustafa, 2021) and virtual communication (e.g. Stranzl *et al.*, 2021; Tate *et al.*, 2019) on EE. Specifically, our findings align with the SET, highlighting the importance of the leader-employee exchange relationship in inducing reciprocal employee behavior. The results reinforce our argument that e-leadership and virtual communication are critical social resources that enable employees to address remote work challenges, such as workplace isolation, technological infrastructure constraints, and reduced networking opportunities. In essence, the findings suggest that organizations stand to benefit from simultaneously leveraging e-leadership and virtual communication in the remote work environments.

Further, our findings confirm that virtual communication acts as a mediator between e-leadership and EE, demonstrating that e-leadership enhances EE through effective virtual communication. These results align with previous studies on communication-related constructs (e.g. Bulińska-Stangrecka *et al.*, 2021; Rabiul *et al.*, 2023), which also highlight the mediating role of communication in the leadership-EE relationship. Following the SET, our results suggest that e-leadership through multiple facets of digitally mediated communication and collaboration strategies (Wood, 2021), fosters a supportive remote working environment. This, in turn, enhances employee participation, morale, and cooperation, thereby strengthening EE within the exchange relationship.

Lastly, our findings propose that virtual communication and shared understanding generate a moderated mediation model in linking e-leadership and EE. Our integrative model offers preliminary insights into moderated mediation mechanisms in remote working. We establish that virtual communication and shared understanding may be other relevant leader-employee exchange factors to consider. This study verifies that e-leadership does affect EE via virtual communication, and this mediating relationship is stronger for employees with higher leader-employee shared understanding. Shared understanding initiatives, including space for self-disclosure (Burkus, 2021) and a legal framework defining various stakeholders' entitlements or obligations, can mitigate the loss of facial expressions, body gestures, and other subtleties in virtual communication (Vartiainen, 2021). Consequently, shared understanding creates psychological safety for employees to stay focused in the remote workspace. This moderated mediation process provides new insights into EE literature in remote working.

Contributions to research

This study contributes to theory in several ways. First, this study contributes to EE literature by validating the role of e-leadership (e.g. Kandil and Moustafa, 2021; Maheshwari *et al.*, 2024) and virtual communication (e.g. Stranzl *et al.*, 2021; Tate *et al.*, 2019) on EE in remote work settings. Consistent with the SET, employees benefiting from e-leadership and virtual communication in remote work settings are more likely to engage in an exchange relationship to reciprocate the support received, often through EE (Saks, 2006). This extends the application of the SET from traditional workplace settings to the emerging remote working environment.

Second, this study establishes virtual communication as the mechanism linking e-leadership and EE. Our statistically justified model of e-leadership-virtual communication-EE in remote contexts enriches extant literature on leadership, communication, and EE (e.g. Bulińska-Stangrecka *et al.*, 2021; Rabiul *et al.*, 2023), which has primarily focused on selective communication-related variables within traditional physical office settings. Based on the SET, we argue that virtual communication, specifically its frequency, predictability, responsiveness, clarity, and mode (Van *et al.*, 2019) can be an organizational resource in remote working settings. It fosters positive employer-employee relationships, which then enhances EE (Hai *et al.*, 2020; Muzee *et al.*, 2021; Rabiul *et al.*, 2023). Our findings extend Homans' (1958) work that virtual communication influences social exchange relations. Our findings may instigate continuous explorations on how leadership in remote working settings can effectively leverage communication for higher EE as remote work matures.

Third, this study supports shared understanding (Agredo-Delgado *et al.*, 2022; Morgan *et al.*, 2014) as a moderating variable (Peter, 2003) by verifying the interactional effect of virtual communication and shared understanding on EE in the remote working ecosystem. Our findings, which highlight the positive relationships between virtual communication and EE under conditions of both low and high perceptions of shared understanding, align with the SET. Specifically, they support the role of beneficial resources in promoting EE as part of the employer-employee social relationship exchange (Blau, 1964). When a shared understanding is fostered, employees who perceive virtual communication tools and techniques positively are more likely to reciprocate by being more engaged in their work, compared to those who perceive a lack of shared understanding in remote work settings. Our findings hence provide support for a positive synergistic effect between virtual communication and shared understanding to improve EE in remote work settings.

Contributions to practice

Our results offer industry practitioners and policymakers ways to create an engaged workforce in remote working settings, particularly post-COVID-19 pandemic. Based on the reciprocal exchange relationship between the organizations and employees, organizations that invest in e-leadership through a solid foundation of effective virtual communication will likely improve EE. This suggests that organizations wishing to fast-track EE in digitally mediated remote workplaces can benefit from integrating e-leadership and virtual communication aspects into their daily operations. E-leadership, which emphasizes the strategic use of information and communication technology (ICT), leverages ICT to lead teams, facilitate work processes, and empower employees to use technology innovatively. Promoting employee participation in ICT-related training further enhances these efforts, potentially boosting EE.

Additionally, e-leaders can consider implementing policies and procedures that optimize virtual communication, as it is a supportive resource to strengthen the organization's remote work environment. Virtual communication tools and techniques, including both asynchronous and synchronous methods, enable prompt responses and clear communication of goals, tasks, and performance expectations. These tools create a supportive environment where employees can work effectively and meaningfully in geographically dispersed virtual settings, ultimately enhancing EE. To sustain this engagement, organizations should consider implementing e-leadership development programs and providing leaders with training in virtual communication tools and techniques.

Besides, industry practitioners should not underplay the role of shared understanding in strengthening the relationship between virtual communication and EE. Without face-to-face interaction and non-verbal cues, the frequent and open sharing of information helps employees feel that their work is meaningful and creates a sense of psychological safety, encouraging their engagement in the work. Hence, industry practitioners and organizational leaders should consider implementing targeted programs like virtual team-building activities or dialogue sessions to enhance mutual understanding among team members. These initiatives help establish a shared understanding of the team's goals, work processes, interaction norms, coordination mechanisms, role expectations, and conflict resolution strategies, thereby enabling effective virtual collaboration (Tan *et al.*, 2019). Furthermore, investing in employees promotes a climate of reciprocity, strengthening engagement and overall organizational commitment.

Limitations and future research

Notwithstanding the novelty of the theoretical framework and the merits of our findings, this study should be interpreted against a few inherent limitations that could serve as a forward-looking agenda for future research. Firstly, reliance on employees' self-report data is susceptible to common method bias (Bulińska-Stangrecka *et al.*, 2021; Podsakoff *et al.*, 2012). While we argue that employees are well-suited to self-report their perceptions and found that common method variance did not significantly undermine the validity of our findings, we acknowledge the need for more robust methodological approaches. Future research can enhance rigor by incorporating multiple data sources, refining the design of scale items, encouraging authentic self-expression, and employing validation techniques such as Harman's one-factor test to strengthen the reliability of the findings.

Secondly, our quantitative survey relies on a relatively small sample size collected at a single point in time, which may constrain the ability to draw definitive conclusions about causal relationships. To address this limitation, future research could adopt a longitudinal approach with a larger sample to substantiate the evidence for causality in our hypotheses. Thirdly, the generalizability of our findings is limited to the context of Malaysian remote work. Future studies should expand to a broader geographical scope and diverse contexts to comprehensively understand the observed effects.

Lastly, we anticipate that cross-sectional data may evolve over time due to shifts in management policies and economic conditions as the global workforce becomes increasingly familiar with remote work. Consequently, the relationships among the variables examined in this study may also change. Future research could adopt a qualitative approach (Bulińska-Stangrecka *et al.*, 2021) to gain deeper insights into EE in the relatively underexplored context of remote work (Mutha and Srivastava, 2023).

References

Agredo-Delgado, V., Ruiz, P.H., Mon, A., Collazos, C.A., Moreira, F. and Fardoun, H.M. (2022), "Applying a process for the shared understanding construction in computer-supported collaborative work: an experiment", *Computational and Mathematical Organization Theory*, Vol. 28, September, pp. 247-270, doi: 10.1007/s10588-021-09326-z.

Ahuja, J., Puppala, H., Sergio, R.P. and Hoffman, E.P. (2023), "E-Leadership is un(usual): multi-criteria analysis of critical success factors for the transition from leadership to e-leadership", *Sustainability*, Vol. 15 No. 8, p. 6506, doi: 10.3390/su15086506.

Avolio, B.J., Sosik, J.J., Kahai, S.S. and Baker, B. (2014), "E-leadership: re-examining transformations in leadership source and transmission", *The Leadership Quarterly*, Vol. 25 No. 1, pp. 105-131, doi: 10.1016/j.leaqua.2013.11.003.

Awang, Z. (2015), "SEM made simple: a gentle approach to learning structural equation modeling", MPWS Rich Publication Sdn. Bhd, Bangi, Selangor, Malaysia.

Bakker, A.B. and Demerouti, E. (2017), "Job demands-resources theory: taking stock and looking forward", *Journal of Occupational Health Psychology*, Vol. 22 No. 3, pp. 273-285, doi: 10.1037/ocp0000056.

Bass, B.M. (1997), "Does the transactional-transformational leadership paradigm transcend organisational and national boundaries?", *American Psychologist*, Vol. 52 No. 2, pp. 130-139, doi: 10.1037/0003-066x.52.2.130.

Bieńkowska, A., Hazubska, Z., Nowakowska, M. and Tworek, K. (2023), "Organizational performance model based on e-leadership in crisis caused by COVID-19 pandemic", *Procedia Computer Science*, Vol. 225, pp. 98-107, doi: 10.1016/j.procs.2023.09.096.

Blau, P.M. (1964), *Exchange and Power in Social Life*, Transaction Books, New Brunswick.

Boccoli, G., Gastaldi, L. and Corso, M. (2024), "Transformational leadership and work engagement in remote work settings: the moderating role of the supervisor's digital communication skills", *The Leadership and Organization Development Journal*, Vol. 45 No. 7, pp. 1240-1257, doi: 10.1108/LODJ-09-2023-0490.

Bulińska-Stangrecka, H., Bagieńska, A. and Iddagoda, Y.A. (2021), "The mediating role of social media in the relationship between perceived leadership support and employee engagement in banking", *European Research Studies*, Vol. Special Issue 1 No. 24, pp. 851-874.

Burkus, D. (2021), *Leading from Anywhere: The Essential Guide to Managing Remote Teams*, Houghton Mifflin Harcourt Publishing Company, Boston, New York.

Busse, R. and Weidner, G. (2020), "A qualitative investigation on combined effects of distant leadership, organizational agility and digital collaboration on perceived employee engagement", *The Leadership and Organization Development Journal*, Vol. 41 No. 4, pp. 535-550, doi: 10.1108/lodj-05-2019-0224.

Chamakiotis, P., Panteli, N. and Davison, R.M. (2021), "Reimagining e-leadership for reconfigured virtual teams due to COVID-19", *International Journal of Information Management*, Vol. 60, October, 102381, doi: 10.1016/j.ijinfomgt.2021.102381.

Contreras, F., Baykal, E. and Abid, G. (2020), "E-leadership and teleworking in times of COVID-19 and beyond: what we know and where do we go", *Frontiers in Psychology*, Vol. 11, December, 590271, doi: 10.3389/fpsyg.2020.590271.

Cropanzano, R. and Mitchell, M.S. (2005), "Social exchange theory: an interdisciplinary review", *Journal of Management*, Vol. 31 No. 6, pp. 874-900, doi: 10.1177/0149206305279602.

Gallup (2023), *State of the Global Workplace 2023 Report*, Gallup, United States of America, available at: https://www.gallup.com/workplace/349484/state-of-the-global-workplace-2022-report.aspx?thank-you-report-form=1 (accessed 1 January 2024).

Garcia, I. (2020), "E-leadership: a bibliometric analysis", *International Journal of Advanced Corporate Learning*, Vol. 13 No. 1, pp. 19-34, doi: 10.3991/ijac.v13i1.12341.

Hai, S., Wu, K., Park, I.J., Li, Y., Chang, Q. and Tang, Y. (2020), "The role of perceived high-performance HR practices and transformational leadership on employee engagement and citizenship behaviors", *Journal of Managerial Psychology*, Vol. 35 No. 6, pp. 513-526, doi: 10.1108/jmp-03-2019-0139.

Hair, J.F. Jr, Black, W.C., Babin, B.J. and Anderson, R.E. (2019), *Multivariate Data Analysis*, 8th ed., Cengage Learning, EMEA, United Kingdom.

Hajjami, O. and Crocco, O.S. (2023), "Evolving approaches to employee engagement: comparing antecedents in remote work and traditional workplaces", *European Journal of Training and Development*, Vol. 48 Nos 3/4, pp. 375-392, doi: 10.1108/EJTD-10-2022-0103.

Homans, G.C. (1958), "Social behavior as exchange", *American Journal of Sociology*, Vol. 63 No. 6, pp. 597-606, doi: 10.1086/222355.

Hooi, L.W. (2021), "Leveraging human assets for MNCs performance: the role of management development, human resource system and employee engagement", *International Journal of Human Resource Management*, Vol. 32 No. 13, pp. 2729-2758, doi: 10.1080/09585192.2019.1590443.

Hurtienne, M.W., Hurtienne, L.E. and Kempen, M. (2022), "Employee engagement: emerging insight of the millennial manufacturing workforce", *Human Resource Development Quarterly*, Vol. 33 No. 2, pp. 137-156, doi: 10.1002/hrdq.21453.

Jiang, H. and Shen, H. (2023), "Toward a relational theory of employee engagement: understanding authenticity, transparency, and employee behaviours", *International Journal of Business Communication*, Vol. 60 No. 3, pp. 948-975, doi: 10.1177/2329488420954236.

Kahn, W.A. (1990), "Psychological conditions of personal engagement and disengagement at work", *Academy of Management Journal*, Vol. 33 No. 4, pp. 692-724, doi: 10.2307/256287.

Kandil, M.A. and Moustafa, M.A.E. (2021), “The effect of virtual leadership practices on work engagement during COVID-19”, *Delta University Scientific Journal*, Vol. 4 No. 1, pp. 44-53, doi: 10.21608/dusj.2021.205893.

Kisi, N. (2023), “Bibliometric analysis and visualisation of global research on employee engagement”, *Sustainability*, Vol. 15 No. 13, 10196, doi: 10.3390/su151310196.

Klebe, L. and Felfe, J. (2023), “What difference does it make? A laboratory experiment on the effectiveness of health-oriented leadership working on-site compared to the digital working context”, *BMC Public Health*, Vol. 23 No. 1, pp. 1-11, doi: 10.1186/s12889-023-15798-2.

Kossyva, D., Theriou, G., Aggelidis, V. and Sarigiannidis, L. (2023), “Definitions and antecedents of engagement: a systematic literature review”, *Management Research Review*, Vol. 46 No. 5, pp. 719-738, doi: 10.1108/mrr-01-2021-0043.

Lartey, F.M. and Randall, P.M. (2021), “Indicators of computer-mediated communication affecting remote employee engagement”, *Journal of Human Resource and Sustainability Studies*, Vol. 9 No. 1, pp. 82-92, doi: 10.4236/jhrss.2021.91006.

Layng, J.M. (2016), “The virtual communication aspect: a critical review of virtual studies over the last 15 years”, *The Journal of Literacy and Technology*, Vol. 17 No. 3, pp. 172-218.

Liu, C., Ready, D., Roman, A., Van Wart, M., Wang, X., McCarthy, A. and Kim, S. (2018), “E-leadership: an empirical study of organisational leaders’ virtual communication adoption”, *The Leadership and Organization Development Journal*, Vol. 39 No. 7, pp. 826-843, doi: 10.1108/lodj-10-2017-0297.

Maheshwari, S.K. and Yadav, J. (2020), “Leadership in the digital age: emerging paradigms and challenges”, *International Journal of Business and Globalization*, Vol. 26 No. 3, pp. 220-238, doi: 10.1504/ijbg.2020.110950.

Maheshwari, G., Clarke, S., Nguyen, Q.A.N., McClelland, R. and Kunte, M. (2024), “Effect of e-leadership on employees’ outcomes in the higher education sector during COVID-19 and beyond: a case study from Vietnam”, *Educational Management Administration and Leadership*, 17411432231222715, doi: 10.1177/17411432231222715.

Mayuran, L. and Kailasapathy, P. (2022), “To engage or not? Antecedents of employee engagement in Sri Lanka”, *Asia Pacific Journal of Human Resources*, Vol. 60 No. 3, pp. 1-24, doi: 10.1111/1744-7941.12270.

Mer, A. and Srivastava, A. (2023), “Employee engagement in the new normal: artificial intelligence as a buzzword or a game changer?”, in Tyagi, P., Chilamkurti, N., Grima, S., Sood, K. and Balusamy, B. (Eds), *The Adoption and Effect of Artificial Intelligence on Human Resources Management, Part A (Emerald Studies in Finance, Insurance, and Risk Management)*, Emerald Publishing, Leeds, pp. 15-46.

Morgan, L., Paucar-Caceres, A. and Wright, G. (2014), “Leading effective global virtual teams: the consequences of methods of communication”, *Systemic Practice and Action Research*, Vol. 27 No. 6, pp. 607-624, doi: 10.1007/s11213-014-9315-2.

Mutha, P. and Srivastava, M. (2023), “Decoding leadership to leverage employee engagement in virtual teams”, *International Journal of Organizational Analysis*, Vol. 31 No. 3, pp. 737-758, doi: 10.1108/ijoa-07-2021-2856.

Muzee, H., Kizza, J. and Mugabe, G.M. (2021), “Organisational compassion and employee engagement in virtual work environments during COVID-19 lockdown in Uganda and Rwanda”, *International Journal of Management, Knowledge and Learning*, Vol. 10, pp. 127-137, doi: 10.53615/2232-5697.10.127-137.

Newman, S.A., Ford, R.C. and Marshall, G.W. (2020), “Virtual team leader communication: employee perception and organizational reality”, *International Journal of Business Communication*, Vol. 57 No. 4, pp. 452-473, doi: 10.1177/2329488419829895.

Oh, S.P. and Chua, Y.P. (2018), “An explorative review of e-leadership studies”, *International Online Journal of Educational Leadership*, Vol. 2 No. 1, pp. 4-20, doi: 10.22452/iojel.vol2no1.2.

Pass, S. and Ridgway, M. (2022), “An informed discussion on the impact of COVID-19 and ‘enforced’ remote working on employee engagement”, *Human Resource Development International*, Vol. 25 No. 2, pp. 254-270, doi: 10.1080/13678868.2022.2048605.

Peters, L.M.L. (2003), "Now you see them... now you don't: toward a greater understanding of virtual team effectiveness", Doctor of Philosophy, Management Organisation Studies, thesis, University of Massachusetts Amherst, Massachusetts, available at: https://www.proquest.com/openview/b5897a1423f4795baf2dfa0644e7117f/1?pq-origsite=gscholar&cbl=18750&diss=y (accessed 6 February 2022).

Podsakoff, P.M., MacKenzie, S.B. and Podsakoff, N.P. (2012), "Sources of method bias in social science research and recommendations on how to control it", *Annual Review of Psychology*, Vol. 63 No. 1, pp. 539-569, doi: 10.1146/annurev-psych-120710-100452.

Rabiul, M.K., Shamsudin, F.M., Yean, T.F. and Patwary, A.K. (2023), "Linking leadership styles to communication competency and work engagement: evidence from the hotel industry", *Journal of Hospitality and Tourism Insights*, Vol. 6 No. 2, pp. 425-446, doi: 10.1108/jhti-09-2021-0247.

Saks, A.M. (2006), "Antecedents and consequences of employee engagement", *Journal of Managerial Psychology*, Vol. 21 No. 7, pp. 600-619, doi: 10.1108/02683940610690169.

Saks, A.M. and Gruman, J.A. (2014), "What do we really know about employee engagement?", *Human Resource Development Quarterly*, Vol. 25 No. 2, pp. 155-182, doi: 10.1002/hrdq.21187.

Santoso, N.R., Sulistyaningtyas, I.D. and Pratama, B.P. (2022), "Transformational leadership during the COVID-19 pandemic: strengthening employee engagement through internal communication", *Journal of Communication Inquiry*, pp. 1-24, doi: 10.1177/01968599221095182.

Schaufeli, W.B., Salanova, M., Gonzalez-Roma, V. and Bakker, A.B. (2002), "The measurement of engagement and burnout: a two-sample confirmatory factor analytic approach", *Journal of Happiness Studies*, Vol. 3 No. 1, pp. 71-92, doi: 10.1023/a:1015630930326.

Schaufeli, W.B., Shimazu, A., Hakanen, J., Salanova, M. and De Witte, H. (2019), "An ultra-short measure for work engagement: the UWES-3 validation across five countries", *European Journal of Psychological Assessment*, Vol. 35 No. 4, pp. 577-591, doi: 10.1027/1015-5759/a000430.

Sinval, J., e Pina, J.A., Sinval, J., Marôco, J., Santos, C.M., Uitdewilligen, S., Maynard, M.T. and Passos, A.M. (2020), "Development of the referee shared mental models measure (RSMMM)", *Frontiers in Psychology*, Vol. 11, October, 550271, doi: 10.3389/fpsyg.2020.550271.

Soto-Acosta, P., Popa, S. and Martinez-Conesa, I. (2018), "Information technology, knowledge management and environmental dynamism as drivers of innovation ambidexterity: a study in SMEs", *Journal of Knowledge Management*, Vol. 22 No. 4, pp. 824-849, doi: 10.1108/jkm-10-2017-0448.

Stranzl, J., Wolfgruber, D., Einwiller, S. and Brockhaus, J. (2021), "Keeping up the spirit. Internal communication in an increasingly virtual work environment", in *Communication Insights*, Academic Society for Management & Communication, Leipzig, Germany, Vol. 13.

Sulistiana, I.N. and Darma, G.S. (2023), "Digital leadership, work-life balance, compensation, job satisfaction, and employee engagement", *Quantitative Economics and Management Studies*, Vol. 4 No. 5, pp. 981-993.

Tan, C.K., Teoh, A.P. and Cheah, J.H. (2019), "Factors influencing virtual team performance in Malaysia", *Kybernetes*, Vol. 48 No. 9, pp. 2065-2092, doi: 10.1108/k-01-2018-0031.

Tate, T.D., Lartey, F.M. and Randall, P.M. (2019), "Relationship between computer-mediated communication and employee engagement among telecommuting knowledge workers", *Journal of Human Resource and Sustainability Studies*, Vol. 7 No. 2, pp. 328-347, doi: 10.4236/jhrss.2019.72021.

Turner, P. (2021), "Management competence for the fourth industrial revolution: engages and develops the workforce", in Turner, P. (Ed.), *The Making of the Modern Manager*, Palgrave Macmillan, Cham, pp. 263-294.

Van Wart, M., Roman, A., Wang, X. and Liu, C. (2019), "Operationalising the definition of e-leadership: identifying the elements of e-leadership", *International Review of Administrative Sciences*, Vol. 85 No. 1, pp. 80-97, doi: 10.1177/0020852316681446.

Vartiainen, M. (2021), “Mobile multilocational work: benefits and drawbacks”, in Korunka, C. (Ed.), *Flexible Working Practices and Approaches*, Springer, Cham, pp. 117-147.

Wang, H., Xiao, Y., Wang, H., Zhang, H. and Chen, X. (2024), “Who knows me understands my needs: the effect of home-based telework on work engagement”, *Psychology Research and Behavior Management*, Vol. 16, pp. 619-635, doi: 10.2147/prbm.s402159.

Windeler, J., Maruping, L.M., Robert, L.P. and Riemenschneider, C.K. (2015), “E-profiles, conflict, and shared understanding in distributed teams”, *Journal of the Association for Information Systems*, Vol. 16 No. 7, pp. 608-645, doi: 10.17705/1jais.00401.

Wiroko, E.P. (2021), “The role of servant leadership and resilience in predicting work engagement”, *Journal of Resilient Economies*, Vol. 1 No. 1, pp. 32-40, doi: 10.25120/jre.1.1.2021.3821.

Woods, M. (2021), “Technology impacts on employee engagement during COVID-19”, in Visvizi, A., Troisi, O. and Saeedi, K. (Eds), *Research and Innovation Forum 2021 (RIIFORUM 2021), Springer Proceedings in Complexity*, Cham, Springer, pp. 45-58.

Wu, B., Yu, X. and Hu, Y. (2019), “How does principal e-leadership affect ICT transformation across different school stages in K-12 education: perspectives from teachers in Shanghai”, *British Journal of Educational Technology*, Vol. 50 No. 3, pp. 1210-1225, doi: 10.1111/bjet.12766.

Corresponding author
Lai Wan Hooi can be contacted at: c-hooi@apu.ac.jp