The Effect of Virtuality on Work Engagement through Social Presence: Moderated Mediation Effect of Team Members’ Perception of Identity Entrepreneurship

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ABSTRACT

This study aims to verify the effects of virtuality in the workplace and social presence on work engagement and the moderated mediating effects of leaders’ identity entrepreneurship perceived by team members. This study used a quantitative approach to collect and analyze cross-sectional survey data of remote workers in South Korea. An online survey was conducted on remote workers and 300 questionnaires were analyzed. The research findings confirmed that social presence mediated the relationship between virtuality and work engagement. Furthermore, the moderating effect of leaders’ identity entrepreneurship was significant in the relationship between virtuality and social presence. As hypothesized, the moderating effect of the leaders’ identity entrepreneurship perceived by the team members was confirmed. Based on the result, this study proposes the necessity of the social presence of members in a remote work environment with high virtuality. Although this study overlooked causal relationships between the variables and remote workers’ home context, this study enlightens the importance of team leaders’ identity entrepreneurship quality in enhancing social presence among employees in the virtual working environment. The implications of the findings were facilitating virtual communication training programs and developing identity entrepreneurship training programs for team leaders. For virtual teams, it is necessary to find the most suitable virtual communication tool for each different task.
The workplace interaction of employees is a key factor in forming a strong social identity and raising employees’ level of work engagement (Kahn, 1990). Individuals define not only their identity but also the identity of other interactors when expressing themselves (Weinstein & Deutschberger, 1963), and one’s identity is recognised when the image of oneself and others’ match (Gioia et al., 2000). Therefore, all interaction partners in their self-representation process not only define their own identities but also the identity of the other (Lührmann & Eberl, 2007; Weinstein & Deutschberger, 1963). However, when context and relationship changes, identities are constantly being invented and reinvented (Gergen, 1991; Lührmann & Eberl, 2007). Such an identity exchange is composed of reciprocal and mutually reinforcing identities of leaders and followers. It is a social component that can change the identity of leaders and followers according to the time and situation due to interactions between individuals and various contextual factors, not the individuals’ self-concepts (Derue & Ashford, 2010). Therefore, the identity-building of leaders and followers contributes to the quality of leader–follower relationships (Graen & Uhl-Bien, 1995).

Individuals who perceive social support form trust, identity, and a sense of belonging to the organisation and members to create psychological stability and become more engaged in their tasks (May et al., 2004). Work engagement is defined as the special belief that employees have about their job that leads them to devote physical, emotional, and cognitive energy to their job (Christian et al., 2011). Previous studies on the factors affecting work engagement, especially organisational factors, have found that social support formed by leadership and interaction with supervisors and colleagues in the organisation is a key factor (Bakker & Demerouti, 2008; Bakker et al., 2002; Halbesleben, 2010). When leadership establishes leader and follower identity, the leader and follower identity interaction is less concentrated, and role expectation stabilises. Thus, leaders and followers can focus on their work and tasks, and the possibility of conflict in leader–follower relationships is greatly reduced (Lührmann & Eberl, 2007). In a remote working environment, leaders must promote geographically dispersed team members’ “social presence” to promote closeness with each other. To raise the level of work engagement, it is crucial to create an environment in which team members feel strongly connected (Bakker et al., 2011). However, the increased use of advanced technology in work environments can cause obstacles to work engagement (Palumbo, 2020).

Teamwork is valued in terms of productivity, flexibility, and collaboration, and organisations are adopting more team-based organisational structures to improve performance (Offerman & Spiros, 2001). The number of companies that conduct work from home or allow remote work as alternative work modes has also increased to prevent the spread of the Coronavirus Disease 2019 (COVID-19) pandemic worldwide since late 2019. The rapid improvement in the accessibility and function of ICT has allowed the construction of a virtual world, and face-to-face interaction has been replaced by interaction through media communication technology (Dixon & Panteli, 2010). However, while ICT can promote interaction and collaboration among members online, remote workers cannot replace face-to-face interactions with ways that can promote intimate social relationships for developing friendly and close relationships (Vayre & Pignault, 2014). There is a need to explore and develop an understanding of the impact of face-to-face and remote work on teams (Dixon & Panteli, 2010) and to examine the importance of leaders’ role within social interactions in a hybrid working environment. Interaction and communication through the technology of remote
work form unstable relationships among members, leading to a decline in work engagement (Lee-Kelley, 2006; Panteli et al., 2019). Meanwhile, work engagement positively affects an organisation’s effectiveness; therefore, the organisation needs to manage it based on a clear understanding of the virtual work team. This study aims to explore how team members can stay engaged in their work in a virtual working environment, which has been transitioned in the context of the COVID-19 pandemic. In this context, this study focuses to emphasise social presence as an important factor to contribute to the existing research on team-based work environments and work efficiency through ICT and to verify the capabilities of leaders as a role to enhance social presence.

This study investigates the structural relationships among the degree of work virtuality, work engagement, social presence, and leader identity entrepreneurship that is perceived by members from the perspective of social presence, based on the recognition of problems raised in social interactions among geographically dispersed remote workers. This study is designed to verify the moderating mediating effect of leader identity entrepreneurship that is perceived by remote workers and to identify the mediating effect of social presence in the virtual work environment and the influence of leader identity entrepreneurship that controls these mediating effects.

Theoretical Background and Hypotheses

Virtuality and Work Engagement

Work engagement is a positive, fulfilling, work-related state of mind associated with positive organisational outcomes (Schaufeli & Bakker, 2004). The main characteristics of work engagement are vigour, dedication, and absorption (Schaufeli & Bakker, 2004). Work engagement is associated with key organisational results such as job performance (Bakker & Bal, 2010; Halbesleben & Wheeler, 2008) and financial returns (Xanthopoulou et al., 2009). Work engagement is usually explained within the job demands-resources (JD-R) model. Job resources are positive elements that foster employees’ work engagement, including feedback, social support, and autonomy (Schaufeli & Bakker, 2004).

Remote workers usually work online with communication tools to interact with their supervisors or coworkers. According to Sardeshmukh et al. (2012), higher telecommuting was associated with increased role ambiguity, poor feedback, and low social support, which negatively affected work engagement. Remote workers have diminished feedback and support from supervisors/coworkers due to the physical separation and limited communication/interaction (Gunawardena, 1995; Mackie-Lewis, 1998; Sardeshmukh et al., 2012), which makes them difficult to recognise the presence of their colleagues (Bickle et al., 2019), and consequently feel isolated (Galanti et al., 2021). This makes it difficult for remote workers to obtain the information needed for their tasks and the expectations from supervisors, colleagues, or organisation (Sardeshmukh et al., 2012), which negatively impacts work engagement caused by decreased job resources and increased job demands. In the same vein, Nagata et al. (2021) argued that low-intensity remote work was associated with work engagement, while high-intensity remote work was not related to work engagement.

However, teleworking may influence work engagement positively through increased autonomy (Fujimoto et al., 2016; Galanti et al., 2021; Sardeshmukh et al., 2012; Palumbo, 2020), which means less supervision with more flexibility on time, location, and methods of working (Bailey & Kurland, 2002; Mann et al., 2000). For example, remote workers may work
during the time that they are less disturbed by family issues (Galanti et al., 2021) and can save commuting time, which allows them to utilise saved time efficiently for family responsibilities or recreational activities, leading to reduced stress from work (Kim et al., 2020; Mann et al., 2000).

As discussed earlier, the impact of remote work on work engagement is inconsistent. Therefore, it is worth reevaluating the impact of virtual work on work engagement during remote work due to COVID-19.

Despite the development of ICT, remote workers have limited face-to-face interaction with their supervisor/coworkers and have difficulties in getting immediate feedback and support, leading to less information and role clarity. In line with these considerations, we propose:

H1: Virtuality of remote workers is negatively associated with work engagement.

Mediating Effect of Social Presence
Changes in work arrangements alter teleworkers’ job demands and resources, which differ from those of traditional office workers, leading to changes in the level of work engagement (Sardeshmukh et al., 2012). In terms of effectiveness in a virtual environment, social presence is one of the key factors for participants to complete their tasks.

Short et al. (1976) established the concept of social presence as “salience of the other” in communication, which is important for the success of online learners (Sung & Mayer, 2012) and virtual teams (Bickle et al., 2019) determined by intimacy and immediacy (Short et al., 1976). Intimacy results from eye contact, physical proximity, topic intimacy, and accounts of smiling (Argyle & Dean, 1965), whereas immediacy refers to the directness and intensity of the relationship between two individuals (Mehrabian, 1967).

Remote workers are difficult to make eye contact with their colleagues and to recognise nonverbal signals such as facial expressions and gestures (Gunawardena, 1995) and have fewer opportunities for spontaneous, informal interactions with coworkers (Mackie-Lewis, 1998). Thus, it is difficult for remote workers to perceive the presence and support from their supervisors/coworkers (Bickle et al., 2019), leading to lower intimacy and immediacy. In addition, remote workers find it difficult to acquire timely assistance for their tasks from supervisors/coworkers, causing role ambiguity and, consequently, lower levels of concentration on their tasks (Sardeshmukh et al., 2012).

According to media richness theory, face-to-face communication is the richest medium because it has many nonverbal signals and immediate feedback (Daft & Lengel, 1986; Daft & Wiginton, 1979). Therefore, remote workers will likely have lower media richness than office workers.

Although, several scholars argue that virtual environments do not always have a lower social presence. Fonner and Roloff (2012) examined the relationships among media type, social presence, stress from interruptions, and organisational identification, and no differences were found in social presence. Gunawardena (1995) observed that graduate students who participated in global conferences and communicated only through computer-based messaging, which has low media richness, had an adequate social presence. Regarding this phenomenon, even in social presence theory, it is uncertain whether the low social presence of a specific media is due to the characteristics of the media itself or the user’s perception of the media (Walther, 1992).
Hence, it is reasonable to see social presence as a result of the subjective experience of someone caused by an interplay of physical proximity, mutual understanding, and intimacy (Biocca et al., 2003; Kettinger & Grover, 1997).

Trust is essential for virtual workers (Germain & McGuire, 2014) and can be strengthened when team members recognise each other to be “present”, and with trust, remote workers can focus on team performance (Croes et al., 2016; Shin & Kim, 2010). Therefore, fostering interpersonal relationships, developing trust, and encouraging members to engage are efficient means of improving social presence (Croes et al., 2016; Shin & Kim, 2010). Web conferences, Google Docs, Google Hangouts, Skype, or Dropbox provide social spaces and collaborative workplaces to virtual workers (Aritz et al., 2018; Nafukho et al., 2010). Such a social space promotes virtual workers’ social presence through various collaborative media technologies (Kauppila et al., 2011; Shin & Kim, 2010), and with collaborative online social space, virtual workers can exchange verbal/nonverbal cues, thereby facilitating social interactions (Kreijns et al., 2004; Maduka et al., 2018).

Given the research reviews discussed above, social presence should be considered critically in the online work environment. However, most social presence research has been conducted in online learning environments. To the best of our knowledge, no studies have examined the role of social presence in the relationship between remote work and work engagement.

As discussed above, remote workers in the virtual environment experience changes in job demands and resources, and these changes affect their work engagement. In this process, social presence arose from various communication technologies can provide additional job resources. Drawing on these arguments, we propose:

**H2: Social presence mediates the relationship between virtuality and work engagement.**

**Moderated Mediating Effect of Identity Entrepreneurship**

According to social presence theory, social presence is a process that improves mutual understanding and intimacy (Kettinger & Grover, 1997) because it is a subjective and psychological experience of the user rather than an objective phenomenon (Biocca et al., 2003). Social presence is crucial in a virtual environment, and Gunawardena (1995) emphasised that the role of a moderator is important in this process. Remote workers may recognise a relatively low social presence owing to the nature of the virtual environment. However, when the moderator facilitates social cohesiveness among communicating parties, they experience a sense of community belonging and higher social presence (Gunawardena, 1995). In light of Gunawardena’s (1995) finding, the fact that remote workers have trouble understanding what their supervisors, coworkers, or organisations expect from them (Sardeshmukh et al., 2012) and that they feel isolated (Galanti et al., 2021) may be regarded as an issue of identity. Taken together, remote workers’ social presence depends on the extent to which they recognise their identity. The moderator, the remote worker’s supervisor or leader, plays an important role in identity development. Therefore, the competency of a leader or supervisor to make remote workers aware of their identity is important; this is known as identity leadership (Steffens et al., 2018).

Pianese et al. (2023) argued that remote workers tend to struggle to find their work identity and suggested that management should consider practical initiatives to influence remote
workers’ identity regulation. In response to Pianese et al. (2023), we expect identity leadership to have practical implications for remote workers.

Identity leadership is a leadership theory and concept that approaches leadership from the perspective of social identity. Social identity provides a conceptual foundation for a new understanding of leadership and is a theoretical argument that makes all types of meaningful collective actions possible (Steffens et al., 2018). Identity leadership is a multifaceted process that focuses on a leader’s capacity to establish, construct, and internalise a common social identity among the group members (Haslam et al., 2011). Steffens et al. (2014) identified four characteristics of identity leadership: leader prototypicality, identity advancement, identity entrepreneurship, and identity impresarioship. Among these, identity entrepreneurship binds people together by creating a shared feeling of “we” and “us” within a group, making them feel like they belong to the same group and fostering a sense of cohesiveness and inclusiveness among the group members (Steffens et al., 2014). As discussed, even in virtual environments, if individuals have an identity of belonging to a community, they may not feel isolated from one another (Gunawardena, 1995). Therefore, leaders of these communities or organisations need to play the role of identity entrepreneurs daily; their words and actions might contribute to the formation of a shared identity among their followers (Reicher & Hopkins, 2001). Through this process, a sense of commonality and the formation of a group identity should be fostered (Haslam & Platow, 2001).

Leader identity entrepreneurship can reduce group members’ burnout and increase their work engagement, which positively impacts group performance (Steffens et al., 2014). Moreover, leaders who demonstrate strong identity entrepreneurship improve members’ sense of belonging and foster collaboration (Steffens et al., 2018). Self-efficacy increases when group members feel strongly connected, which can positively affect empowerment and engagement (Greco et al., 2006; Schermuly & Meyer, 2016). Hence, leaders’ identity entrepreneurship is expected to have an effect on social presence in the relationship between virtuality and work engagement. In line with these considerations, we propose:

H3: Identity entrepreneurship moderates the relationship between virtuality and social presence.

H4: Identity entrepreneurship moderates the mediating effect of social presence on the relationship between virtuality and work engagement.

Based on the relationships proposed above, we conceptualised the following research model, illustrated in Figure 1.

**Figure 1**
Research Model
Method

Sample

This study collected survey data from employees of various organisations that conducted remote work in South Korea through an online survey agency from November 20 to December 4, 2021. The focus is on the experience of highly virtualised business activities in spatially and geographically dispersed environments. Therefore, the target participants of this study were remote workers who had worked remotely for more than three months. In order to collect data from employees that have similar periods of time of remote working experience, we restricted the participants to having at least three months of remote working experience. In addition, we limited the participants to those who worked for at least three months, considering the adaptation time for interactions in a remote working environment. Three hundred employees from organisations of different sizes participated in this study. The participants worked remotely more than three times a week. As shown in Table 1, among the 300 participants, 143 worked remotely three times a week (47.7%); 56 worked four times a week (18.7%); 92 worked five times a week (30.7%); four worked six times a week (4%), and five worked seven times a week (1.7%).

Table 1

<table>
<thead>
<tr>
<th>Demographic Information</th>
<th>Total</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>146</td>
<td>48.7</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>154</td>
<td>51.3</td>
<td></td>
</tr>
<tr>
<td>Organisation Size</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>58</td>
<td>19.3</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>91</td>
<td>30.3</td>
<td></td>
</tr>
<tr>
<td>Small to medium enterprise</td>
<td>121</td>
<td>40.3</td>
<td></td>
</tr>
<tr>
<td>Public institute/enterprise</td>
<td>19</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>Education/Research</td>
<td>5</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Etc.</td>
<td>6</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Remote working (per week)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three times a week</td>
<td>143</td>
<td>47.7</td>
<td></td>
</tr>
<tr>
<td>Four times a week</td>
<td>56</td>
<td>18.7</td>
<td></td>
</tr>
<tr>
<td>Five times a week</td>
<td>92</td>
<td>30.7</td>
<td></td>
</tr>
<tr>
<td>Six times a week</td>
<td>4</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Seven times a week</td>
<td>5</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Team size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to &lt; 5</td>
<td>26</td>
<td>8.7</td>
<td></td>
</tr>
<tr>
<td>5 to &lt; 10</td>
<td>68</td>
<td>22.7</td>
<td></td>
</tr>
<tr>
<td>10 to &lt; 15</td>
<td>65</td>
<td>21.7</td>
<td></td>
</tr>
<tr>
<td>15 to &lt; 20</td>
<td>41</td>
<td>13.7</td>
<td></td>
</tr>
<tr>
<td>20 to &lt; 25</td>
<td>32</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>25 to &lt; 30</td>
<td>68</td>
<td>22.7</td>
<td></td>
</tr>
<tr>
<td>Job</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management support</td>
<td>70</td>
<td>23.3</td>
<td></td>
</tr>
<tr>
<td>Sales/Distribution</td>
<td>23</td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td>Production/Research</td>
<td>36</td>
<td>12.0</td>
<td></td>
</tr>
<tr>
<td>IT/Data</td>
<td>59</td>
<td>19.7</td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>20</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>Service/Customer management</td>
<td>52</td>
<td>17.3</td>
<td></td>
</tr>
<tr>
<td>Specialised job</td>
<td>18</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>22</td>
<td>7.3</td>
<td></td>
</tr>
</tbody>
</table>

Instruments

Virtuality. This study’s participants responded to the 12-item Virtuality Index Scale developed by Chudoba et al. (2005). The questionnaire was measured on a five-point Likert scale (1 = not at all, 5 = completely). The selected measurement scale was used after completing the reverse translation process and was reviewed by two experts with an overseas master’s degree. The
virtuality scale comprises six sub-factors: geography (four items), temporal (two items), cultural (two items), work practice (three items), organisation (three items), and technology (four items). Cronbach’s α was used to measure the reliability of the items on the scale. The Cronbach’s α for the current research measurement was .89.

Identity entrepreneurship. The participants responded to four items that assess perceived leader identity entrepreneurship from the seven-point Identity Leadership Inventory Scale (1 = not at all, 7 = completely) developed by Steffens et al. (2014). The selected measurement scale was used after completing the reverse translation process and was reviewed by two experts with an overseas master’s degree. Cronbach’s α of the current research measurement was .91.

Social presence. The participants responded to the seven-point Social Presence Scale (1 = not at all, 7 = completely) developed by Hwang (2007). The scale consists of 21 items and five sub-factors: mutual perception, mutual understanding, dispersion of attention/concentration, emotional bonds, and common sense of space. This study used the following scales (and corresponding items): mutual perception (4 items), mutual understanding (4 items), dispersion of attention/concentration (6 items), emotional bond (4 items), and common sense of space (3 items). Cronbach’s α of the current research measurement was .81.

Work engagement scale. Participants responded to the Korean version of the nine-item Utrecht Work Engagement Scale (UWES) developed by Schaufeli and Bakker (2003). Kim et al. (2017) validated the seven-point Likert scale Utrecht Work Engagement-Korean version (UWES-K). The scale has three sub-factors: vigour, dedication, and absorption. This study used the following scales (and corresponding items): vigour (3 items), dedication (3 items), and absorption (3 items). Cronbach’s α for the current research measurement was .91..

Analysis Method
The data analysis was conducted using SPSS 21.0, SPSS Process Macro (v.3.5), AMOS 21.0 and the following procedures were followed. First, the correlation was confirmed by Pearson’s correlation analysis between the descriptive statistics and variables of virtuality, identity entrepreneurship, social presence, and work engagement using SPSS. Confirmatory factor analysis (CFA) was conducted using AMOS to verify the construct validity of the measurement tool. Next, a multiple regression analysis was performed to verify the mediating effect of social presence on the relationship between virtuality and work engagement. The significance test of the mediating effects was verified by the bootstrapping method using SPSS Process Macro. Multiple regression analysis was conducted to examine the interaction effect between virtuality and identity entrepreneurship. Finally, the moderating mediating effect was verified using SPSS Process Macro to check whether the mediating effect of virtuality on work engagement through social presence was affected by identity entrepreneurship.

Results
Descriptive Statistics
First, the descriptive statistics of virtuality, identity entrepreneurship, social presence, and work engagement show that the average response value to identity entrepreneurship was the highest at 4.68, and the standard deviation was the highest at 1.26. There was a large deviation between the responses to identity entrepreneurship, as shown in Table 2.
Table 2

Descriptive Statistics, Correlations, and Reliabilities

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Virtuality</td>
<td>(.89)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Identity entrepreneurship</td>
<td>.58**</td>
<td>(.91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Social presence</td>
<td>.40**</td>
<td>.57**</td>
<td>(.81)</td>
<td></td>
</tr>
<tr>
<td>4. Work engagement</td>
<td>.54**</td>
<td>.58**</td>
<td>.63**</td>
<td>(.91)</td>
</tr>
<tr>
<td>Mean</td>
<td>3.21</td>
<td>4.69</td>
<td>4.44</td>
<td>4.62</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.79</td>
<td>1.26</td>
<td>0.59</td>
<td>1.03</td>
</tr>
</tbody>
</table>

Note. N = 300. Reliability estimates are shown in parentheses. * means p < .05, and ** means p < .01.

Validity and Reliability Analysis

CFA was conducted to verify the construct validity of the measurement tool and the fit of the research model. Virtuality, as an independent variable, and social presence, as a mediation variable, are composed of several sub-factors and items. As such, the complexity of the model may cause problems such as model conformity. Therefore, this study used the item parceling method to increase model suitability and reliability (Yu, 2015). In the bundle of items approach, when a factor is measured using several items, a bundle of new items is created through the sum or mean of the measured items (Hair et al., 2006). This study used a method of creating item bundles, which is one approach to deal with multidimensionality. This is a method of creating a bundle of items for each constituent concept using a mean or total score with each item of the constituent concept of a factor (Kishton & Widaman, 1994). The CFA results are $X^2 = 343.70$, df = 168, CFI = .95, TLI = .94, RMSEA = .06, and SRMR = .06, which determined that this study model was suitable (see Table 3).

Table 3

Measurement Model

<table>
<thead>
<tr>
<th></th>
<th>$X^2$</th>
<th>df</th>
<th>TLI</th>
<th>RMR</th>
<th>CFI</th>
<th>SRMR</th>
<th>RMSEA</th>
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<tbody>
<tr>
<td>Model</td>
<td>343.70</td>
<td>168</td>
<td>.94</td>
<td>.07</td>
<td>.95</td>
<td>.06</td>
<td>.05</td>
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<tr>
<td>Fit</td>
<td>-</td>
<td>-</td>
<td>&gt; .90</td>
<td>&lt; .08</td>
<td>&gt; .90</td>
<td>&lt; 1</td>
<td>&lt; .07</td>
</tr>
</tbody>
</table>

Hypotheses Testing

The Mediating Effect of Social Presence

Process Macro Model 4 was used to verify the mediating effect of social presence on the relationship between virtuality and work engagement. In the results of the verification, virtuality had a positive effect on social presence ($\beta = .09$, $p < .001$). This means that the higher the virtuality, the greater the social presence. Virtuality positively affected work engagement ($\beta = .45$, $p < .001$). Therefore, Hypothesis 1 is rejected. Finally, virtuality and social presence had a positive (+) influence on work engagement ($\beta = .84$, $p < .001$). This means that the higher the virtuality, the greater the level of social presence, and the mediating effect of work engagement was significant, as shown in Table 4.

Table 4

Mediating Effects of Social Presence in the Relationship between Virtuality and Work Engagement

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dependent (Social Presence)</th>
<th>Dependent (Work Engagement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>3.45</td>
<td>-.58</td>
</tr>
<tr>
<td>Virtuality</td>
<td>.30</td>
<td>.45</td>
</tr>
<tr>
<td>Social presence</td>
<td>.84</td>
<td>.07</td>
</tr>
</tbody>
</table>

$R^2 = .16$, $F = 59.79$, $p = .000$

$R^2 = .49$, $F = 148.14$, $p = .000$

Note. *** denotes $p < .001$; **, $p < .01$; and *, $p < .05$. 
A bootstrapping test was conducted to confirm the statistical significance of the mediating effect of social presence (see Table 5). According to the results of the bootstrapping test, the confidence interval did not include 0, indicating that the mediating effect of social presence was statistically significant, as shown in Table 5.

**Table 5**
Mediating Effect of Social Presence, Bootstrapping Result

<table>
<thead>
<tr>
<th>Mediating Effect Coefficient (Index)</th>
<th>SE (BootSE)</th>
<th>95% Confidence Level</th>
<th>BootLLCI</th>
<th>BootULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>.25</td>
<td>.04</td>
<td>.18</td>
<td>.34</td>
<td></td>
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</tbody>
</table>

**The Moderating Effect of Identity Entrepreneurship**

This study analysed the moderating effect of identity entrepreneurship on the relationship between virtuality and social presence using Process Macro Model 1. The result of analysing virtuality and social presence by mean-centring revealed that virtuality had a positive (+) effect on social presence ($\beta = .43$, $p < .001$). Identity entrepreneurship had a positive (+) effect on social presence ($\beta = .37$, $p < .001$), and the virtuality and identity entrepreneurship interaction term had a significant effect on social presence ($\beta = .13$, $p < .001$). Therefore, H3 is supported.

In summary, the effect of virtuality on social presence is controlled by the degree of identity entrepreneurship, as shown in Table 6.

**Table 6**
Moderating Effect of Identity Entrepreneurship in the Relationship between Virtuality and Social Presence

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficient</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>4.54</td>
<td>.04</td>
<td>91.93***</td>
</tr>
<tr>
<td>Virtuality</td>
<td>0.43</td>
<td>.06</td>
<td>6.20***</td>
</tr>
<tr>
<td>Identity Entrepreneurship</td>
<td>0.37</td>
<td>.04</td>
<td>8.26***</td>
</tr>
<tr>
<td>Virtuality × Entrepreneurship</td>
<td>0.13</td>
<td>.03</td>
<td>3.77***</td>
</tr>
</tbody>
</table>

Increase by interaction effect $R^2 = .02$, $F = 14.23$, $p = .0002$

*Note. *** denotes $p < .001$; **, $p < .01$; and *, $p < .05$.*

The value of the added interaction term was .27 ($p < .001$), which means that the interaction term explained 27% of the total change in the scores of virtuality and social presence. Therefore, the relationship between virtuality and social presence was statistically significant. The moderating effect of identity entrepreneurship is thus confirmed. The analysis of the conditional effect of the independent variables on the dependent variables in the value of specific moderating variables (Table 7) showed that the identity entrepreneurship value did not include 0 in the confidence interval of each M-ISD, M, and M + ISD level, which was statistically significant. Therefore, Hypothesis 2 is supported.

**Table 7**
Verification of the Conditional Indirect Effect on the Moderating Effect of Identity Entrepreneurship with Virtuality and Social Presence

<table>
<thead>
<tr>
<th>Conditional Indirect Effect</th>
<th>Effect</th>
<th>SE</th>
<th>BootLLCI</th>
<th>BootULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-ISD(-1.2608)</td>
<td>.26</td>
<td>.07</td>
<td>.10</td>
<td>.41</td>
</tr>
<tr>
<td>M(.0000)</td>
<td>.43</td>
<td>.06</td>
<td>.29</td>
<td>.56</td>
</tr>
<tr>
<td>M+ISD(1.2608)</td>
<td>.60</td>
<td>.08</td>
<td>.43</td>
<td>.77</td>
</tr>
</tbody>
</table>

**The Moderating Mediating Effect of Identity Entrepreneurship**

Process Macro Model 7 was used to investigate the moderating mediating effects of social presence and identity entrepreneurship on the relationship between virtuality and work.
engagement (see Table 8). A reliability interval of 95% was set by designating 5,000 bootstrapping iterations, and the mean centring analysis results for the independent and control variables are shown in Table 8. A bootstrapping method was used to verify whether the path of virtuality to work engagement through social presence would show a moderating mediating effect by identity entrepreneurship. We confirmed that 0 was not included in the confidence interval, indicating that the moderating mediating effect index was statistically significant. As shown in Table 8, virtuality had a positive (+) effect on social presence ($\beta = .09, p < .001$), and social presence had a positive (+) effect on work engagement ($\beta = .84, p < .001$). Virtuality and social presence were statistically significant and had a mediating effect. Additionally, the interaction term of virtuality and identity entrepreneurship had a significant positive (+) effect on social presence ($\beta = .07, p < .001$), which showed a moderating effect. In other words, identity entrepreneurship controlled the intensity of the mediating effect in the relationship between virtuality and work engagement, and the moderating mediating effect was statistically significant.

**Table 8**

*Verification of the Moderating Mediating Effect of Identity Entrepreneurship*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficient</th>
<th>95% Confidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta$</td>
<td>$SE$</td>
</tr>
<tr>
<td>(Constant)</td>
<td>4.39</td>
<td>.03</td>
</tr>
<tr>
<td>Virtuality</td>
<td>.09</td>
<td>.04</td>
</tr>
<tr>
<td>Identity Entrepreneurship</td>
<td>.26</td>
<td>.02</td>
</tr>
<tr>
<td>Virtuality $\times$ Identity Entrepreneurship</td>
<td>.07</td>
<td>.02</td>
</tr>
</tbody>
</table>

$R^2 = .36, F = 57.00, p = .0000$

*Note.*** denotes $p < .001$; **, $p < .01$; and *, $p < .05$. Moreover, using the bootstrapping method, the conditional indirect effect (see Table 9) was analysed according to the level of the moderating variable. As the M-ISD, M, and M+ISD moderating variables increased, the size of the mediating effect increased, and the mediating effect was significant at low and high levels. Therefore, Hypothesis 4 is supported.

**Table 9**

*Analysis of the Moderating Mediating Effect Index*

<table>
<thead>
<tr>
<th>Modulating Effect Index</th>
<th>$SE$(BootSE)</th>
<th>95% Confidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BootLLCI</td>
<td>BootULCI</td>
</tr>
<tr>
<td>.06</td>
<td>.02</td>
<td>.01</td>
</tr>
</tbody>
</table>

However, when the moderating variable value was low, the lower limit of the bootstrapping confidence interval was -.09 (and -.00), and the upper limit was .10 (and .16), which was not significant because the confidence interval contained 0 (see Table 10). This study used floodlight analysis, a Johnson–Neyman technique, to determine the level of identity entrepreneurship that had a significant moderating effect (Spiller et al., 2013).
Table 10
Conditional Effect of Virtuality on Identity Entrepreneurship

<table>
<thead>
<tr>
<th>Identity Entrepreneurship</th>
<th>Effect</th>
<th>SE</th>
<th>t</th>
<th>95% Confidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BootLLCI</td>
</tr>
<tr>
<td>-1.2608</td>
<td>.00</td>
<td>.05</td>
<td>.62</td>
<td>-.09</td>
</tr>
<tr>
<td>.0000</td>
<td>.08</td>
<td>.04</td>
<td>2.40</td>
<td>-.00</td>
</tr>
<tr>
<td>1.2608</td>
<td>.16</td>
<td>.05</td>
<td>3.64</td>
<td>.05</td>
</tr>
</tbody>
</table>

The floodlight analysis method presented a significant mediating effect area and a non-significant area (see Figure 2) in the whole section of the moderating variable identity entrepreneurship.

Figure 2
Verification of the Moderating Mediating Effect

Figure 2 confirms that the conditional indirect effect of virtuality on work engagement was significant for those with high leader identity entrepreneurship awareness through the moderating effect of social presence. However, the conditional indirect effect was no longer significant in the area of identity entrepreneurship awareness of -.38 or less. Therefore, social presence had a positive (+) mediating effect on work engagement, except in the area where the awareness of identity entrepreneurship was low. In particular, the mediating effect of social presence on work engagement was moderated in a positive (+) direction by the awareness of identity entrepreneurship, and work engagement increased as the interaction between identity entrepreneurship awareness and social presence increased. All of the tested hypotheses are shown in Figure 3.

Figure 3
Results of the Moderated Mediation Effects
Discussion

Implications for Theory and Research

The theoretical implications of this study are as follows. First, it was confirmed that social presence mediates the relationship between virtuality and work engagement. This means that the higher the social presence among team members, the more the work engagement of team members with high virtuality can recognise. These results support those of previous studies that showed a positive relationship with peer network participation in work situations with high virtuality, which is characterised by spatial dispersion and a dynamic structure (Weber & Kim, 2015). We argue that employees working in spatially dispersed environments are more likely to form relationships with colleagues to pursue knowledge than employees working in the same space (Weber & Kim, 2015). Additionally, previous studies have estimated that high levels of virtuality are associated with more collaborative technology use (Chudoba et al., 2005). We propose that remote workers would have had frequent exchanges with geographically dispersed colleagues to obtain and adapt information, owing to uncertain work environments, to prepare for rapidly switching work environments. The results of this study suggest that workers who worked in remote environments would have been actively engaged in information exchange with their team members to handle their work in a new work environment. Simultaneously, social interactions would have occurred constantly.

Second, the research findings confirm that the identity entrepreneurship of the leader recognised by team members acts as a moderating variable in the relationship between work virtuality and social presence. These results support previous studies showing that perceived identity entrepreneurship reduces the burnout of team members and increases work engagement (Steffens et al., 2018). Furthermore, a previous study emphasised that leaders enhance the importance of group identity and increase identification by emphasising groups through a comprehensive language (i.e., “we”) (Shamir et al., 1998). Notably, leaders’ use of a comprehensive language (“we”) in communication with followers is especially important in expressing social identity (Seyranian & Bligh, 2008; Wilbert et al., 2023). The word “we” connotes a process of cultivating one to think of oneself as a member of a larger group rather than being just an individual. Thus, leaders need to motivate the team to achieve consensus on shared identity centred on identity entrepreneurship so that even if team members are in geographically dispersed working environments, they can identify core values, norms, and ideals and feel like members of the same group.

Third, the mediating effect of social presence on the relationship between work virtuality and work engagement was confirmed to have a moderating effect according to the identity entrepreneurship of the leader as perceived by team members. This means that the higher the identity entrepreneurship of the leader as perceived by employees, the stronger the impact of virtuality on work engagement through social presence. In other words, when team members perceive social presence during remote work, this positively affects work engagement, and the leader’s level of identity entrepreneurship plays an important role in this relationship. More clearly, the higher the level of the leader’s identity entrepreneurship, the higher the social presence, and the higher the work environment, the higher the work engagement. Accordingly, to increase the work engagement of a remote working team, leaders must demonstrate strong identity entrepreneurship to strengthen the sense of belonging of team members and promote communication to enhance social presence (Steffens et al., 2018).
**Implications for Practice**

The following summarises the results of this study, and the implications that can be applied to HR practice are as follows. First, it is necessary for remote work teams to find out the most effective and efficient communication media that are best suitable for their task. This can help remote workers to sense a high level of social presence, and thus they will be able to focus on their tasks. The level of social presence of members of remote work teams may be decreased in a virtual working environment (Miao & Ma, 2022). Therefore, team leaders need to set up regular meetings via online platforms to build intimacy among remote working team members in order to ask after each other and share their knowledge and new ideas.

Second, in order to facilitate interactions and conversations among members of remote work teams, HR practitioners need to provide communication training programmes for team leaders. In a virtual working environment, it is more challenging to communicate intuitively compared to in-person communication. Therefore, HR practitioners should support team leaders to utilise the most appropriate communication methods for their teams. In addition, not only real-time communication media but also asynchronous communication media such as emails, chats, and discussion boards can help remote workers to communicate efficiently (Pan & Sullivan, 2005; Watts, 2016). Because non-real-time communication media are less distracting than real-time media which means that it allows remote workers to concentrate on their task and improve productivity. Hence, HR practitioners may offer some training programmes related to asynchronous communication methods for leaders of remote work teams.

Finally, we propose that HR practitioners should provide training programmes for leaders of remote work teams to develop identity entrepreneurship. It is difficult for remote workers to sense a shared sense of ‘we’ in a virtual working environment. Remote team leaders are necessary to remind their team members of their identity constantly and periodically. Therefore, remote work team leaders are expected to have the capability to facilitate a sense of belonging among team members through the training programme related to identity entrepreneurship.

**Conclusions**

This study analyses the effects of virtuality and social presence of remote workers on work engagement and the moderated mediating effect of the leader identity entrepreneurship perceived by team members. In this study, the research findings showed that in the context of a virtual work environment, leaders with a high level of identity entrepreneurship strengthened the social presence of team members, and this social presence effect increased the level of team members’ work engagement.

The limitations and recommendations for future research of this study are as follows. This study is a cross-sectional correlational study, causal relationships could not be identified. In future studies, it will be crucial to validate the causal relationships among the variables using a longitudinal design. Second, because we mainly focused on work-related factors, we overlooked the remote workers’ home context. Third, one component of supervisor leadership was used as a moderator variable. However, since all variables were collected from the same source, the possibility of common variance bias must be acknowledged. Fourth, this study does not show the effect of different levels of remote working. Therefore, it is necessary to examine the relationship between social presence, identity entrepreneurship, and work engagement.
according to remote working style (low remote, median remote, and total remote working) in subsequent studies.

Declarations

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Ethics Approval

Not applicable.

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