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What influence virtual workers’ communication?: Exploring network inertia and media affordance theories

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ABSTRACT
The COVID-19 pandemic has made virtual work more prevalent than ever. Building on the theoretical frameworks of network inertia and media affordances, this paper examines how network characteristics (tie strengths and heterogeneity), and media affordances (persistence and social presence) jointly influence virtual workers’ intention to communicate with colleagues. Data from a U.S. nationally representative sample (N = 389) provided partial support for both theories. Tie strength and social presence had a significant impact on virtual workers’ communication intention. Psychological heterogeneity influenced people’s intention to approach colleagues, but demographic heterogeneity did not. Theoretical and practical contributions were discussed.

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1. Introduction

Virtual workers, telecommuters, and employees who work from home are dispersed employees who work completely remotely via computers and media (Allen et al., 2015; Manochehri & Pinkerton, 2003; United States Census Bureau, 2017). In 2018, only about 3.6% of the entire U.S. workforce, around five million people, worked either part-time or full-time from home (Global Workplace Analytics, 2018). However, the recent Coronavirus disease 2019 (COVID-19) pandemic pushed the proportion and population of virtual workers to unprecedented high rates by April 2020 (62%, Brenan, 2020; 45%, Dey et al., 2020), and by October 2020, 71% employees work virtually all or most of the time (Parker et al., 2022). With the pandemic gradually coming to an end, the majority of the workforce (59%, Parker et al., 2022) still work virtually by January 2022. Many large companies have been offering virtual work a permanent option going forward, such as 3M, Lyft, and Reddit (Robinson, 2022; Smith, 2022). Forbes predicted that the remote workforce is here to stay and will increase in the years to come (Robinson, 2022). Virtual workers are and will continue to be a critical part of the future workforce.

Communication is essential in the workplace (McPhee & Zaug, 2009; Nicotera, 2019). Studying virtual workers’ communication intentions and patterns is able to provide significant insight into how virtual teams, groups, and organizations function. Communication patterns and intentions connect closely to key organizational outcomes, such as knowledge management (Syed-Ikhsan & Rowland, 2004), team performance (Brewer & Holmes, 2016), and organizational innovation (Kivimäki et al., 2000). Extensive research has studied the communication of virtual workers (see a review, Morrison-Smith & Ruiz, 2020), but a more nuanced understanding is needed regarding how virtual workers communicate with their co-workers of different networks, and whether platform characteristics or affordances play a role. Examining the role of tie strength in communication is important for

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organizations as strong ties and weak ties serve differential functions and provide different types of social support for employees (Xu et al., 2021). Examining platform characteristics or affordances, on the other hand, can provide practical implications for organizations to adopt the appropriate media platforms to promote interaction and communication among employees (Mao & DeAndrea, 2019). However, it remains unclear when studied together, which theoretical framework has a stronger predictive and explanatory power on virtual workers’ communication behaviors and if the two would interact with each other. To fill the research gap, we draw on the literature from the two theoretical perspectives to guide our research on virtual workers’ communication behaviors.

First, building on the social network perspective, T. Y. Kim et al. (2006) found that workers have the tendency to continue connecting with existing relationships, and they exhibit a resistance to forming new relationships at work, which these researchers termed “network inertia.” Network inertia theory seeks to understand the factors that strengthen inertia and provides useful insights about network change and formation over time (Shi & Zhang, 2020; Tunisini & Marchiori, 2020). According to this theory, the existing relationships among virtual workers would make them tend to communicate more with strong-tie colleagues than weak-tie colleagues.

The second theoretical perspective focuses on media affordances to predict communication at work. Affordance theory proposes that the attributes, commonalities, and qualities across media influence communication intention (Evans et al., 2017; Eveland, 2003; Fox & McEwan, 2017). The concept of communication affordances here refers to the subjective evaluation of users’ understanding of media, which connects the perceptions of such media with users’ action possibilities and behavioral intentions. In fact, existing research recommends that perceived affordances play a significant role in organizational members’ daily communication behavior. For example, visibility and anonymity affordances influence employees’ intention to speak up (Mao & DeAndrea, 2019), the persistence affordance helps workers to better contextualize and understand work issues (Gerile et al., 2004), and the association affordance influences organization’s interview decisions (Steinfeld et al., 2009). Users’ perceptions of a media platform largely determine their intention to use the media. Thus, the affordance perspective can also inform our understanding toward virtual workers’ mediated interaction with colleagues.

This paper integrates these two theoretical perspectives to investigate how existing network characteristics (i.e., tie strength and network heterogeneity) and media affordances (i.e., perceived persistence and social presence) influence workers’ intention to communicate with colleagues during virtual work. This paper makes theoretical contributions by integrating the predictions from both theories to study the communication of virtual workers and by testing the inter-organizational network inertia theory at the individual level. Building on both theoretical frameworks, this paper also makes practical implications to improve virtual workers’ organizational network and their communication experiences.

2. Network inertia theory

Network refers to set actors and connections among the actors. Actors could be people, groups, and organizations, while the connections are ties between two actors (Borgatti & Foster, 2003; Brass et al., 2004). The social network perspective examines the qualities of connections between a focal person (i.e., ego) and their connections. In this study, individual virtual workers are the actors in the network and their relationships with other colleagues are the ties. The social network perspective complements the traditional way of understanding individuals’ social behaviors, which primarily examines perceptions of the focal person (Borgatti & Foster, 2003; Brass et al., 2004). Network inertia theory takes an evolutionary perspective and describes a status when organizations have reached a retention stage, after variation and selection processes (Monge et al., 2011). The inertia status is characterized by workers performing organizational duties with a stable set of relationships over an extended period of time (T. Y. Kim et al., 2006; Monge et al., 2011).
Workers would tend to communicate with colleagues with existing relationships, even when there are significant changes in the organization (Barnett & Carroll, 1995; Briscoe & Tsai, 2011). The inertia framework explains the factors that influence the “persistent organizational resistance to changing interorganizational network ties or difficulties that an organization faces when it attempts to dissolve old relationships and form new network ties” (T. Y. Kim et al., 2006, p. 704). Though inertia theory primarily discusses interorganizational relationships, T. Y. Kim et al. (2006) suggested a broad applicability of the theoretical framework to different units of analyses such as interpersonal relationships, intergroup relationships within an organization, or international treaties and alliances. Network inertia at the interpersonal level could influence company-level inertia because for a company to establish new relationships with other companies depends on decisions at the interpersonal level. The inertia theory studies the factors that relate to the retention stage and factors that predict how organizations or their members avoid making new connections and/or terminating existing relationships.

From the perspective of using an organizational chart, workers would address organizational problems by approaching the most appropriate colleagues at work, perhaps based on their job titles, responsibilities, and expertise, regardless of existing relationships. However, organizations that have reached a certain inertia usually have a mature and well-established network, even if certain workers have changed titles and moved around within the organizations (T. Y. Kim et al., 2006). Furthermore, organizations in an inertia status also tend to have lower competitiveness and reduced innovation (Shi & Zhang, 2020). The theory of network inertia proposed that the degree to which an organization tends to operate by inertia is dependent on several factors, such as the age, size, and past history of the organization; the dyadic relationships between workers; the duration, size, complexity, and structures of the network; the organizational status, competitiveness, in the network; and the industrial environments (T. Y. Kim et al., 2006). One key predictor of network inertia is the dyadic tie qualities between the communicating partners. This paper examines two important aspects of network tie qualities: strengths of a relationship tie and the heterogeneity between these partners in dyads and pairs.

2.1. Tie strengths

The concept of tie strengths refers to the closeness of connections between a focal person and their connections (Borgatti & Foster, 2003; Brass et al., 2004). Tie strengths are important (J. Lee & Kim, 2011; Yuan et al., 2010) because they reflect the degree to which colleagues have frequent, emotionally intense, intimate, and reciprocal interactions (Granovetter, 1973). Tie strength is said to be weak when two colleagues merely know each other and rarely communicate or interact with each other. Tie strength is said to be strong when two colleagues communicate frequently and know each other interpersonally quite well.

Network inertia theory proposes that existing communication patterns, such as the strength of relationships between two colleagues, predict their intention to communicate with each other, even in a new environment (T. Y. Kim et al., 2006). Network ties have been consistently argued to be a strong predictor of workers’ intention to communicate with each other (e.g., Demirkan et al., 2013). For virtual workers, the previously established strong-tie relationship may further reinforce workers’ current communication patterns (Xu et al., 2019), and thus workers are more likely to continue their interactions with strong-tie colleagues when working from home. Strong connections between virtual workers make communication easier because they have more shared common knowledge, higher level of trust, and easier information flow (Yang et al., 2022). Compared with strong-tie colleagues, weak-tie colleagues are characterized by less frequent contact, fewer overlapping social circles, and a lower level of trust (Bakker et al., 2022; Kee et al., 2016; Putnam, 2001). Working at physically separated localities may increase the communication gap between strong-tie and weak-tie colleagues. Thus, we propose that,

**H1:** Virtual workers are more likely to talk to their strong ties than their weak ties.
2.2. Heterogeneity

Heterogeneity is defined as the perceived differences or dissimilarities from the focal person’s (ego) perspective towards their direct connections (alters, Eveland & Hively, 2009). Following the definition of heterogeneity, discussion network heterogeneity or communication heterogeneity refers to the communication with people that are different from the ego (B. Kim & Kim, 2017; Scheufele et al., 2006). Heterogeneity has been widely examined in the context of political communication (Eveland & Hively, 2009; Scheufele et al., 2004). Extensive research in communication suggests that people would perceive it safer and have a stronger intention to connect and communicate with people that are similar to themselves (Xu et al., 2021), especially in terms of political knowledge, news media consumption, and political affiliation (Eveland & Hively, 2009; Scheufele et al., 2004).

Organizational studies about a different but related construct—diversity—which describes the differences and dissimilarities at the group and organizational levels suggest two types of organizational diversity: demographic or visible, and psychological non-visible attributes diversities (Milliken & Martins, 1996). Similarly, interpersonal differences from the ego’s perspective, perceived heterogeneity, could be also categorized into two types: demographic heterogeneity and psychological heterogeneity. Demographic heterogeneity refers to the differences in demographic factors, such as gender, ethnicity, and education levels. Psychological heterogeneity refers to the perceived differences in attitudes, values, and beliefs.

How heterogeneity or diversity influences organizational communication is largely under-studied (Yadav & Lenka, 2022). How perceived heterogeneity influences interpersonal communication at work remains unclear. Drawing from political communication research, perhaps perceived heterogeneity may reduce interpersonal and organizational communication. This may be due to communication with people who are different, can be more effortful, and could lead to misunderstanding, discomfort, and/or conflicts (Eveland & Hively, 2009).

Existing studies have recommended that the workplace can be a venue where people would have a chance to meet and network with heterogeneous others (Mutz & Mondak, 2006). Indeed, the in-person office work environment provides workers unique opportunities for communication beyond existing relationships due to physical proximity. Workers would have a chance to meet and communicate with colleagues who have a different gender, ethnicity, tenure, and interests. For virtual workers, however, they are working exclusively from remote locations. The in-person opportunities to communicate with heterogeneous others may be significantly reduced. Some of the research that is done with in-person contexts may not be applicable. Therefore, we post a research question:

RQ1: How different types of heterogeneity (demographic and psychological) influence virtual workers’ intention to talk to coworkers?

3. Perceived media affordance theory

The theoretical concept of media affordances is useful for understanding communication patterns of virtual workers, because they work physically separated from other coworkers, they rely heavily on media technologies to connect and communicate with colleagues, collaborators, and clients. The term affordance was first coined by ecological psychologist Gibson (1979). He defined affordance as “a combination of physical properties of the environment that is uniquely suited to a given animal—to his nutritive system or his action system or his locomotor system” (p. 79). Building on Gibson’s ecological understanding of animals and their environment, scholars applied the affordances concept to understand humans’ technologies and social behaviors (Gaver, 1991; Norman, 1990). Affordances refer to the possibilities for action based on a combination of physical properties of the media (Evans et al., 2017; Gibson, 1979; Norman, 1988). The perceived media affordances theory studies how people’s subjective evaluations of a media platform influence their intention of using it. The use of perceived affordances highlights people’s subjective evaluation of a media platform and their use behaviors (Costa, 2018). The perceived media affordance perspective studies virtual workers’
communication intention based on their understanding of media. Media, such as emails, instant messaging apps, enterprise social media, and video conferencing tools are frequently used to connect dispersed workers from different geographical locations and allow them to collaborate on work (Huang & Yen, 2003; Park et al., 2014; Stenfield, 1986; Stephens, 2007; Treem & Leonardi, 2013). The perceived affordance perspective (Evans et al., 2017; Gibson, 1979) provides a systematic framework to understand how people’s perceptions of media influences their intention of using the media. In the context of virtual workers, we believe that the persistence and social presence affordances would have significant influences on their intention to connect with other colleagues.

3.1. Persistence

Perceived persistence refers to the degree to which users believe that a media platform keeps the original conversations permanently and allows future access (Bregman & Haythornthwaite, 2003; Fox & McEwan, 2017; Treem & Leonardi, 2013). The persistence affordance is consistently argued to be one of the key affordances in the context of organizational communication (e.g., Hampton, 2016; Raja-Yusof et al., 2016; Treem & Leonardi, 2013). Communication that happened at work ranges largely on the persistence continuum. Face-to-face conversations and meetings and unrecorded video conference calls locate at the lower end because these interactions are often not recorded as they unfold and are not accessible in the future. On the other hand, conversations that take place on enterprise social media, such as Wikis, social networking sites, and blogs stay in its original form and remain accessible for a relatively longer time (Treem & Leonardi, 2013). In addition to distinct platforms, features of media could affect the perceived persistence affordance. Some teleconferencing tools provide users with the option to record the meetings. When the recording feature is not activated, users may perceive the media as not persistent, whereas when the feature is activated, users may perceive the media to be persistent. We believe that the persistence affordance of media directly influences virtual workers’ intention to engage in communication activities as elaborated below.

Highly persistent media may encourage workers to communicate. The persistence affordance promotes communication among virtual workers in several ways. First, assigning jobs on persistent media helps clarify work duties and responsibilities for virtual workers (Chen et al., 2019). Having clear documentation of how and to whom work is assigned helps reduce ambiguity and potentially decreases conflicts (Treem & Leonardi, 2013). When faced with uncertainties about task or information, virtual workers could refer to communication documented on persistent media for clarification and reduce the need to ask for instruction again, thus improving work efficiency and job satisfaction. Second, the persistence affordance preserves the process of how ideas were generated, allowing workers to revisit the content, which can improve collaboration and task communication (Gergle et al., 2004). Thus, it may be beneficial for virtual workers to use a persistent media platform that allows them to revisit its content for work-related matters because the persistence affords information and knowledge to accumulate over time (Treem & Leonardi, 2013). Third, although one can argue that the preference towards persistence may be to generational difference among workers, having persistence allows certain workers to choose not to use the media, thus having more flexibility across the organization. Given this, the availability of persistent communication platforms at work would lead to positive work effects because such platforms could better tailor individual employees’ need and thus reduce employees’ stresses subjective stress (van Zoonen et al., 2022). Thus, we predict that,

H2: Perceived persistence of media increases the intention to communicate with colleagues.

3.2. Social presence

Social presence refers to the degree to which a media platform is perceived to transmit the sense that the communication partners are near and close (Short et al., 1976). In-person communication provides the most intimate communication experience (Rice, 1993). Similarly, an in-person office
work environment best facilitates workers to communicate with colleagues that they meet in open spaces such as elevators, hallways, or break rooms (Payard & Weeks, 2007). Virtual work does not allow frequent in-person communication because they work at dispersed locations. Besides in-person communication, the different types of media that are available to virtual workers afford different levels of social presence (Rice, 1993).

The social presence theory (Short et al., 1976) proposes that the more the number of cues pass through a certain communication medium, the stronger the social presence communication partners can experience. Though the theory proposes a linear addition of different types of communication cues that can contribute to social presence, physical appearance, namely the presence of communication partners’ faces, has been shown to be a strong factor influencing the sense of social presence (Y. Li & Xie, 2020; Storck & Sproull, 1995; Walther et al., 2001). Therefore, profile pictures of people can increase the social presence, leading to strong sense of warmth and affinity of communication partners.

A strong sense of social presence would thus lead to a strong intention to communicate with other virtual workers. The use of human faces and images induces a strong sense of social presence and thus higher user engagements for text-heavy platforms, such as Twitter (Y. Li & Xie, 2020). For virtual workers, most communication is conducted primarily through text-based communication media, such as emails and instant messages (Yang et al., 2022). When a communication medium allows workers to see the picture images of other workers, they would experience a strong sense of their presence and thus have a stronger intention to talk with them. Thus, for virtual workers, we propose

H3: Perceived social presence of media increases the intention to talk to colleagues.

4. Method

An online study was conducted to test the hypotheses. Participants were recruited through Qualtrics, a professional survey company, with matching gender and ethnicity distributions to the latest census statistics (United States Census Bureau, 2019). The institutional review board at the second author’s university reviewed and approved the content of the questionnaire. To ensure that participants have adequate experiences with virtual work, screening questions were set to include participants who were regular salaried workers and had switched to working from home for at least a month. Qualified participants were then provided with online consent. A total of 410 participants completed the online survey. To ensure data quality, we included attention check questions in the questionnaire, and only the data of participants who passed the attention checks were included in the final analysis.

The final sample included 389 (N) participants. Demographic information is summarized in Table 1. On average, participants had been working for 9.36 (SD = 8.03) years in their organizations, satisfied about their jobs \( M = 3.98, SD = 0.86 \), options ranging between 1 [strongly dissatisfied] to 5 [strongly satisfied]).

4.1. Measures

4.1.1. Tie strengths

To measure tie strength, we used the egocentric network name generator technique (Carrasco et al., 2008) by asking participants to think about names of strong-tie and weak-tie colleagues who perform a similar job function as themselves. We provided the definitions of strong ties and weak ties to participants: A strong-tie colleague is a person to “discuss important matters with, regularly keep in touch with, or is there for you if you need help,” and a weak-tie colleague refers to the person who “is an acquaintance, you infrequently communicate with, and is not very close.” Tie strengths measures asked participants if the colleague [the name of their weak-tie colleagues] was the person they “discuss important matters with,” “regularly keep in touch with,” and “is there for me if I need help” with options from 1 (strongly disagree) to 5 (strongly agree). Strong-tie Cronbach’s \( \alpha = .82 \), weak-tie Cronbach’s \( \alpha = .87 \).
Table 1. Demographic information (N = 389).

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>187 (48.1)</td>
</tr>
<tr>
<td>Women</td>
<td>202 (51.9)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>White (non-Hispanic or non Latino)</td>
<td>285 (73.3)</td>
</tr>
<tr>
<td>African American</td>
<td>63 (16.2)</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>38 (9.8)</td>
</tr>
<tr>
<td>Asian</td>
<td>22 (5.7)</td>
</tr>
<tr>
<td>Other</td>
<td>6 (1.5)</td>
</tr>
<tr>
<td>Experience with Work from Home Prior COVID-19</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>183 (47.7)</td>
</tr>
<tr>
<td>No</td>
<td>206 (53.0)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>36 (9.3)</td>
</tr>
<tr>
<td>Associate’s degree</td>
<td>53 (13.6)</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>171 (44.0)</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>104 (26.7)</td>
</tr>
<tr>
<td>Doctorate or equivalent</td>
<td>25 (6.4)</td>
</tr>
<tr>
<td>Income Level</td>
<td></td>
</tr>
<tr>
<td>&lt;50,000</td>
<td>66 (17.0)</td>
</tr>
<tr>
<td>50,001–75,000</td>
<td>94 (24.2)</td>
</tr>
<tr>
<td>75,001–100,000</td>
<td>89 (22.9)</td>
</tr>
<tr>
<td>100,001–200,000</td>
<td>122 (32.4)</td>
</tr>
<tr>
<td>&gt;200,001</td>
<td>18 (4.6)</td>
</tr>
</tbody>
</table>

4.1.2. Perceived heterogeneity

Two types of heterogeneity were measured, including demographic heterogeneity, i.e., differences in gender, ethnicity, and education; and psychological heterogeneity, i.e., differences in thoughts and interests. For differences in gender, “1” was coded when the ego’s gender is different from the alter’s gender. Ethnicity heterogeneity was calculated in the same way. Differences in education were measured by asking “Is [auto-filled the colleague’s name]’s educational background similar to or different from yours?” with options ranging from 1 (very similar) to 5 (very different). Differences in thoughts and interest was measured by asking participants “Is []’s thoughts and interests similar to or different from yours?” (1 = very similar, 5 = very different). Higher numbers represent higher levels of perceived heterogeneity.

4.1.3. Perceived persistence

The perceived persistence affordance was measured by an adapted subset (three items) of a persistence scale (Fox & McEwan, 2017). We provided different example media platforms that participants would use in their everyday work, some with a higher level of perceived persistence, e.g., media that would record a chat history, and some with a lower level of persistence, e.g., media that would not record a chat history. Then, we asked participants to rate their level of perceived persistence of these media with three items, e.g., “this platform keeps a record of communication that I can go back and look at,” with options ranging from 1 (strongly disagree) to 5 (strongly agree). Cronbach’s α = .98.

4.1.4. Perceived social presence

The perceived social presence affordance was measured by the adapted subset (three items) of the social presence scale (Fox & McEwan, 2017), in a similar way as the perceived persistence. Social presence is operationalized as the presence of colleagues’ portrait photos. An example of the items is “this platform makes it seem like the other person is present,” with options from 1 (strongly disagree) to 5 (strongly agree). Cronbach’s α = .89.
4.1.5. Intention to communicate
Participants’ intention to engage in communication was measured by asking participants to rate the following items: “to have a job-related talk with [auto-filled colleague’s name],” “to talk with [ ] about projects at hand,” “to talk with [ ] about industry news,” “to talk with [ ] about new, potential projects” with options from 1 (very unlikely) to 5 (very likely). Strong-tie Cronbach’s α = .84, weak-tie Cronbach’s α = .89.

4.2. Confirmatory factor analyses (CFA)
CFA were conducted to confirm the dimensionality of the new and adapted scales (i.e., persistence, privacy concerns, and network inertia) using the lavaan package in R4.0.2 (Rosseel et al., 2020). Other than using the use of Maximum Likelihood as estimator, we used diagonally weighted least squares (DWLS) as estimator because it is more robust and less influenced by the distribution of observed variables. DWLS works on the diagonal elements of the full weight matrix in the fit function, is more flexible in calculation, and provides superior results with nonnormal and ordinal variables (Beauducel & Herzberg, 2006; C. H. Li, 2016). The measurement model demonstrated a great fit: χ²(155) = 48.44, p = 1.00, Comparative Fit Index (CFI) = 1.00, Tucker-Lewis Index (TLI) = 1.00, Root Mean Square Error of Approximation (RMSEA) < .00, and Standardized Root Mean Square Residual (SRMR) = .04 (Zhao, 2015).

5. Results
See Table 2 for descriptive data for heterogeneity and Table 3 for the correlation matrix for all key variables.

Hypothesis 1 predicted that virtual workers would be more likely to communicate with their strong ties rather than their weak ties. A paired sample t-test showed that participants are more likely to communicate with strong-tie colleagues (M = 4.47, SD = 0.69) than weak-tie colleagues (M = 4.13, SD = 0.88, t (389) = 8.28, p < .001). Hypothesis 1 was supported.

Hierarchical regressions were performed to examine research question 1, hypothesis 2, and hypothesis 3. See Table 4 for detailed results. In summary, research question 1 asked how heterogeneity in gender, ethnicity, education, and attitudes and interest predicted virtual workers’ intention to communicate with their colleagues. Results suggested that psychological heterogeneity predicted

### Table 2. Perceived heterogeneity of alter by ego (N = 389).

<table>
<thead>
<tr>
<th>Heterogeneity Category</th>
<th>Strong-Tie Colleagues M (SD)</th>
<th>Weak-Tie Colleagues M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity*</td>
<td>.75 (.43)</td>
<td>.67 (.47)</td>
</tr>
<tr>
<td>Gender*</td>
<td>.73 (.44)</td>
<td>.64 (.48)</td>
</tr>
<tr>
<td>Educationb</td>
<td>2.21 (1.12)</td>
<td>2.54 (1.19)</td>
</tr>
<tr>
<td>Thoughts and Interestsb</td>
<td>2.08 (0.92)</td>
<td>2.80 (1.17)</td>
</tr>
</tbody>
</table>

*Dichotomous variable 0 = Same, 1 = Different.

*Rated on 1 to 5, 1 = very similar, 5 = very different.

### Table 3. Descriptive statistics and zero-order correlations between study variables (N = 389).

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Strong Tie Strength</td>
<td>4.35</td>
<td>0.66</td>
<td>.12*</td>
<td>.08</td>
<td>.20**</td>
<td>.33**</td>
<td>-</td>
</tr>
<tr>
<td>2. Weak Tie Strength</td>
<td>3.39</td>
<td>1.08</td>
<td>.08</td>
<td>.34**</td>
<td>-</td>
<td>.43**</td>
<td>-</td>
</tr>
<tr>
<td>3. Persistence</td>
<td>3.42</td>
<td>1.48</td>
<td>.11*</td>
<td>.09</td>
<td>.09</td>
<td>.35**</td>
<td>.37**</td>
</tr>
<tr>
<td>4. Social Presence</td>
<td>3.85</td>
<td>0.87</td>
<td>.35**</td>
<td>.37**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Communication Intention Strong-Tie</td>
<td>4.03</td>
<td>0.72</td>
<td>.27**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Communication Intention Weak-Tie</td>
<td>4.13</td>
<td>0.88</td>
<td>.27**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*p < .05,**p < .01.
virtual workers’ intention to communicate with both strong-tie colleagues and weak-tie colleagues. However, demographic heterogeneity, differences in sex, ethnicity, or education, did not relate to virtual workers’ intention to communicate with other colleagues.

Hypothesis 2 predicted that persistence positively predicted virtual workers’ intention to communicate with strong-tie and weak-tie colleagues. Results suggested that perceived persistence of the media did not influence participants’ intention to communicate with either strong-tie colleagues or weak-tie colleagues. Hypothesis 2 was not supported. Hypothesis 3 predicted that social presence increases virtual workers’ intention to communicate with strong-tie and weak-tie colleagues. Hypothesis 3 was supported. Though not hypothesized, we further tested the interaction effects between tie strengths, persistence, and social presence. The interaction effects were not significant in predicting intention to communicate with either strong ties or weak ties.

6. Discussion

This study seeks to understand how network inertia theory and perceived media affordance theory influenced virtual workers’ intention to communicate with their colleagues. This study gathers evidence to support the network inertia theory and suggests that virtual workers have stronger intention to communicate with colleagues that they have already known well. In addition to the network inertia theory, virtual workers’ communication intention is also influenced by the perceived similarities in interest and thoughts, but not the similarities in demographic characteristics. From the perceived media affordance perspective, social presence positively predicted participants’ intention to communicate with other colleagues but not how persistent the communication channel could be.

6.1. Theoretical implications

First, this paper makes theoretical contributions to the network inertia framework and the media affordance theory by applying the theories in the context of virtual work at the individual level, where previous work has primarily focused on offline interorganizational situations (Demirkan et al., 2013; Shi & Zhang, 2020). Consistent with network inertia theory, virtual workers tend to communicate with strong-tie colleagues even in the work-from-home context. This finding is consistent with existing literature, which suggests that previous interaction and collaboration between team members may strengthen their ties, build mutual trust, and thus foster communication frequency (Yang et al., 2022). This finding also suggests that Granovetter’s weak ties hypothesis may be the result of weak ties being an epiphenomenon to the reach and resourcefulness of the tie.

Second, we proposed a more nuanced measurement of network inertia—a tendency to maintaining communication with strong-tie colleagues and an avoidance to connecting with weak-ties. However, theory suggests that network inertia could be broken by disconnecting strong-tie colleagues and reaching out to weak-tie colleagues. Existing studies have mainly examined inertia and tie strength as the tendency to connect with strong-tie organizations (Demirkan et al., 2013; Shi & Zhang, 2020). In this study, we operationalized inertia as both the intention to approach strong-tie colleagues and weak-tie colleagues. We obtained robust results from both operationalizations and gained more confidence about our results and implications. Results suggest that virtual workers would approach both types of colleagues regardless of the differences in demographic heterogeneity, such as gender, ethnicity, and education levels. But virtual workers would approach both strong-tie and weak-tie colleagues who share similar values and interests with them.

Our findings on demographic and psychological heterogeneities also provided more nuance to the existing research on heterogeneity. Among the two types of heterogeneity, only psychological heterogeneity predicted virtual workers’ intention to approach colleagues for work issues. These findings provided value to our understanding of organizational heterogeneity typology and virtual workers’ communication preferences. Practical implications will be discussed.
Table 4. Regression coefficients of intention to communicate with strong-tie colleagues and weak-tie colleagues.

<table>
<thead>
<tr>
<th></th>
<th>Intention to Comm with Strong-Tie Colleagues</th>
<th>Intention to Comm with Weak-Tie Colleagues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>β</td>
</tr>
<tr>
<td>Age</td>
<td>.00</td>
<td>.04</td>
</tr>
<tr>
<td>Education</td>
<td>-.01</td>
<td>-.01</td>
</tr>
<tr>
<td>Income</td>
<td>.04</td>
<td>.08</td>
</tr>
<tr>
<td>Sex</td>
<td>-.09</td>
<td>-.06</td>
</tr>
<tr>
<td>Ethnicity_Black</td>
<td>.15</td>
<td>.07</td>
</tr>
<tr>
<td>Ethnicity_White</td>
<td>.06</td>
<td>.03</td>
</tr>
<tr>
<td>Ethnicity_Asian</td>
<td>.30</td>
<td>.10</td>
</tr>
<tr>
<td>Ethnicity_Hispanic</td>
<td>.16</td>
<td>.07</td>
</tr>
<tr>
<td>Persistence</td>
<td>.02</td>
<td>.05</td>
</tr>
<tr>
<td>Social Presence</td>
<td>.29**</td>
<td>.35**</td>
</tr>
<tr>
<td>Heterogeneity</td>
<td>-.13**</td>
<td>-.16**</td>
</tr>
<tr>
<td>Thoughts &amp; Interests</td>
<td>.14</td>
<td>.38</td>
</tr>
</tbody>
</table>

*Male = 1, Female = 2.
*p < .05. **p < .01.
The application of media affordance theory in the virtual workers’ context suggested that persistence affordance did not influence virtual workers’ intention to communicate with colleagues but the different levels of social presence of media did. Participants of our study were equally likely to conduct task-related communication on a media platform regardless of whether it keeps a permanent record of their communication. Existing literature heavily discussed how highly persistent media offer various benefits to work (e.g., Bregman & Haythornthwaite, 2003; Treem & Leonard, 2013; van Zoonen et al., 2022). But from the users’ perspective, virtual workers’ intention to use a highly persistent platform may be low. This result resonates with research in health communication where patients did not show an increased intention to use well-documented communication platform to contact their primary care physicians (Mao & Hovick, 2022) and in the context of interpersonal communication where online daters are stressed about the fact that social networking sites may keep a permanent record of their dating history (Fox & Moreland, 2015). More needs to examine the mechanisms of this seemingly contradictory phenomenon.

This research complements the perceived social presence affordance literature by bridging the relationship between social presence and people’s intention to communicate. Existing research has examined how different media afford different levels of social presence and different effects of using media affording different levels of social presence (Rice, 1993). This paper studied people’s intention of communicating with other colleagues via media when the media afford different levels of social presence, besides in-person communication.

### 6.2. Practical implications

Employees are people who are hired by an organization or an individual (employer) to fulfill specific tasks. They could be paid or unpaid, full-time or part-time, task/contract-based or salary based. The results of this study could be generalized to any virtual worker who use communication technology to connect with their colleagues for work. To improve virtual employees’ communication experience and work environment, we would like to make the following suggestions to virtual workers and their management. First, when working virtually, people tend to connect with colleagues with whom they have already developed close relationships (Yang et al., 2022). In a long run, communicating only with strong-tie virtual workers may limit their access to information and resource and hurt creativity (Baer, 2010). Recent research on virtual work also shows that, virtual workers are becoming less interconnected (Yang et al., 2022). The results of this paper suggested that virtual workers are still meeting heterogeneous others at work, including colleagues who are different from themselves demographically when they share similar interests and attitudes. Greater communication with heterogeneous others would increase social self-efficacy as well as life and job satisfaction (B. Kim & Kim, 2017). Existing research recommends that social media could be a useful tool to expose users to meet more heterogeneous groups (B. Kim & Kim, 2017). In addition to previous recommendations about establishing network heterogeneity (J. K. Lee et al., 2014; Y. Kim & Chen, 2015), in the virtual organizational communication context, we recommend setting up interest groups, which creates an environment for workers to meet weak-tie colleagues who share similar interests and values.

The results suggest that persistence in media does not significantly influence virtual workers’ intention to communicate with either strong-tied or weak-tied colleagues. Existing research, however, shows that instead of substituting in-person communication with more synchronous communication, virtual workers turn to other more persistent and asynchronous communication, such as sending emails and instant messages in practice (Yang et al., 2022). We believe that this may be the case because of the limited availability of less persistent media. Instant messages, text messages, and emails usually afford a high level of persistence. With the growing popularity of ephemeral media (Bayer et al., 2016), we recommend providing virtual workers additional and optional media that are less persistent, for communication that otherwise would not have happened. Workers’ intention would not be reduced, but they could use the ephemeral media for different tasks when they do not wish to be judged or criticized, such as brainstorming and raising concerns at work.
Communication through media that afford different levels of presence could generate positive communication outcomes, such as communication warmth, task participation, and organizational identification (Biocca et al., 2003; Fonner & Rolloff, 2012; Rice, 1993). Results of this study also suggest that virtual workers’ intention to talk with both strong-tied and weak-tied colleagues would be stronger when they feel other communication partners are close and near. Thus, to increase workers’ task participation, organizational identification, we recommend using media that could increase virtual workers’ senses of intimacy, immediacy, and social presence, such as turning on microphones and cameras. That said, we acknowledge that media preferences (e.g., synchronous vs. asynchronous media) may be due to generational differences, therefore, providing more options would allow communication otherwise would not happen.

6.3. Limitations and future research

This study was conducted about five months after the shutdown due to COVID-19. Time is an important factor that influences virtual workers’ patterns of using media at work (Hollingshead et al., 1993). Virtual workers’ access to different media, and intention to communicate may experience substantial changes as the pandemic continues to unfold and as time passes on. Particularly, when they become familiar with the habits of working from home, they may reach a new normal and adopt their own patterns of communication. Communication with and among virtual workers, especially knowledge workers, is and will be an important area of research for scholars to understand and study during or even after COVID-19. Future research could continue investigating virtual workers’ network change and media perceptions. Future research could also examine how other media affordances, visibility, and association influence virtual workers’ intentions for communication.

The participants of the study were mainly full-time virtual workers. The implication of the results was thus limited to employees who work fully remote. With the rise of hybrid mode (working both in office and at home) for employees, we believe that most of the results could be replicated with a hybrid sample. But, when employees work both at home and in office, they will have the opportunity to meet and communicate with colleagues that they may not when they work fully remote. Being physically close to weak-tie colleagues, heterogeneous colleagues, may influence communication intentions in a different way than fully remote employees. The degree to which our results could still be applied to workers who work in a hybrid mode, knowledge workers who work extra at home, remains an interesting future direction.

Also, we note that the intention to communicate is a complex action that could be affected by many other factors, such as differences in agency (e.g., if the virtual workers feel like communicating with a particular coworker and/or on a particular matter at work), personality (e.g., introverts may be less inclined to communicate even if the work situation calls for a meeting), voluntariness (e.g., whether the intention to communicate is the result of following the request of supervisor to hold a meeting with a group of workers due to a project), and relationship quality (e.g., positive vs. negative relationships between workers), time (e.g., if an employee needs to submit a report in 30 min, s/he may not have the time to hold a long meeting with a project team), and timing (e.g., if a managerial meeting among key decision makers will be held in an hour, a worker may urgently need to meet with his/her supervisor who is going to be advocating for their project before the managerial meeting). Future research should look into other factors that can better explain the variance in the intention to communicate.

Finally, our conceptualization of heterogeneity only included demographic and psychological diversities. Given the increasing importance of physical disabilities (Patton, 2022) and neurodiversity (Khan et al., 2022) at the workplace, future research should expand the scope of “heterogeneity” to include physical and mental disabilities to investigate communication among virtual workers with different backgrounds.
7. Conclusion

Virtual work has and will continue to become an important topic for management and scholars to learn and study. Network inertia theory and perceived media affordance theory both provide important guidance to understanding virtual workers’ intention to communicate with colleagues. Virtual workers tend to connect and communicate with colleagues that they are already familiar with but not comfortable reaching out to colleagues that they are not familiar with, especially when the colleagues were perceived to have different thoughts and interests than themselves. Virtual workers have different intentions for different communication platforms. They will be more likely to talk with their colleagues when they feel others are close and near to them. We recommend providing virtual workers with multiple communication channels, which varies in different levels of persistence and social presence so that they could strategically choose a channel that best suits their communication purpose.

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