# When Tasks Get Virtual:  How Tasks Virtuality Affects Work Behavior and Innovative Capabilities

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## Abstract

Since organizations have become more global, the structures in organizations have been transformed into more flexible units. With these changes, many new approaches have emerged in management practice. Among all others, virtuality in organizations received a growing attention in the last decade. Extensive amount of research confirmed the fact that virtuality plays a crucial role in organizations. Findings linked virtuality to a number of variables including organizational and behavioral outcomes, which range from team leadership to employee feelings, lack of face-to-face contact between people at the workplace resulted in fierce challenges that raised the barriers for organizational effectiveness and innovativeness. Although the dynamics of virtual working have gained much traction, only a limited number of studies addressed the impacts of virtuality at the individual and task level. This paper discusses the implications of task virtuality by elaborating its impacts on work related, behavioral outcomes as well as innovation capabilities of knowledge employees.

**Keywords:** Team virtuality, task virtuality, innovation capabilities, work outcomes, knowledge workers

**Introduction**

In the second issue of Journal of Management and Innovation, in his discussion of the future of organizational structures, Coughlan (2016) has placed a particular emphasis on the need for new social technologies to deal with the changing organizational structures. In today's organizations, extensive and lateral collaborations are achieved through multiple networks in organization design. Due to increasing use of electronic communication, globalization practices and desire for accessing and attracting the global talent, virtual organizations have become the mainstream structure within organizations. Irrespective of formality of teams or groups, heavy reliance on virtual teams brought many advantages to organizations, besides its limitations.

Traditionally, virtuality has been treated as an organizational level construct, characterized by "highly dynamic processes, contractual relationships among entities, edgeless, permeable boundaries, and reconfigurable structures" (DeSanctis & Monge, 1998, p. 693). Later, the virtual team concept overtook the majority of discourse in organizational research, in which virtuality is referred as "the extent to which team members use virtual tools to coordinate and execute team processes, the amount of informational value provided by such tools, and the synchronicity of team member virtual interaction" (Kirkman & Mathieu, 2005, p. 700). As a result of extensive use of electronic tools for communicating and coordinating of work, task structures are also virtualized (Orhan, 2014; Blount 2015; Varty, O'Neill, & Hambley, 2017). Telework allowed anytime, anywhere working opportunities for many employees, but at the same time it also brought additional challenges (such as performance, social isolation,

satisfaction) attached to the individual level of virtuality; particularly for those who hold corporate positions (Arling & Subramani, 2011; Orhan, Rijsman, & van Dijk, 2016). On the other hand, Bloom and colleagues (2014) reported that home-office applications significantly increased productivity, job satisfaction and positive work attitudes on average, while isolation, lack of socialization opportunities (during and after work) and employees' negative perceptions about the possibilities of getting promotions due to lack of office presence were cited among the major challenges.

In management research, the operational definition and measurement of team virtuality often differ from its conceptual definition (Hoch & Dulebohn, 2017; Gilson, Maynard, Young, Vartiainen, & Hakonen, 2015). Even though geographic dispersion and computer mediated interactions (the extent of ICT use) appeared to be the most frequently observed dimensions defining team virtuality, the extent of face-to-face interactions between team members is found to be the key determinant for the measurement of team virtuality (Orhan, in press; Maynard, Gilson, Young, & Vartiainen, 2017). Regardless of conceptualization or operationalization, team virtuality is concerned with the interactions of team members. As opposed to the team level construct of virtuality, task virtuality deals with one's exposure to virtuality at the individual level (Orhan, 2014; Arling, Miech, & Arling, 2017). In an organization, team members are not the only people who provide information for coordinating task processes and how information flows is also affected by team interdependencies. Thus, not only team members' input matters when information is processed. The input from other parties (e.g. customers, suppliers) also contributes to task processes. In this respect, task virtuality

deals with the level of interaction with all parties that are not communicated via face-to-face contacts (Orhan, 2014). For instance, the level of task virtuality increases with the use of electronic communication (in lieu of face-to-face contact) when collaborating with others (not necessarily team members only) whose input required to perform a particular task. To gain cost advantages, to leverage organizational assets, to improve efficiency, centralization can offer benefits for global companies (Coughlan & Bernstein, 2015). Global Centers of Excellence (CoEs) bring many employees together who serve other organizational units of multinational organizations. Often, co-located, centralized teams disseminate knowledge to other sub-organizational units, and thus they have to process a large amount of information obtained from other parts of the firm. In this case, co-located teams deal with virtual tasks as they have to respond to the needs of other parties. A recent study by Pineda (2015) confirms that virtual tasks can emerge at various stages even for co-located teams. According to the earlier virtual team literature, a linear and unidirectional relationship is suggested between team virtuality and the virtuality at the individual level (Suh, Shin, Ahuja, & Kim, 2011). This implies that the source of virtuality can only vary with the level of team virtuality. The higher an individual's team virtuality, the more virtuality the individual experiences and is exposed to. However, recent trends suggest that individual and task level virtuality can be more appropriate since though telework applications and flexible work adaptations increase the dependency on information technologies that allow communicating with everyone remotely even in the industries that face-to-face interactions are commonplace (Arling et al., 2017; Varty et al., 2017; Orhan et al., 2016). When tasks become more complex and,

require collaboration and coordination with others, media richness and synchronicity gain a particular importance in individuals' performance (Dennis, Fuller, & Valacich, 2008; Montoya, Massey, Hung, & Crisp, 2009). High virtuality often suffers from lack of media richness and synchronicity, which negatively impact individual performance (Pillis & Furumo, 2007; Furumo, 2009). Arling and Subramani (2011) also argue that individuals' position in the network structures determine behavioral and performance outcomes, because the position is also affected by ICT based interactions related to tasks and information required to process these tasks. This, in turn, influences individuals' and organizations' innovative capabilities, as knowledge transfer and integration get difficult and are hindered by weak network ties and ambiguity inherent in high virtuality conditions (Choi & Lee, 2016). An individual, coordinating tasks through information shared and distributed by parties, which are solely communicated through electronic media, will fail to retain contextual and tacit knowledge because low frequency of interactions and lack of face-to-face communication prevent building stronger network ties (Alavi & Tiwana, 2002).  In this case, the individual with high task virtuality also fails to realize the actions to perform. Although virtual work allows flexibilities, there are a few challenges that appear to be common for many types of works in today's organizations.

The aim of our paper is to present the challenges associated in modern organizations where virtual work is prevalent and in environments where task virtuality affects employees irrespective of their team structures. Our overarching goal is to highlight the challenges influencing work behaviors and innovative capacities of

knowledge workers, and to offer a different perspective on the recent trends of dynamics organizations. The goal of this paper is to discuss the theoretical impacts of task virtuality on work-related behavioral outcomes and innovative capabilities and to highlight the practical arguments on managerial implications, which can shed light on necessary steps to prevent the detrimental effects of increased level of individual virtuality on innovation outcomes.

### TASK VIRTUALITY AND ITS IMPACTS ON WORK OUTCOMES

Team interdependence plays a critical role in how much coordination and collaboration required within a team. How information flows, how processes are designed, how teams structured, and how coordination and integration established determine the structure of team interdependence. These team related interdependencies also change employees' network and task structures, which influence the individual levels of virtuality experiences. Challenges of team virtuality rooted from lack of face-to-face contact can be rather easier to overcome if teams are structured to follow a pooled/additive workflow compared to in the teams that have reciprocal workflow structure (Kitchin, 2010). In a more intensive workflow environment, the interdependence can be even more complex. In today's organizations we observe this complexity due to increased intensity of interactions at the global scale. Hence, the source of virtuality is no longer arises from the interactions with team members only. The involvement of other parties (e.g. customers, suppliers etc.) at distance multiplies the challenges, since information sharing, coordination and collaboration take place in virtual

environments where face-to-face contact is very unlikely to happen. With the increasing complexity, the higher the use of electronic communication, the more virtual get the tasks, so the challenges do (Maynard, Mathieu, Rapp, & Gilson, 2012; Orhan, 2014). As a result, team interdependence can only be responsible for a small proportion of virtuality challenges, if different parties other than team are involved in information sharing because task virtuality will take the lead in these kinds of situations.

In order to manage the challenges associated with virtuality effectively, Maznevski and Chudoba (2000) highlight the crucial role played by face-to-face meetings. Curseu, Schalk and Wessel (2008) support that physical, face-to-face encounters lead to the initial development of interpersonal trust in virtual teams. Interestingly, however, a significant number of employees today in organizations perform tasks with people that they never meet. They rely on information from people whom they never see. To be able to function effectively, virtual team members are provided training programs that alert the challenges (Warkentin & Beranek, 1999; Malhotra Majchrzak, & Rosen, 2007). Rosen, Furst and Blackburn (2006) conclude that effective training programs are essential especially for virtual settings, as the skills required to perform in such an environment differ vastly. On the other hand, virtual work has become a norm for global organizations. In response to increased competition in the highly dynamic global business arena, multinational companies' utilization of virtual teams becomes inevitable; not only because technological advancements allowed efficient, cost-effective solutions and wider access to global talent pool, but also because flexible work allowed various skills to be employed by the organization (Maynard, Vartiainen, & Sanchez, 2017).

Consequently, these skills are needed to be acquired by those who encounter the challenges of virtual work, no matter how their teams are structured (i.e. virtual or traditional). Considering virtual team members are not the ones interacting virtually, there is also a need to address this issue from a broader perspective covering all interactions with others in organizations. Thus, the "task virtuality" concept is coined to be able to answer further questions related to the challenges.

For this study, we used the data from Orhan et al. (2016). From the dataset, we identified the individuals (N=238) experiencing low and high task virtualities based on the measure identified and used by the authors. According to this distinction, we observed 162 individuals with high task virtuality and 76 individuals with low task virtuality in this dataset. To extend the initial findings of the previous study, we further tested the differences of behavioral and organizational variables between employees possessing low task virtuality and those with high task virtuality. For this purpose, we utilized the independent sample t-tests which compare the following variables; physical isolation, informational isolation, social isolation, perceived performance, job satisfaction and turnover intention. These variables were initially measured using 6-Likert scale. The results of comparisons and correlation matrix are presented in the Table 1 and Table 2 respectively.

Table 1. Independent Sample t-tests

| | Task Virtuality | | | | |
| | Low (N=76) | | High (N=162) | | |
| Variable | Mean | SD | Mean | SD | t-test (Sig.) |
|---|---|---|---|---|---|
| Physical Isolation | 2.000 | 1.113 | 2.501 | 1.125 | -3.215 (0.001)** |
| Informational Isolation | 3.451 | 1.010 | 3.803 | 0.894 | -2.713 (0.007)** |
| Social Isolation | 2.402 | 0.931 | 2.881 | 0.938 | -3.685 (0.000)** |
| Job Satisfaction | 4.445 | 1.042 | 4.126 | 0.914 | 2.401 (0.017)* |
| Perceived Performance | 4.026 | 0.800 | 3.710 | 0.854 | 2.719 (0.007)** |
| Turnover Intention | 2.342 | 1.150 | 2.858 | 1.158 | -3.213 (0.001)** |

*$**p<0.01; *p<0.05$*

Table 2. Correlation Matrix

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Task Virtuality | | | | | | | |
| 2. Physical Isolation | 0.307** | | | | | | |
| 3.Informational Isolation | 0.158* | 0.288** | | | | | |
| 4. Social Isolation | 0.318** | 0.940** | 0.571** | | | | |
| 5. Job Satisfaction | -0.218** | -0.514** | -0.310** | -0.557** | | | |
| 6. Perceived Performance | -0.232** | -0.287** | -0.122 | -0.298** | 0.282** | | |
| 7. Turnover Intention | 0.228** | 0.324** | 0.246** | 0.364** | -0.527** | -0.160* | |
| 8. Team Virtuality | 0.331** | 0.267** | -0.143* | -0.162 | -0.062 | 0.006 | 0.001 |

*$**p<0.01; *p<0.05$*

The comparison of means indicate important results. As argued in the introduction section, empirical evidence supported the fact that increased task virtuality is associated with a number of behavioral and organizational variables in the workplace. Even though virtuality is often elaborated and researched as a team level construct, the results confirmed that the individual level differences play a crucial role in people's feelings and attitudes. The results also confirm the idea that it is a factor that is inherent in all kinds of occupations in today's organization, regardless of team settings. We argue that that social isolation, physical isolation and informational isolation can be caused by high levels of

task virtualities of individuals which significantly influences people's perception about their performance, their satisfaction from job and intentions to quit. The correlation matrix also indicated that task virtuality is significantly associated with all variables discussed in this article, whereas team virtuality remains insufficient to correlate neither with job satisfaction, nor with perceived performance nor turnover intenion. Moreover, the correlations of team virtuality with informational isolation and social isolation measured as weak.  These results imply that frequent face-to-face interaction with others of which an employee had higher task interdependence is a crucial determinant in job satisfaction, perceived performance and consequently turnover intention, as it diminishes workplace isolation socially, physically and informationally.

**IMPACTS ON INNOVATIVE CAPABILITIES**

Rapid changes in structures and technologies also affect innovative capabilities of individuals since information flow and communications are directly affected (Coughlan, 2016). Effective communication is one of the key indicators of tacit knowledge that is transferred smoothly within an organization. Alavi and Tiwana (2002, p. 1030) state the following: "because the most valuable of any organization's knowledge is tacit, its members' ability to pool and apply their tacit knowledge is the most pronounced predictor of its value". The authors also argue that codifying the knowledge becomes more difficult in virtual environments if more tacit elements involved in that knowledge required for completing jobs. Since in high virtuality conditions information sharing between agents does not take place in same time and same location, the lack of shared

context, lack of networking opportunities and lack of non-verbal cues create barriers in tacit knowledge integration and dissemination (Ardichvili, Page, & Wentling, 2003). As knowledge integration is a communication process, intragroup dynamics play a crucial role in knowledge creation, transfer, processing and innovative capabilities of team members. Curseu et al. (2008) note several drawbacks of information processing of virtual groups compared to face-to-face counterparts. First, the performance of virtual groups is often lower than that of face-to-face groups if the tasks are knowledge-intensive. Even though higher creativity and more idea generating capabilities are observed in virtual teams, operationalization remains weak. This is due to the fact that the accumulation of knowledge, information integration and transactive memory systems are rather difficult to obtain in virtual environments. Subsequently the use of computed mediated communication tools influence information processing of individuals and their performance because of lack of para-verbal and non-verbal cues exchanged over these tools.

In this respect, the same barriers apply in all communications within an organization, where the use of electronic tools becomes the norm and the large part of information shared and stored takes place in virtual environments. The process of knowledge implementation is influenced by virtual environments because of predominant reliance on information that cannot be observed, but communicated through electronic channels. Thus, until and unless documented, retrieval and share of information get problematic (Verona, Prandelli, & Sawhney, 2006). Task ambiguity emerges as a major issue in such situations if communication and collaboration is mainly dependent on

asynchronous tools. Employees will prefer more face-to-face contact to overcome the ambiguity and to seek immediate feedback to resolve issues (Nataatmadja & Dyson, 2006; Stevens, Karkkainen, & Lampela, 2009). As a result, the higher the task virtuality, the more ambiguous becomes the tasks, particularly those that have higher complexity and require collaboration and shared information.

Batarseh, Usher and Daspit (2017) exhibit that collaboration capabilities of employees within a virtual setting depend on trust, communication and commitment. These dimensions are found to have a positive, significant relation with the perception of team innovativeness. Nevertheless, they also note that the lack of face-to-face communication with team members and others bring the challenges of building trust, obtaining communication clarity and developing commitment. This is not only because of lack of face-to-face communication, but also because the amount of information shared virtually is comparably low (Curseu et al., 2008). Additionally, job satisfaction declines significantly in high virtual settings, since increased task virtuality increases isolation feelings (Batarseh et al., 2017) and has negative impacts on perceived individual performance (Orhan et al. 2016).

To excel in innovativeness, Coughlan (2014) identifies that proximities play a crucial role in terms of quality and quantity of innovations. The right balance of communication and media use preferences effect the clarity of communications within an organization and therefore reduce the likelihood of failures caused by the dimensions of proximity. These dimensions include:

- Cultural proximity

- Cognitive distance

- Organizational proximity

- Technological proximity

- Vision proximity

- Virtual proximity

Other researchers also contribute to the literature with additional dimensions of proximity that includes geographical, institutional, relational, professional and social proximity (Knoben & Oerlemans, 2006). Similarly, the virtuality literature also makes similar categorizations when defining the characteristics of teams and jobs. Even though there is no consensus on a single definition of virtuality, it is discussed that the defining characteristics of virtuality is the lack of face-to-face communication arising from proximities and discontinues in various dimensions of proximity (Chudoba, Wynn, Watson-Manheim, 2005). In a very recent study, Claudel and colleagues (2017) confirm that proximity positively affect collaborative performance of knowledge workers, even though face-to-face communication is not considered essential given the fact that digital tools allow sufficiently effective communication and collaboration opportunities.

Today, many international organizations aim to reduce proximities introducing virtual tools that can help develop collaborative initiatives. The major aim of these initiatives is that proximities can be reduced so a mutual understanding can be established. One of these examples that can be shown as an effective virtual space is the Unite Labs launched by the United Nations, aiming to facilitate innovation across

different units within the organization by making virtual and physical proximities closer. Even though tasks are still virtual within the organization, initial training programs and developing shared goal mindset are important steps for responding the challenges of virtuality.

### MANAGERIAL IMPLICATIONS

A series of managerial concerns is linked to virtuality at the individual level. Increased awareness about the challenges caused by task virtuality is critical for managers to the success of teams and as well as individuals in organizations, and any organization is no exception. The implications can be emphasized by highlighting three major pillars that relate task virtuality to organizational design, remote leadership and performance evaluation of individuals' innovativeness.

The first managerial implication relates to the organizational design element. While virtual teams are given special attention for its coordination and facilitation for information sharing to maximize organizational effectiveness (Maznevski & Athanassiou, 2003), virtual work in traditional organizational settings has not received sufficient attention so far. Managerial support, coordination and training requirements should be carefully analyzed for employees dealing with dispersed contacts including, but not limited to team members. As studies examining task virtuality demonstrate, an individual may face a high level of task virtuality against a low level of team virtuality (Pineda, 2015). By the same token, a high level of team virtuality does not directly imply a high level of task virtuality (Orhan et al, 2016). Thus, resources, training and support

facilities, and technological arrangement should be made based on individual

requirements.

The second implication is that employee well-being and work related feelings and

outcomes can suffer from a high level of task virtuality.  For effective leadership,

managers need to be able to understand the dynamics that influence employees' feelings

and perceptions. We argue that task virtuality could affect employees' feelings about

loneliness as well as satisfaction they get from jobs. As an instant diagnosis, executives

need to assess the level of electronic communication of employees with others (lack of

face-to-face contact thereof) and information value carried over electronic channels,

because when employees lack face-to-face interaction with those who play the most

critical roles in employees' task interdependencies, managers take the risk of employee

isolation, dissatisfaction and potentially performance decrease. Being able to offer social

support and to create conditions that could increase identification to goals and

organizations carries more importance when the task virtualities of individuals are high.

Task virtuality allows managers and organizational designers to assess the individual

level of virtuality experienced by employees both in virtual and traditional team settings.

Whenever isolation is detected at the individual level, the rectification of work settings or

resources, social support and training may lead to increased satisfaction and performance

and consequently reduced employee turnover (Furst, Blackburn, & Rosen, 1999; Beranek

& Martz, 2005; Malhotra et al., 2007; Garrison, Wakefield, Harvey, & Kim, 2010; Hoch

& Kozlowski, 2012).

As much as team members interact within teams by cooperating and accomplishing common tasks, they also compete with each other (Beersma, Hollenbeck, Humphrey, Moon, Conlon, & Ilgen, 2003). Managers are responsible for providing fair tools and conditions to promote a fruitful environment for maximum individual and group performance within a team. Therefore, the design of organizations can also be considered as a procedure which should be applied fairly. An unfair organizational design for team members, such as one having a high level, whereas another has a low level of task virtuality, may result in negative feelings because of unfair goal perceptions. Therefore, the evaluation of performance cannot be based on fair judgments since the conditions for each member differ. In order not to compare apples with oranges, task and network structures should be comparable when designing organizations, so that performance outcomes could be comparable as well. Designing each individual's tasks appropriately and accordingly may not only increase the person-environment fit due to perceived equal justice in procedures (Kristof, 1996; Elovainio, Kivimauki, Eccles, & Sinervo, 2002), but subsequently it can also provide a better mechanism that will enable comparable performance evaluation. As a result, task virtuality facilitates an important role in determining suitable more designs for organizations as well as fair goal settings and performance evaluations.

Finally, managers and organization designers often categorize teams according to their virtualities when they develop organizational structures. As a common practice, teams that are considered more virtual are provided supplementary training programs that familiarize members with the challenges of virtuality. However, individuals working in

traditional teams do not get such support even though virtual work is prevalent in more organizations than ever. We emphasize that the challenges that are considered unique for virtual teams can be experienced by anyone in today's modern organizations, not necessarily by virtual team members only. The real questions to be asked are that how much lack of face-to-face interaction has an impact on individual performance and how managers can initiate social and technical support at the individual level in order to overcome challenges. Recognizing "virtuality" as the individual level concept, rather than the team or organizational level, can enhance the understanding of employee feelings, attitudes and perceptions in a more comparable and objective fashion.

**LIMITATIONS AND DIRECTION FOR FUTURE RESEARCH**

As all kinds of research article, our article cannot be interpreted accurately without addressing its limitations either. The first limitation of our article is its nature. Since the goal of the paper was to discuss the theoretical impacts of task virtuality on work-related behavioral outcomes and innovative capabilities, our article was mostly based on the conceptual relations that were examined in earlier studies. Our major aim was to merge these different studies and to interpret and to highlight them by summarizing the existing trends and changes in working conditions. All ideas, statements and propositions discussed in our article deserve deeper academic investigations. While we could confirm some of our discussions providing empirical evidence, the claims about the relation between task virtuality and innovative capabilities need to be tested. Therefore, we invite researchers to evaluate the impact of task virtuality on innovative

capabilities and creativity, both at the individual and at the team levels. Furthermore, today's organizations allow various communication technologies which can inhibit or stimulate innovative capabilities of individuals. Measuring these differences will also provide new directions for future research.

The second limitation is that other factors that play role in innovative capabilities and knowledge transfer are not discussed. Team characteristics, cultural diversity, person-group fit can be considered as critical determinants for innovative capabilities of teams, and of individuals. Futures studies can also include these variables to better understand the effects of these variables when assessing the relationship between task virtuality, behavioral and work outcomes including innovative capabilities.

### Conclusions

The aim of this paper is to underline the implications of task virtuality by bringing its differences from team virtuality to light and to discuss its relevance in management research and practice from behavioral and innovation perspectives. Since the beginning of discussions about the "virtuality" concept in the management literature, it has been assumed that the impacts associated with a certain level of virtuality within a team are distributed to its members evenly. For this reason, the literature is fully loaded with studies measuring the impact of team virtuality on individuals and on behavioral and organizational outcomes. In this paper, however, we defend that the extent of virtuality and interdependence within the team level can vary largely so that even members of a same team may experience different levels of virtuality at the individual level. Therefore,

virtuality should be elaborated at the individual level which arises from task and network structures. The guiding principle of our article is to challenge these previous assumptions by deliberating the complex issue of the individual level of virtuality and its impacts on work behavior and innovation outcomes.

In the light of discussions, we also argue that organizational researchers and practitioners need to pay closer attention to task virtuality in order to understand the broader impacts of virtuality at the individual level. Technological advancements are evolving and continously penetrating into all areas of work that are used to be considered as traditional. Interactions between people turn out to be more computer-based, since more and more people predominantly communicate using ICT-mediated tools in all sorts of organizations and industries. This dominance of the technology in organizations is inevitable and has the likelihood to precipitate negative behavioral outcomes and innovativeness of individual and firms, because workplace social relations and knowledge transfer are usually impaired by virtualization of work and work relations. It is therefore crucial to ensure that sufficient opportunities and platforms are prepared by managers for their employees' well-being and productivity, while researchers need to shed more light on the workplace dynamics and task virtuality.

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