Social Loafing Impact on Collaboration in 3D Virtual Worlds: An Empirical Study

Research-in-Progress

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ABSTRACT

Collaboration is increasingly distributed and influenced by the technologies involved in the workspace. 3D Virtual Worlds (VWs) are rich and promising collaboration tools that provide highly interactive environments. Several researchers and practitioners are particularly interested in the potential of these new media to support collaborative practices. However, the literature does not provide yet satisfactory and accurate response to companies about impacts of these technologies' use for professional collaboration purposes. The present research attempts to address this gap and looks at this effect more closely. This research in progress presents the research model and research methodology used. The research model hypothesizes social loafing as substantial factor that determines team members' involvement in knowledge sharing and application processes. In the future, this empirical study suggests quantitative assessment of the impact of 3D virtual world use in workspace on knowledge sharing and knowledge application.

Keywords

3D virtual worlds, collaboration, social loafing, knowledge sharing, knowledge application.

INTRODUCTION

Collaboration is an important competency for organizations that wish to leverage collective intelligence and maximize productivity (Drucker 1989; Nunamaker et al. 1998; Nunamaker et al. 2002). Effective collaboration is considered as a key success factor and competitive advantage of today's organization (Kock 2008) since it reinforces knowledge sharing and enhances knowledge development and application. In an environment where technology gains incremental advances for media communication, virtual collaboration is being enabled and fostered (Boughzala et al. 2012). Indeed, individuals are invited to collaborate with other co-workers all over the world and they are no longer limited or expected to interact with them directly in a face-to-face setting. According to Griffith and colleagues (2003), new technology would expand the opportunities for teams to collaborate more and would make them more effective.

3D VWs are 3D virtual environments where users interact via avatars. They are enrolled in the 3D trend as a new and promising collaboration tool providing rich and interactive media. They provide team members with new ways to manage and overcome several barriers to face-to- face collaboration (Davis et al. 2009). In addition, these 3D environments have been found to increase group-oriented learning (Suh and Lee 2005) and process engagement (Franceschi *et al.* 2009). Thus, 3D VWs have potential for richer and more engaging collaboration (Davis et al. 2009).

Further, regarding the benefits of global collaboration in VWs, there is an increasing demand by multinational corporations to implement 3D VWs in order to improve their work processes (Wasko et al. 2011). Nevertheless, using them in professional settings is still surrounded with much hype as their capabilities have not been yet deeply explored (Davis et al., 2009). In fact, studies in this subject should allow a clear vision with VWs lenses of this new kind of collaboration with respect of the specificities of these new media. Thus, research needs to inform and help organizations to optimally benefit from 3D VWs assets (Boughzala et al. 2012; Wasko et al. 2011). There is a need to develop theoretical understandings of the fit between collaborative tasks and VW capabilities and processes (Boughzala et al. 2012). Indeed, we are interested more specifically in this challenge.

Several research teams have embarked on the study of 3D VWs such as learning (Davis and Zigurs 2008; Franceschi et al. 2009), project management (Owens et al. 2009), brand equity (Nah et al. 2011), collaboration (Chandra et al. 2012; Nardon and Aten 2012; Schmeil et al. 2012; Venkatesh and Windeler 2012). However, researchers studied specific factors influencing collaboration such as task complexity (Nah 2011 a), cognitive absorption (Chandra et al. 2012; Goel et al. 2011), personality traits and group cohesion (Venkatesh and Windeler 2012), adoption of VWs in work spaces (Chandra et al. 2012; Nardon and Aten 2012), flow and Tele-presence (Animesh et al. 2011; Nah et al. 2011).

While these considerations are crucial, these factors were approached qualitatively through personal observation of the collaborators behavior or through their data available on the 3D platforms. On the one hand, relevant constructs such as knowledge sharing, knowledge application and social loafing have not been studied quantitatively through team members' perceptions of 3D environments usage and the impact workspace.

On the other hand, object manipulation and customization effects, as key specific features of 3D VW environment, have not been assessed in the context of teamwork. This paper brings a literature review and builds up a research model that addresses the theoretical gap in the literature. Similarly, this research is an attempt to answer a business need of organizations willing to use 3D VWs in work spaces if its positive developing impact could be approved.

The remainder of this paper is organized around presenting the key constructs and propositions for the suggested research model, introducing the research methodology adopted and the preliminary testing of the data collection tool. The paper foresees main limitations and perspectives. It presents new directions for developing further the research in the predesigned setting and as well as in further research.

Collaboration in 3D Virtual Worlds

Research has argued that collaboration in VWs is rich and engaging thanks to their capabilities (Davis et al. 2009; Schmeil et al. 2012; Venkatesh and Windeler 2012) although these are not clearly and exhaustively identified yet. They provide high synchronicity in communications, a 3D representation of avatars affording a sense of presence and immersion (Animesh et al. 2011; Biocca et al. 2003; Walsh 2002). They provide also hand gestures and facial expressions and movements allowing rich interactivity between avatars (Davis et al. 2009; Franceschi et al. 2009; Suh and Lee 2005). Consequently, they provide a more realistic visual dimension in representing work environment and provide a promising alternative to face-to-face. Furthermore, research has argued that VWs enhance collaboration and virtual project management (Owens et al. 2009) by providing new ways to manage and overcome collaboration barriers (Davis et al. 2009). In fact, efficient and effective use of 3D VWs as a platform for team collaboration may yield a variety of benefits to an organization ranging from reducing operating costs (e.g., travel, lost work time due to excessive or untimely meetings), to enhancing productivity (e.g. speed and richness of collaboration, creativity) (Wang and Haggerty 2009).

Operationally, virtual collaboration becomes essential in today's companies, it aims at enhancing employees competences and improves knowledge sharing between them (Davis and Zigurs 2008). Despite the amount of opportunities provided by these virtual environments, the idea of using them in professional settings is still surrounded with much hype (Davis and Zigurs 2008; Owens et al. 2009; Venkatesh and Windeler 2012) even if many encouraging results have been reported such as IBM experience (LindenLabs 2009). Actually, nowadays organizations are hesitating about using VWs since their impact on team collaboration is not examined in depth (Davis et al. 2009; Davis and Zigurs 2008). They are requiring more insurance to adventure in these new collaboration tools (Davis and Zigurs 2008; Wasko et al. 2011). While some earlier researches have shown that VW collaboration represents a successful alternative to traditional face-to-face collaboration, VWs interaction could also engender misunderstanding, acceptance issues (Bessière 2009), intra community conflicts (Cahalane et al. 2010), violation of group norms (Owens et al. 2009), and difficulty building trust between users (Bessière et al. 2006; Schroeder 2008; Yee et al. 2007). Indeed, this bolsters the need to analyze such usage in various settings and among many groups.

Actually, one of major reason about hype around VWs is that people are not developing a real wave of innovation in VWs, they are trying to replicate real world experience into the virtual one (Wasko et al. 2011). Collaboration is impacted by the introduction of a new technology (Vreede et al. 2009), and it has its own specificities. Thus, we cannot see it the same as collaboration in a face-to face setting or in a screen to screen one (Venkatesh and Windeler 2012). Virtual teams need more guidance about VW technology use in order to benefit from collaboration asset (Davis and Zigurs 2008).

Furthermore, the literature of VWs considers a set of factors impacting team collaboration. Venkatesh and Windeler (2012) studied the relationship between a team's disposition towards IT, their general disposition (i.e., personality), and their virtual world use in influencing team cohesion and performance. Chandra and colleagues (2012) studied the motivations for adaptive use intention when using VWs for team collaboration. They identified cognitive absorption and user trust as the mechanisms leading to the individual level adoption decision. While Nardon and Aten (2012) conducted a qualitative study targeting

assessment of a VWs as a medium in collaborative work (Nardon and Aten 2012). Another relevant research conducted by Schmeil and colleagues (2012) reporting on the development and the application of a structured approach for the combined design of 3D virtual environments and the collaborative activities within them (Schmeil et al. 2012).
Suh and colleagues (2011) studied the impact of customizing avatars to be close to the users' actual appearance on their behavior in VWs. This study focuses on the antecedent leading to customization and the implication of such attitude on users' willingness to experience and evaluate some business areas related to users' lives in the real world. In the same frame, Animesh and colleagues (2011) studied the impact of the technological and spatial environment on the users' intention to purchase virtual products.
In spite of rich amount of investigations conducted on VWs, some relevant constructs such as social loafing, knowledge sharing and knowledge application haven't been studied yet. In addition, two specific features of 3D VWs namely object manipulation and customization still not well studied in workspace. This paper will try to address this gap and bring highlight these relevant constructs.

VW Technology use

Technology usage in work environment has been extensively discussed (Agarwal and Karahanna 2000; Burton-Jones and Straub 2006; Davis 1989). Both traditional and online-virtual use technologies were presented in order to analyze and understand individuals and teams' use and behavior towards these technological supports. In human and computer interaction, a recent analysis (Sun and Teng 2012) reviewed technologies and information system use comparing to other researchers who focused mainly on team related tasks performed on the system. This analysis argues that main activities performed around the technology use are information reporting, group tasks performance and decision-making. In the specific context of this study, we argue that high usage of these technologies would enhance the workers willingness to share knowledge with their collaborators. Yet, the more advanced an individual is in the 3D technologies usage, more specifically, the more each employee is able to manipulate an object and the more customizable the virtual working environment is. Consequently, the employee would be more willing to share and spread knowledge with his/her collaborators. We suggest our first proposition about the considerable impact that high usage of 3D Technologies would have at boosting knowledge sharing and we develop particularities about 3D virtual world with the object manipulation and customization subsections below.

Hypothesis 1: VW Technology high usage enhances the willingness to share knowledge

Knowledge sharing

Defined as the willingness of individuals in an organization to share their own knowledge (Davenport and Prusak 1998), knowledge sharing is a voluntary action by which knowledge is being spread and made known to others (Boughzala and Briggs 2011; Cramton 2001; Cummings 2004; Davenport and Prusak 1998). Yet, knowledge is considered as crucial resource for organizational growth and competitive advantage, thus knowledge sharing is found to be tremendously relevant for firms development (Bock et al. 2005; Wang and Noe 2010; Wasko and Faraj 2005). The literature argues that information technology use to support knowledge sharing leads to more effective knowledge sharing in teams (Choi et al. 2010) . Indeed, knowledge sharing is considered as a key success factor for collaboration (Grant 1996) entailing risks and benefits for organization (Constant et al. 1994; Cummings 2004). Further, this behavior could be influenced by the IT support, the team members behavior and the organizational context (Wang and Noe 2010).

Knowledge application

Knowledge sharing is not sufficient; teams must apply it effectively in the aim to deal with given challenges (Alavi and Leidner 2001; Alavi and Tiwana 2002; Choi et al. 2010). Knowledge application is a key individual capability which is considered as "the crux" of knowledge management in organizations (Alavi and Tiwana 2002). It may lead to value creation once knowledge is shared, integrated and applied where it is needed (Alavi and Tiwana 2002). Indeed, knowledge application is the valued concretization of individual and organization knowledge, since most shared knowledge is not effectively applied (Pfeffer and Sutton 2000). While knowledge sharing increases, it underpins favorable setting to apply more the acquired knowledge. Additional alternative solutions to concurrent issues with the work environment facilitate to apply knowledge acquired earlier from co-workers. (Choi et al. 2010) support this proposition.

Hypothesis 2: High knowledge sharing has a positive impact on knowledge application.

Social loafing

Defined as the tendency for individuals to expend less efforts when working collectively than when working individually (Karau and Williams 1993), this phenomenon occurs in a wide variety of tasks in laboratory settings (Brickner et al. 1986; Jackson and Williams 1985; Kerr and Bruun 1981; Petty et al. 1980; Zaccaro 1984), but also workers in the professional context may display similar attitude (George 1992; George 1995). One key consequence of the perception of loafing is reducing the motivation of the group members working with lurkers (loafers) (Mulvey and Klein 1998). This phenomenon is considered as a widely accepted explanation for productivity losses (Liden et al. 2004). In addition, research has shown that social loafing within physical work environments would also have similar effects within technology-supported work environments (Suleiman and Watson 2008). In similar settings, lurkers take advantage of the knowledge provided by other team members without sharing their own knowledge with others. Earlier research has shown that social loafing has negative impact on knowledge sharing (Wasko and Faraj 2005). In 3D Virtual World, we expect social loafers will similarly affect their work group as represented by their respective avatars, which will reflect their individuals' loafing attitude.

Hypothesis 3: High social loafing has a negative impact on knowledge sharing.

Object manipulation

Object manipulation refers to the ability to reach out a hand, grab an object, and move it around the virtual environment using natural, physical motions (Robinett and Holloway 1992). This feature allows users to touch and manipulate objects virtually (Ruddle et al. 2002). Object manipulation is considered as a crucial asset of 3D VWs as it makes them a metaphor of real life (Ruddle et al. 2002). Further, earlier research asserts that object manipulation evoke corresponding vivid mental images and increase intentions of object use regardless of users' goals (Schlosser 2003). In addition, VWs are considered as rich media and allow interactivity between avatars (Davis et al. 2009; Franceschi et al. 2009; Suh and lee. 2005). As rich media impact the level of communication and then the social interaction (Daft 1984; Daft 1987), mastering the usage of these media could lead to enhanced level of communication between users in a distributed team (Majchrzak et al. 2005) which will increase knowledge sharing.

Hypothesis 4: Object manipulation will significantly moderate the effect of VW technology use effect on knowledge sharing.

Customization

Customization is about changing the appearance of the avatar or the environment around the avatar (Ducheneaut et al. 2009). It gives users the ability to personalize their profiles and the working environments in the aim to be more at ease in workspace. Customization serves to facilitate human-computer interaction, ease of use and would improve user response (Suh et al. 2011). In these VWs, users are able to customize their environments (i.e. creating and buying new decors) and also shaping their own appearance to be similar to themselves (Suh et al. 2011). Other users may choose an 'ideal' appearance which they would like to have. Customizing an avatar appearance is considered as a rich capability afforded by the media (Davis et al. 2009; Suh et al. 2011). Researchers argue that customization add more enjoyment to the virtual experience and increases the feeling of presence and immersion (Bailey et al. 2009; Ruddle et al. 2002; Teng 2010). Furthermore, Suh and colleagues (2011) reported that the more closely an avatar resembles its user, the more the user is likely to have positive attitudes in 3D VWs. Consequently, users who are the most able to customize their own avatars the closer to their preferences will be more willing to interact with others and share knowledge with them.

Hypothesis 5: Customization would significantly moderate the effect of VW Technology use on knowledge sharing.

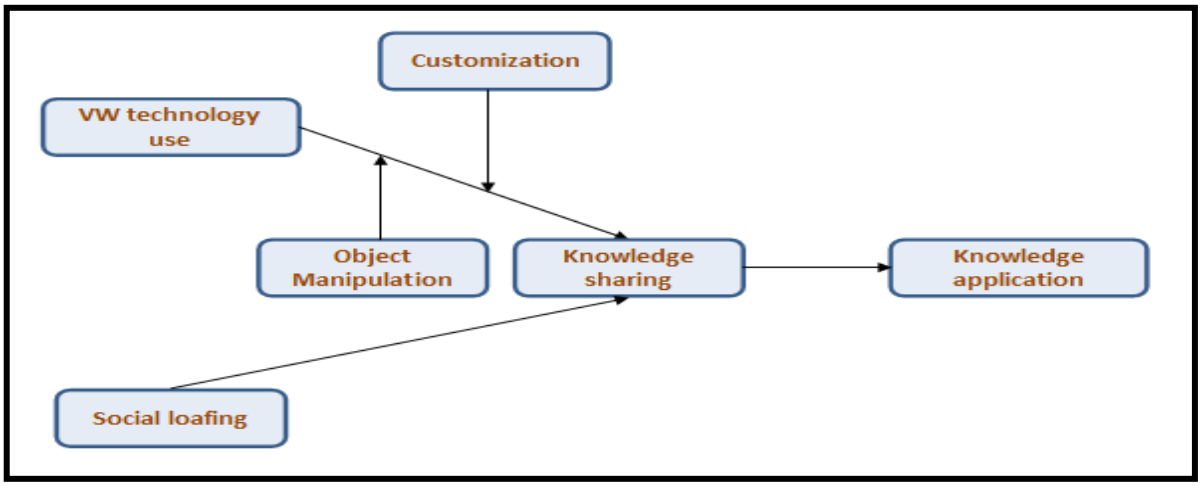

Figure 1. The research model

METHOD

The study is run through a quantitative research that allows assessing the impact of VW use and social loafing on knowledge sharing and knowledge application in the 3D virtual world setting. The empirical study would allow assessing whether collaboration and social loafing are of similar weight and impact across these organizations.

Data collection

A survey was developed for the purpose of this study. Items to measure respective constructs were selected from earlier validated scales and scales in their earlier versions that were adapted to virtual world analyzing context. Additionally, we here adapted the social loafing scale to 3D virtual environments and developed the object manipulation scale based on a validated taxonomy about object manipulation in 3D virtual worlds and using the Churchill new scale development process.

Constructs	**Items examples**
Customization	The virtual world enables users to customize the equipment of their avatar.
	The virtual world enables users to customize the accessories of their avatar.
	The virtual world enables users to customize the decorations of their avatar.
Object manipulation	I can simply touch an object.
	Once I selected an object, I can simply move it.
	Once I selected an object, I can have control on it.
Knowledge application	Our team members apply knowledge learned from experience.
	Our team members use knowledge to solve new problems.
	Our team members apply knowledge to solve new problems.
Knowledge sharing	Our team members share their work reports and official documents with other team members.
	Our team members provide their manuals and methodologies for other team members.
	Our team members share their experience or know-how from work with other team members.
VW Technology usage	Decision support: I use VW Technology to try to pinpoint causes of certain problems.
	Information reporting: I use VW Technology to monitor status for day to day operations.
	Group support: I use VW technology to engage in joint efforts with co-authors.

Table 1. Items examples

Based on measurements from literature, a quantitative questionnaire has been prepared to VWs' users who are collaborating through VWs. This questionnaire takes into account different constructs announced below. The questionnaire was pretested with four workers in 3D virtual environment. First feedback shows that the items cover well key aspects to consider in VW technologies use. The questions also appeared to be clearly understood by the respondents. Some insights and comments have been extracted in the aim to enhance the questionnaire and make respondents have better understanding of the questions. Data collection is still in progress and data analysis will be done with SEM. In addition, data analysis is scheduled next July. In fact adopting the snowball data collection technique and having the constraint to collect at least 120 valid answers did not allow achieving to collect this number in the time preset interval.
The survey was addressed to workers using 3D VWs in their workspaces. The sample includes people from a large number of companies and organizations that operate in different fields.
Examples from the items used in the developed questionnaire appear in Table 1.

Model Testing

According to Vaishanvi and Kuechler (2008), three aspects should be assessed (Vaishnavi and Kuechler 2008):

- The construct validity: The degree to which the variables used in the study accurately measure the concepts they purport to measure,
- The internal validity: The causal-effect interdependency between constructs,
- The external validity: The generalization of the results.

In order to check these validities and be able to conclude on whether the hypotheses could be accepted or should rather be rejected, data will go first for filtration through exploratory and confirmatory factor analyses using SPSS, then the model will be tested using SmartPLS in order to evaluate both the measurement model (confirmation) and the structural model.

Conclusion

VWs present promising opportunities for team collaboration thanks to their advanced capabilities. However, these capabilities are still not studied in depth and not identified precisely. While the present study does not intend to dig into various capabilities in 3D virtual world, it rather focuses on how employees and collaborators can benefit from such advances. Analyzing collaboration in VWs is tremendous as it brings deep understandings of the specificities of these new media. Insights and best usage practices could be provided to enhance collaboration in these environments and bring satisfactory responses to organizations willing to use them in their workspaces. This paper tries to bring new understandings assessing the role of relevant constructs that could impact collaboration practice in 3D VWs. Further research could focus rather on how companies could develop their workers' competencies to collaborate through these new online collaboration systems.
This research is still in progress and the research model is not yet empirically tested. Collected data collected will be analyzed using Structural Equation Modeling (SEM) in order to test the hypotheses and the research model.

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