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SHADOW IT AND COMPUTER-MEDIATED COLLABORATION: DEVELOPING A FRAMEWORK BASED ON SOCIAL PRESENCE THEORY

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ABSTRACT

The use of unauthorized technologies in the workplace, called shadow IT (SIT), is increasing within organizations. Previous research identified that Shadow technologies are often collaborative systems used by employees to communicate and share content with colleagues, clients, or external partners. Therefore, we aim to develop a framework for the influence of shadow IT usage on computer-mediated collaboration based on Social Presence Theory. We conducted a literature review that resulted in a framework and the development of research propositions. The literature suggests that there is a positive influence of shadow IT usage on employee collaboration and communications. This paper presents theoretical and practical contributions. Analyzing shadow IT and collaboration through a theoretical lens makes progress on the discussion about the consequences of these unauthorized technologies for individuals and organizations. It is important for organizations to comprehend these impacts, such as on collaboration, which, in turn, can facilitate improvements in employee productivity.

Keywords: Shadow IT, collaboration, social presence, IT user behavior, IT management.

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RESUMO

A utilização de tecnologias não autorizadas no local de trabalho, chamadas de Shadow IT (SIT), está aumentando nas organizações. Pesquisas anteriores identificam que tecnologias Shadow são frequentemente sistemas colaborativos utilizados pelos funcionários para se comunicar e compartilhar conteúdo com colegas de trabalho, clientes ou parceiros externos. O objetivo deste trabalho é desenvolver um framework, à luz da Teoria da Presença Social, de como o uso de shadow IT pode influenciar a colaboração mediada pela tecnologia. Para tanto, foi realizada uma revisão de literatura, culminando no desenvolvimento de um framework e em proposições de pesquisa. A literatura sugere que há uma influência positiva do uso de shadow IT na colaboração dos funcionários. Este trabalho traz contribuições teóricas e práticas. A análise da relação Shadow IT e colaboração a partir de uma lente teórica corrobora para a discussão dos impactos destas tecnologias não autorizadas. Para as organizações, é importante conhecer estes impactos, como por exemplo na colaboração, o que, por sua vez, pode viabilizar melhorias na produtividade dos funcionários.

Palavras-chave: *Shadow IT, Colaboração, Presença Social, Comportamento do Usuário de TI, Gestão de TI.*

1 INTRODUCTION

The use of unauthorized technologies called Shadow IT is evermore present within organizations, regardless of the size of the firm or sector. As the name suggests, Shadow IT is an IT (Information Technology) solution utilized by employees without the approval and formal support of the company's IT department to perform work tasks (Rentrop; Zimmermann, 2012; Györy *et al*., 2012; Walters, 2013; Silic; Back, 2014). This phenomenon has been propelled by IT Consumerization (ITC) and the growth of Cloud Computing (CC), which have promoted the adoption and use of technologies by users themselves, without having to resort to the IT department (GOODWIN, 2014).

Since the internet's popularization, a growing number of collaborative solutions, such as communication and content-sharing software, allow for individuals to work in different locations. In the context of the globalized market, the geographic dispersal of employees is a reality for most organizations, with investments becoming increasingly necessary in collaborative technologies that provide fast, efficient communication and information sharing regardless of time and space. In response to this demand, companies are increasing their investments in collaboration technologies so as to make use of their employees' intellectual resources (Maruping; Magni, 2015).

In spite of the firms' large investments in collaborative systems, there is evidence of the proliferation of informal collaborative information technologies, which are used autonomously by employees to perform collaborative activities (Shumarova; Swatman, 2008). Findings by Silic and Back (2014) suggest that employees use Shadow technologies that influence their productivity and furnish better, faster communication and collaboration, such as Skype, Facebook, and Google Talk. Moreover, previous studies (Shumarova; Swatman, 2008; Mallmann; Maçada; Oliveira, 2016) indicate that Shadow IT may provide instantaneous, efficient communication and, as a result, facilitate information and knowledge sharing.

The extant literature corroborates the premise that Shadow IT improves collaboration since it provides fast communication and facilitates information sharing among employees. Social Presence Theory (SPT) is used as a theoretical lens in this study to analyze the relationship between Shadow IT and computer-mediated collaboration, inasmuch as there is a favorable influence of social presence on the perception of collaboration (Weinel et al., 2011).

The objective of SPT is to explain how users select communication channels. Social presence is the degree in which a person is aware of another person's presence in a computer-medi-

ated context of communication (Short; Williams; Christie, 1976). Findings by Weinel et al. (2011) point to how the level of social presence influences the perception of collaboration within a team, being that lower levels of SP may diminish the quality of communication and, as a result, influence the perception of collaboration.

Based on the premise above, the following general research question emerges: based on SPT, what is the relationship between shadow IT usage and computer-mediated collaboration? The purpose of this study is to develop a theoretical framework on how shadow IT may influence collaboration of IT users from the perspective of Social Presence Theory.

Analyzing the relationship between Shadow technologies and computer-mediated collaboration may bring theoretical and managerial contributions. Improvements in collaboration, within the context proposed, can be considered a consequence of Shadow IT, which is still an underexplored topic (Kopper; Westner, 2016). Additionally, the analysis of this relation from a theoretical standpoint does not exist in the literature. For organizations, it is important to understand the impacts of Shadow IT, such as in collaboration, which, in turn, can potentially enable improvements in employee productivity (Silic; Back, 2014).

We follow Webster and Watson (2002) guidelines to perform literature review that. As a result of this review, a theoretical framework was developed with the objective to answer the proposed research question.

This article is structured in five chapters. Chapter 2 presents the literature review, and chapter 3 describes the research method. Chapter 4 describes the research results and presents the framework. Finally, Chapter 5 offers final considerations.

2 THEORETICAL BACKGROUND

This chapter develops the literature review. First, shadow IT is defined, followed by types of Shadow technologies and the conceptualization of shadow IT usage behavior. The relationship between Shadow technologies and computer-mediated collaboration is then developed. Finally, Social Presence Theory, which serves as the theoretical basis of this study, is presented.

2.1 *Shadow IT*: Definition, Types, and Usage Behavior

Shadow IT is an IT solution utilized by any employee to perform their work tasks without the approval and formal support of the company's IT department (Rentrop; Zimmermann, 2012; György *et al.*, 2012; Walters, 2013; Silic; Back, 2014; HAAG; Eckhardt, 2017). It is a generalized phenomenon that includes systems, services, and processes that are not a part of companies' "official IT" (KOPPER; WESTNER, 2016). Shadow IT are solutions such as an application installed at the workplace, a spreadsheet, a database solution, cloud service, peripheral devices, a combined solution, or a legacy system (HUBER *et al.*, 2016). Considering the variety of occurrences, Table 1 provides a breakdown of the types of Shadow IT, according to the literature.

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Table 1 – Types of Shadow IT.

Shadow IT	Description	Authors
Cloud Services	Social media software for communication and information sharing or other services provided by the internet such as SaaS. Mobile Shadow IT. Ex.: WhatsApp, Facebook, Skype, Dropbox, Google Apps, etc.	Rentrop and Zimmermann (2012); Gyory *et al.* (2012); Fürstenau and Rothe (2014); Silic and Back (2014); Haag and Eckhardt (2014); Zimmermann, Retrop and Felden (2014); Huber *et al*. (2016); Kopper and Westner (2016).
Self-made solutions	Solutions developed by business unit employees to perform work tasks. Ex: software developed by the employees themselves to perform their work tasks, or an Excel spreadsheet apart from the company's official system, etc.	Jones *et al*. (2004); Rentrop and Zimmermann (2012); Fürstenau and Rothe (2014); Zimmermann, Retrop, and Felden (2014); Huber *et al*. (2016), Kopper and Westner (2016).
Self-installed applications	Software applications installed by business unit employees on company devices. Internal software: software installed on work computers. Ex: software available on the internet for free download which somehow helps with work activities.	Jones *et al.* (2004); Rentrop and Zimmermann (2012); Fürstenau and Rothe (2014); Zimmermann, Retrop, and Felden (2014); Silic and Back (2014), Huber *et al*. (2016).
Self-acquired devices	In terms of hardware, SIT may be mobile devices, laptops, servers, routers, printers, or other peripherals acquired by employees. These devices are bought directly from retail instead of acquired from the company's official IT catalog. It includes the use of applications from personal devices within the company's network Ex: smartphones, laptops, tablets, etc.	Rentrop and Zimmermann (2012); Silic and Back, (2014); Zimmermann, Retrop, and Felden (2014); Huber *et al.* (2016).

Source: The authors (2017).

Since Shadow IT is a phenomenon that originates from the employee's use of technologies unauthorized by the IT department, this study treats it as a behavior. Haag and Eckhardt (2014) define the individual use of SIT as the voluntary use of any IT resources that violates workplace IT norms and as a reaction to the perceived situational restrictions with the intention to improve work performance without bringing harm to the organization. This definition alleges that shadow IT usage act on their own with the main purpose to finish their work tasks efficiently and productively, which are negatively affected by, for example, the poor functioning of the organization's IT systems or inadequate instructions. This frustration enables the user to accept the potential security incidents and damages to the organization's IT assets involved with using shadow IT. By utilizing an adapted system or a new system as a complement or substitute to the organization's IT infrastructure, the user deliberately dodges explicit and implicit IT policies, norms, and procedures, according to the authors.

Therefore, SIT infers an action, such as the use of an unauthorized technology by an individual, and this action is the result of a behavior or is the behavior itself. Thus, the behavior that results from the employee's action to use technology unauthorized by the company's IT department in order to execute work tasks without intentionally incurring damage to the employer is called shadow IT usage behavior

Shadow IT usage, therefore, can encompass a series of user behaviors related to several technologies. Based on this and the types of Shadow IT shown in Table 1, the factors that represent shadow IT usage behavior are defined for this study. Four shadow IT usage behavior emanate from the SIT elements based on the literature:

1) The use of cloud services in the workplace, mainly communication and sharing systems, to communicate and share work information with colleagues, such as social media and a number of other cloud services (SaaS). Ex.: WhatsApp, Facebook, Skype, Dropbox, Google Apps, etc.;

2) The use of other solutions (not available by the company) developed by employees on company computers to execute work tasks;

3) The use of other software installed on company computers to perform work tasks;

4) The use of one's personal devices in the workplace. Ex.: smartphones, laptops, tablets, etc.

These behaviors serve as the basis to analyze Shadow technologies in collaboration. The relationship between Shadow IT and collaboration is explained in the following passage.

2.2 Computer-Mediated Technology: Collaborative Technologies and Shadow IT

In the literature, the concept of collaboration is commonly related to elements such as communication, interaction, information sharing, and knowledge (Winel et al., 2011; Georgescua; POPESCUL, 2015; Ishtaiwaa; Aburezeq, 2015; Kim; Glassman; Williams, 2015). Within the context of globalization, where location and time barriers need to be reduced, technology plays a fundamental role in employee collaboration, prompting companies to invest increasingly more in collaboration technologies (Maruping; Magni, 2015).

Furnishing the appropriate technology to support collaborative work, however, has proven to be a difficult task for organizations. Shumarova and Swatman (2008) argue that several factors are worsening the problem: Organizations are becoming more diffuse, both by geographic distribution and by more dynamic and flexible organizational structures. In these organizational environments, employees are oftentimes members of several teams at the same time, assuming different roles in each, and there is also not just one workplace, which demonstrates the need for multiple information technologies to support the team members' collaborative efforts.

In this context, unauthorized technologies can suggest a form of assistance for the employee to perform their task efficiently, which, in this case, is by way of collaboration. Silic and Back (2014) discovered that employees utilize shadow technologies that provide better, faster communication. The authors' research revealed that 58.97% of the employees from the researched companies use Shadow collaboration and communication technologies, such as message and web conference applications.

Shumarova and Swatman (2008) use the concept of Shadow CIT (Information collaborative technology), which the authors explain is similar to Shadow IT, but specific to collaborative technologies. These Shadow CIT technologies possess advantages in relation to the formal CIT provided by the company's IT department, such as speed, instant communication, easy dissemination and content update, and knowledge sharing. Similarly, Maçada and Oliveira (2016) discovered that most of the systems utilized as Shadow IT by the interviewees of the studies were collaborative systems, such as instant message software, that offered faster, more dynamic communication.

Thus, the literature presents supporting material for the premise that Shadow IT improves collaboration since it provides faster communication and information sharing among employees. This study adopts Social Presence Theory as the theoretical lens to analyze the relationship between Shadow IT and collaboration, as explained and justified in the following section.

2.3 Social Presence Theory

The concept of Social Presence (SP) is pertinent to the current moment wherein the social use of network applications, such as communication, collaboration, and information-sharing solutions, is increasingly greater. According to Biocca, Harms, and Burgoon (2003), research on the individual-computer interaction is normally interested in social presence, inasmuch as it can mediate the effects of other variables of central interest to the researcher, such as attitudes in relation to others, interface resources, etc. Thus, SP can serve as a means to explore aspects of technology and its effects.

Social Presence Theory (SPT) was proposed by Short, Williams, and Christie (1976) to explain how users select communication channels. SPT suggests that different means of communication have different capacities for transmitting signals that create for the user an awareness of other social players ((MENNECKE *et al.*, 2011). SPT studies how the "sensation of being with another" is molded and affected by interfaces, for example, a set of pixels in the shape of a smiling face, a soft voice through a speaker, or a line of text that comes up on the screen from A chat room, create a sensation of "being with the other," explain Biocca, Harms, and Burgoon (2003). These authors even emphasize that because SP is mediated by telecommunication technologies, the term Social Presence is used specifically to signify interactions in computer-mediated environments.

According to Biocca and Harms (2002), Social Presence is defined as a "sensation of being with the other in a mediated environment." It is the moment-to-moment awareness of co-presence of a computer-mediated body and the sense of accessibility to another person's psychological emotional, and intentions. Thus, social presence has frequently been utilized to evaluate people's capacity to connect via telecommunication systems, as well as to measure the degree in which people feel that the interface is capable of furnishing a sense of accessibility to another mind (social presence), as underscored by Nowak and Biocca (2003).

Ogara, Koh, and Prybutok (2014) conceptualize Social Presence as the degree, along a continuum, in which a certain technology is sociable or unsociable, insensitive or sensitive, or impersonal or personal. In other words, the individual may perceive different technologies as providers of different levels of social presence. Thus, the users might be motivated to use the media available to alter their sense of social presence for a broad range of activities, including meeting someone, sharing information or products, solving problems and making decisions, sharing opinions, generating ideas, resolving conflicts, or maintaining friendly relations, argue Biocca, Harms, and Burgoon (2003).

Weinel et al. (2011) emphasize the complex nature of the social presence construct, inasmuch as different technologies provide different senses of social presence. Elevated levels of social presence influence perception of the means, that is, the technology used in collaboration. Like Ogara (2011), this study analyzes social presence from the perspective that considers communication channels as a continuum of SP based on the channel's characteristics, such as return speed, use of verbal and non-verbal signals, language richness, sociability, personal nature, etc.

Biocca and Harms (2002) argue that the sensation of "being with the other," or Social Presence, is better conceptualized and measured based on three levels:

1. Perceptive Level: Sense of co-presence of the other person. This level takes into account the detection and awareness of another individual's co-presence mediated by technology.

2. Subjective Level: Psychological and behavioral accessibility to the other person. This dimension of social presence focuses on the perceived accessibility, the sense that the user has the awareness and access to the other person's attention, emotional state, comprehension, and behavioral interaction.

3. Inter-subjective Level: Mutual social presence. The user's sense of social presence is in part a function of how they perceive their own and the other's sense of social presence.

Considering all the researched authors, the elements of SP were listed for this study. The concept, as well as the measurement, of the sense of social presence is still in construction, inasmuch as the authors that write about social presence seem to define and measure it differently (Lowenthal, 2010). In this study, Social Presence is observed considering the following elements: co-presence, sensitivity, and comprehension.

The concept of co-presence is frequently used in social presence studies and is related to the feeling of connection between two people (NOWAK; BIOCCA, 2003). Co-presence may include the act of "being together" with someone in a computer-mediated environment along with a feeling of togetherness, argue Mennecke *et al*. (2011). The definitions of co-presence are based on mutual awareness, inasmuch as the authors underscore the attention to the other's sensorial properties, especially mutual awareness, of both involved in the interaction, argue Biocca, Harms, and Burgoon (2003). Therefore, co-presence refers to the sensation of being close to the other person as similar to being in the same environment physically (the same meeting room, for example) and, consequently, having the sensation of greater access to and attention in relation to the other.

Sensitivity refers to how much a certain technology allows the user to perceive other people's emotions, as well as to transmit their own emotional state during the interaction. The communication channels with high social presence, according to SPT, are described as sociable, warmer, and personal (OGARA, 2011, pg. 31). The capacity to decentralize and comprehend the emotional quality of the other's perception is important for establishing and maintaining a connection with the other person (BIOCCA; HARMS, 2002). Thus, the sensitivity to perceive the other's mood and emotions, as provided by a technology, creates an impact on the perception of social presence. Terms such as personability or cordiality are similar terms that describe this element of social presence adopted by other authors (ex. Ogara, Koh; Prybutok, 2014).

Biocca and Harms (2002) define comprehension as the degree in which a person feels that they and their audience have a similar view of each other's intentions, motivations, and thoughts. In other words, the interlocutors perceive that there is a mutual comprehension between them. This element can be related to what Short, Williams, and Christie (1976) understood as the quality inherent to the communication channel, as well as the capacity to transmit information through facial expressions, posture, and non-verbal signals. These are perspectives that, to some degree, corroborate how comprehension is facilitated between the interlocutors and that assist with the process of transmitting and perceiving emotions. Table 2 presents a summary of the Social Presence elements listed for this study.

Table 2 - Elements of Social Presence.

Elements of SP	Description	Authors
Co-presence	Access: the sensation of being more accessible and having more access to the other person. Shared environment: sensation of being in the same space (ex.; the same room). Proximity: sensation of being close to the other person. Instant response, sense of urgency.	Mennecke *et al*. (2011); Biocca and Harms (2002); Biocca, Harms, and Burgoon (2003); Nowak and Biocca (2003); Ogara (2011)
Sensitivity	Sensation of perceiving and transmitting emotions and feelings to other people. Intimacy in textual communication.	Lowenthal (2010); Biocca and Harms (2002); Ogara, Koh, and Prybutok (2014); Weinel et al. (2011); Ogara (2011).
Comprehension	Sensation of being understood and understanding the other's intentions, motivations, and thoughts.	Weinel et al. (2011); Biocca and Harms (2002).

Source: The authors (2016).

It is important to highlight that the sensations involve social presence, as demonstrated above, and must be mutual in most cases. Although a balance exists between the two people, the quantity of awareness, attention, and comprehension that each one attributes or is capable of perceiving can differ, resulting in an imbalance in all interaction/communication, explain Biocca and Harms (2002). Thus, the mutuality of sensations is fundamentally important in perceiving social presence in computer-mediated interactions.

Due to the growth of telecommunication infrastructure, many relationships and interactions are mediated by telecommunication systems and their properties, such as the increase in bandwidth, greater mobility, more immersive projects with the promise of offering a better sense of access to real and virtual places, a sense of tele-presence, argue Biocca, Harms, and Burgoon (2003). Within the context of the globalized market, where an organization's employees need to contact colleagues, clients, and external partners from different places, the sense of social presence provided by the technologies becomes increasingly relevant.

Silic and Back (2014) investigated the details of software indentified as illegal and unapproved by the IT departments of the researched organizations. The authors found that more organizations first point to productivity software (for example, Google Apps), followed by communication software (for example, Skype), as Shadow IT. The study revealed that Skype, Google Talk, and Facebook for video calls are the three main applications used by employees to communicate and collaborate with their friends, families, and external partners. These types of software share a common characteristic. They allow for instant communication, including using audio and video resources, in addition to text. Therefore, these types of software provide a sense of greater social presence and frequently figure into the organizations' Shadow IT list.

Considering that collaboration and sharing tools represent a large part of the shadow technologies identified, it is possible to infer that the users are looking to increase their sense of social presence through the use of technologies that they understand to be more instantaneous and interactive. Furthermore, evaluations on the satisfaction with communication systems and productive performance in teleconferences and collaborative virtual environments are based largely on the quality of social presence they offer (BIOCCA; HARMS; BURGOON, 2003).

Weinel et al. (2011) confirm the favorable social presence influence on employees' perception of collaboration. These authors' results support the idea of social presence as a concept that can be beneficial to the employee's experience in the context of online collaboration, or computer-mediated collaboration. Considering these revelations, SPT is an appropriate theory to examine the relationship between Shadow technologies and collaboration.

3 METHOD

The research method used to this study includes a literature review based on guidelines proposed by Webster and Watson (2002). Shadow IT is a new topic and is still minimally explored, especially regarding these technologies' potentially positive impact on organizations, in other words, with respect to the consequences of using these unauthorized technologies. A literature review corroborates this, thereby creating a solid basis for advancing knowledge (Webster; Watson, 2002). Thus, gathering knowledge from extant studies on the topic is fundamentally important to the evolution of research.

This research follows the literature review orientation proposed by Webster and Watson (2002). The search for articles was conducted based on a research protocol. First, research was performed in the main IS journals ("basket eight"). Subsequently, relevant articles were searched

in the Web of Science, Science Direct, Google Scholar, and Ebsco Host databases. Finally, the main conferences in IS of the Associations for Information Systems (ICIS, ECIS, AMCIS, PACIS, etc.) were explored. This expansion to researching databases is justified due to the fact that a significant part of the Shadow IT literature originates from international conferences and can be considered as emergent literature with its growing number of publications throughout the years, as discussed in the next section.

The following key words were utilized in the search for articles and must have been contained in the title, abstract, or key words: shadow IT, shadow systems, and shadow sourcing. Though they possess similarities, the following words represent concepts unlike the term Shadow IT and served as criteria for exclusion: feral practices, workrounds, end-user-computing, and bring your own device (BYOD) (Rentrop; Zimmermann, 2012; French; Guo; Shim, 2014; Haag; Eckhardt, 2017). Considering the research protocol criteria, 48 relative articles according to the research protocol were found. The search was conducted between the October and December 2017.

Table 1 presents the selected articles relevant to this study. Forty-eight articles were selected based on the research criteria. As the table demonstrates, the vast majority of articles on Shadow IT are from international conferences, while only a minority has been published in journals.

Table 1 – Selected Articles

Source		Number of Articles
Journal	Network Security	2
	Computer & Security	1
	Computer Fraud & Security	1
	Information & Management	1
	Journal of Enterprise Information Management	1
	Others (Systems; CAIS, Journal of Information Systems, …)	6
	Total	12
Conference	AMCIS	8
	ECIS	6
	ICIS	5
	PACIS	5
	Others (ACIS, ICDS, BLED, Wirtschaftsinformatik Proceedings, ECKM, Conf-irm …)	12
	Total	36
Total Articles		48

Source: The Authors (2017).

Analysis of this literature review is based on concepts according to orientation from Webster and Watson (2002). Firstly, the literature on shadow IT was analyzed generally. The articles that were selected as relevant according to the research protocol were then studied individually. In this phase, concepts related to collaboration and Social Presence Theory were explored individually in each selected article. To operationalize this analysis, a content analysis with the categories listed *a priori* was performed based on the literature. The category "collaboration" and the secondary categories "communication," "information sharing," "knowledge sharing," or,

more generally, “content sharing” were searched in the articles, as well as elements and sub-elements of SPT: sensitivity, co-presence, and comprehension (see Table 2). Lastly, the research framework was developed and the proposals were presented based on the literature consulted.

4 RESULTS

This section presents the analysis of the results. A general overview of the shadow IT literature is first presented. Next, the articles chosen as relevant are examined individually, exploring concepts related to collaboration and Social Presence Theory in each article. The research framework and proposals are finally presented based on the literature analyzed.

4.1 Literature on Shadow IT: A General Overview

The literature on shadow IT is gaining relevance over the years. In 2012, the number of published articles on shadow IT began to increase and its growth has been exponential since 2014. The largest production date is 2016, with 11 works published. Moreover, it is worth adding that over 70% of the publications date from the last four years (2014, 2015, 2016, and 2017). Thus, most studies on shadow IT are recent, and the topic can still be considered as minimally explored, although it is also gaining notoriety in academic circles over the years. Furthermore, most of the works on the topic were published in conferences, such as the Americas Conference on Information Systems (AMCIS) and the International Conference on Information Systems (ICIS). Only 12 of the 48 articles were published in journals to the present moment.

The topic of shadow IT studies has evolved throughout this time. The first articles to discuss shadow IT’s emergence were after the adoption of ERPs (Enterprise Resource Planning), for example, the creation and use of Excel spreadsheets to execute work tasks instead of using the official ERP system implemented by the organization (ex., Jones et al., 2004; Behrens; Sedara, 2004; Raden, 2005).

Beginning 2012, studies approaching shadow IT at the organizational level stand out, focusing on IT governance mechanisms to deal with shadow IT usage in organizations and to minimize security risks (ex., György et al., 2012; Zimmermann; Rentrop, 2014, Furstenau et al., 2016; Zimmermann; Rentrop; Felden, 2017). In a final analysis, an individual level emerged examining behavioral aspects related to shadow IT usage. In 2014, studies start to investigate behavioral aspects (for example, motivations or priors) from the employees’ perspective, as well as the relationship between shadow IT usage and individual performance, for example, Haag and Eckhardt (2014) and Haag, Eckhardt, and Bozoyan (2015).

4.2 Relationship between Shadow IT and Collaboration based on SPT

Of the 48 articles selected on the topic, ten approached concepts referring to collaboration. Table 3 demonstrates a summary of the articles chosen as relevant to this review.

Table 3– Articles on Shadow IT Relevant to the Topic.

Authors	Objective	Results
Raden (2005)	Discusses the use of Excel spreadsheets as shadow IT, pointing to advantages and disadvantages in using them.	The use of shadow IT demonstrates in which measure business applications really attend to the organization's needs. Shadow IT harms productivity and is ineffective and unstable because it represents a real threat to an organization's agility. Among the solutions, the authors argue that the use of spreadsheets may be permitted, though with an added element of control to these systems.
Shumarova and Swatman (2008)	Explores recent literature in computer-supported cooperative work (CSCW) through a review of what was studied and discovered about collaborative technologies, focused on "shadow CIT" technologies.	*Shadow CIT* makes an impact on collaboration in a number of ways, such as fast dissemination of ideas and content, deposits of knowledge sharing. Finally, it causes an impact on performance expectation.
Silvius and Dols (2012)	Presents a study on the factors that influence employees' non-conforming behavior in organizations.	The study concludes that greater restrictions in IT governance along with cultural aspects are the most important factors that influence non-conforming behavior to IT policies.
Rentrop and Zimmermann (2012)	Presents the first research results from the "Shadow IT" project, focused on establishing the research concept in detail and developing methods to identify and evaluate shadow IT.	Based on the references analyzed, the authors developed a way to define, identify, and evaluate shadow IT, as well as to discuss the importance of shadow IT in IT management As a result of the analysis, several research questions are indicated.
Walters (2013)	Examines the origins and reasons to use shadow IT and the potential impact on organizations in terms of conformity, data protection, and corporate reputation.	Aiming to fight fraud and maintain security and conformity while still gaining from the productivity benefits from cloud-computing solutions, for example, the author suggests that organizations should look to restore management of identification, access, and improper use of cloud-computing applications with application management policies (e.g., BYOD)
Silic and Back (2014)	Exploratory study focused on which shadow IT software are used in organizations, which are security risks to organizational information in using shadow IT, and what motivates shadow IT usage.	Results show that employees use shadow IT that boosts productivity and offers better, faster collaboration and communication. However, the IT risks are greater in the context of shadow IT, but the organizations have ways to control it and countermeasures that may mitigate the risks and protect their organizational assets better.
Singh (2015)	Faced with users' increased adoption of technology not officially required (known as shadow IT), the study examines the emergence and consequences of these adaptations by collecting IT assets from an organization based on the concept of portfolio drift.	The results identified examples of shadow IT instead of alternative solutions (workaround), which is due to at least two reasons. Generally, they were involved in the approval of the purchase or development of these systems. The existence of shadow systems is evidence for portfolio drift.
Mallmann, Maçada, and Oliveira (2016)	Analyzes how knowledge sharing (donation and collection) occurs through the use of shadow IT.	Findings show that a number of collaborative software and mobile devices are used by employees without permission and IT support. Solutions for storing and sharing content, for example, Google Drive and applications like WhatsApp and Skype are used frequently. Thus, the use of shadow IT may facilitate knowledge sharing, especially when the employees are dispersed geographically, since these systems provide faster, more dynamic communication.
Steinhueser et al. (2017)	Explores the use of shadow IT at the individual level, analyzing 1) what brings employees to use private smartphones (and related applications) without formal approval by the company for work practices and 2) how employees use private smartphones (and related applications) in intensive fabrication practices in knowledge.	The results show that employees use their private smartphones to avoid errors, to facilitate collaboration, and to save time and effort, and, thus, create new organizational knowledge management practices that are not currently offered by management. Finally, this leads to more efficient, flawless work processes.
Mallmann and Maçada (2017)	Examines the mediating role of social presence (SP) in the relation between shadow IT usage and individual performance.	The findings show a positive relation between shadow IT usage and individual performance. Since shadow IT usage grants instant communication and facilitates information sharing, the results suggest a positive relation between shadow IT usage and the sense of SP, as well as empirical support for the mediating role of SP between shadow IT usage and the user's performance.

Source: The Authors (2017).

Considering the objective of developing a framework on how shadow IT usage may influence collaboration, this stage of analysis consists of looking for the categories listed a *priori* in the articles chosen as relevant, in other words, concepts related to collaboration and communication, as well as to elements of Social Presence Theory. As can be observed in Table 3, not all the articles had a central focus on collaboration and communication. However, they all approach the use of unauthorized technology and, in some measure, touch on concepts related to communication and SPT. Table 4 presents the analysis of the concepts related to collaboration and SPT found in the articles.

Table 4 – Concepts Related to Collaboration Based on SPT

Articles	**Concepts**					
Authors	Collabo-ration	Communi-cation	Sharing (infor-mation, content, knowledge)	Instant or sense of ur-gency	Accessibili-ty	Sensitivity (emotion)
Raden (2005)	x					
Shumarova and Swatman (2008)	x	x	x	x	x	x
Silvius and Dols (2012)	x		x			
Rentrop and Zimmermann (2012)		x	x			
Walters (2013)	x					
Silic and Back (2014)	x	x	x	x		
Singh (2015)		x				
Mallmann, Maçada, and Oliveira (2016)	x	x	x	x	x	x
Steinhueser et al. (2017)	x	x	x	x	x	
Mallmann and Maçada (2017)	x	x	x	x	x	x

Source: The authors (2017), based on orientation from Webster and Watson (2002).

The results of the literature review disclosed in Table 4 offer evidence of the relation between Shadow IT and collaboration. A large part of the collaboration and communication technologies utilized by the users in the organizations – such as instant message software and cloud storage (Dropbox and Google Drive) – figure as Shadow IT (Walters, 2013; Silic; Back, 2014; Mallmann, Maçada; Oliveira, 2016). One of the occurrences of Shadow IT is the use of "Social Media Software" for communication and information sharing or other services offered by internet providers, for example, cloud services (Rentrop; Zimmermann, 2012). Means of synchronized communication, such as instant messages, offer an experience similar to talking to someone face-to-face, including response speed, explain Shumarova and Swatman (2008).

Employees are still utilizing Shadow technologies that allow for better collaboration and faster communication (Silic; Back, 2014). Instant message application, web conferences, video calls are among these technologies. According to Shumarova and Swatman (2008), the first requirement in performance expectation in the contemporary teamwork environment is speed. Most communication tools (for example, instant messages) offer an immediate return, an instant communication, thus enabling users to share ideas successfully and update and disclose informa-

tion easily, explain the authors.

A sense of urgency was recurrently mentioned in the interviews in the study by Mallmann, Maçada, and Oliveira (2016). The interviewees of this study frequently compared the organizational email with the Shadow technology they utilized, classifying it as a more formal communication tool and, as a consequence, less dynamic and agile. Hence, the literature suggests that individuals are more inclined to share knowledge with other people through informal interactions than through the use of formal systems (Ipe, 2003).

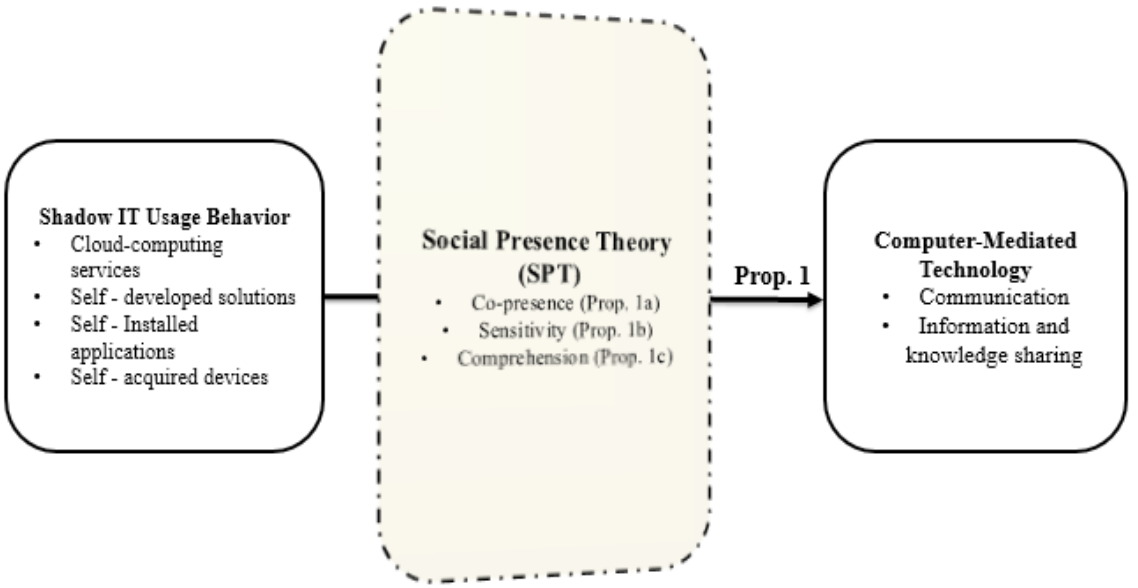
Similarly, shadow IT can facilitate knowledge sharing. Steinhueser et al.'s (2017) study indicates that employees employ shadow IT to facilitate collaboration and save time and effort and, thereby, create new organizational knowledge management practices. Considering that most Shadow systems are communication and content-sharing software, these systems allow employees to obtain the necessary knowledge instantly and dynamically (Mallmann; Maçada; Oliveira, 2016; Steinhueser et al., 2017).

Considering the arguments above, the literature suggests that there is a positive influence of shadow IT usage on employee collaboration since it permits fast, effective communication and helps with sharing both information and knowledge. Fast, effective communication itself has a strong relation with the sense of social presence offered by shadow IT, inasmuch as technologies that permit online, instant, and dynamic communication, such as the use of audio and video resources, like the WhatsApp and Skype applications, provide a greater sense of social presence, as suggested by Biocca, Harms, and Burgoon (2003).

4. 3 Developing the Theoretical Framework and Research Propositions.

Finally, as a result of this literature review, a theoretical framework was developed for later empirical validation. The framework is based on three significant dimensions. The first dimension is the shadow IT usage involving cloud-computing services, self-made solutions, self-installed applications, and self-acquired devices, based on the shadow IT literature (for example, Rentrop e Zimmermann, 2012; Silic and Back, 2014; Haag and Eckhardt, 2014, etc.). The second dimension are the Social Presence Theory elements, in other words, Co-presence, Sensitivity, and Comprehension, based on the literature (for example, Biocca and Harms, 2002; Biocca, Harms, and Burgoon, 2003; Ogara, 2011, etc.). Finally, the third dimension are the elements of collaboration based on the literature (for example, Shumarova and Swatman, 2008; Silic and Back, 2014; Steinhueser et al., 2017, etc.) that involve communication and information and knowledge sharing. Figure 1 presents the theoretical framework and its resulting propositions.

Figure 1 – Theoretical Framework.



Source: The authors (2017).

As demonstrated in Figure 1, the framework presents how shadow IT usage can influence computer-mediated collaboration based on Social Presence Theory. To drive the analysis, proposals referring to the framework were formulated based on the literature studied, which are presented in Table 5.

Table 5 – Research Propositions.

Proposition	**Authors**
P1: Shadow IT usage influences computer-mediated collaboration.	Raden (2005); Shumarova and Swatman (2008); Rentrop and Zimmermann (2012); Walters (2013); Silic and Back (2014); Singh (2015); Mallmann, Maçada, and Oliveira (2016); Steinhueser et al. (2017); Mallmann and Maçada (2017)
P1a: Shadow IT usage influences computer-mediated collaboration due to the sensation of co-presence.	Shumarova and Swatman (2008); Mallmann, Maçada, and Oliveira (2016); Steinhueser et al. (2017); Mallmann and Maçada (2017)
P1b: Shadow IT usage influences computer-mediated collaboration due to sensitivity.	Shumarova and Swatman (2008); Mallmann, Maçada, and Oliveira (2016); Mallmann and Maçada (2017)
P1c: Shadow IT usage influences computer-mediated collaboration due to the sense of comprehension.	Raden (2005); Shumarova and Swatman (2008); Rentrop and Zimmermann (2012); Silic and Back (2014); Singh (2015); Mallmann, Maçada, and Oliveira (2016); Steinhueser et al. (2017); Mallmann and Maçada (2017)

Source: The authors (2017).

5 DISCUSSION

This section discusses the study's results and its contributions. A discussion on the consequences of shadow IT usage for users and organizations is first presented, followed by the work's practical and theoretical contributions.

5.1 Individual and Organizational Consequences of Shadow IT Usage

The literature on shadow IT suggests that improvements in collaboration and communication are consequences of the use of these unauthorized technologies. Previous research identified that employees frequently utilize shadow IT to communicate and collaborate with each other at work (for example, Shumarova & Swatman, 2008; Silic & Back, 2014), as well as to share information and knowledge among co-workers and external partners (for example, Mallmann, Maçada, and Oliveira, 2016; Steinhueser et al., 2017). Nevertheless, improvements in collaboration and communication are not necessarily the user's final objective when using shadow IT at work.

Shumarova and Swatman (2008) highlight that employees are demanding instant communication and easy content updates to perform their tasks and maintain high individual performance. Similarly, Steinhueser et al.'s (2017) study identified that, in addition to shadow IT usage corroborating knowledge management, its use also leads to more efficient, flawless work processes. The literature suggests that employees utilize shadow IT with the intention to improve collaboration, with collaboration and communication thus resulting as consequences of shadow IT usage. Therefore, the user may have the intention to improve collaboration when employing shadow IT, but the improvement is, in fact, a consequence of effective use.

Previous research, such as the study by Haag, Eckhardt, and Bozoyan (2015), indicates that shadow IT boosts individual productivity, improving employees' work performance. This way, improvement in communication and collaboration is one of the requirements that can lead to IT users' increased productivity and individual performance.

The increase in the sense of social presence provided by shadow IT can also be seen as a consequence of its use. As discussed throughout the work, the increased sense of social presence can provide improvements in communication and collaboration. Shadow IT usage, being online, instant, and dynamic communication and collaboration technologies, can increase the sense of social presence and, consequently, optimize communication and content sharing among users.

Social presence also exercises a mediating role between shadow IT and communication, as well as between shadow IT and individual performance. A study conducted by Mallmann and Maçada (2017) found a positive relation between shadow IT usage and individual performance mediated by social presence. Since shadow IT usage allows for instant communication and facilitates content sharing, the study's results indicate that shadow IT increases the sense of social presence, in addition to providing empirical support for the presence's mediating role between shadow IT usage and the user's performance. In other words, the increased sense of social presence provided by the use of shadow IT helps to elevate the organization's IT user's individual performance

Finally, improvements in individual performance can bring benefits to the organization as a whole. Singh (2015) argues that IT managers that manage shadow IT, rather than just trying to avoid its use, can see improvements in its organizations' performance, due to the introduction of the employees' innovations, who are more satisfied with the tools they use to execute work tasks. Similarly, the empirical results of Haag, Eckhardt, and Bozoyan (2015) show that, at the individual level, shadow IT usage can be very valuable to the organization because they are more objective-oriented, effective, and try to find long-term solutions. Therefore, managers can analyze the constructive results of shadow IT usage, such as the perceived improvements in their own work and, consequently, in the company's performance (Haag; Eckhardt, 2015).

5.2 Theoretical and Practical Contributions

This research provides academic and practical contributions. Firstly, analysis of the relationship between shadow IT and collaboration from a theoretical standpoint does not exist in the literature. Therefore, this study contributes to shadow IT literature by proposing a theoretical discussion on the topic and developing a framework of the shadow IT-collaboration relation.

Accordingly, the consequences of shadow IT usage are still minimally explored, although much is discussed about the pros and cons of using these technologies. This study, therefore, contributes to the theoretical discussion on the consequences of shadow IT in terms of collaboration and communication and problematizes other consequences such as individual performance and productivity.

The need for social presence provided by technology in the professional environment is evident. With companies' geographical diffusion, the use of technologies to mediate collaboration and communication is increasingly common among employees, clients, and external partners. Hence, solutions with a greater sense of social presence, which are widely utilized in personal life, are being used in the workplace, oftentimes informally or unknown to the IT department.

For organizations, it is important to understand shadow IT's impact, such as on collaboration, which, in turn, can generate improvements in the employees' productivity. Consequently, this study contributes to the argument that shadow IT usage can bring benefits to organizations, rather than being considered just as a threat.

6 FINAL CONSIDERATIONS

The use of unauthorized technologies is increasing within organizations – many of which are collaborative. Motivated by this context, this study aimed to observe the influence of Shadow technology use on collaboration based on Social Presence Theory. For this purpose, a literature review was conducted, culminating, as a result, in a theoretical framework and the development of research propositions.

As the main results of this study, the literature review suggests that there is a positive influence of Shadow technologies on employee collaboration since they offer fast, effective collaboration and aid in both information and knowledge sharing. Furthermore, a theoretical framework was developed as a result of this review, which still requires empirical validation. Thus, the empirical testing of the propositions is suggested. A quantitative approach, such as a survey, or a qualitative one, through interviews with IT users from different organizations, or both, can be employed as methods to validate the framework. Additionally, the relation between shadow IT and collaboration-mediated individual performance can also be explored in future studies.

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Contribution	[Author 01]	[Author 02]
1. Definition of research problem	√	√
2. Development of hypotheses or research questions (empirical studies)	√	
3. Development of theoretical propositions (theoretical work)	√	
4. Theoretical foundation / Literature review	√	
5. Definition of methodological procedures	√	
6. Data collection	√	
7. Statistical analysis	√	
8. Analysis and interpretation of data	√	
9. Critical revision of the manuscript		√
10. Manuscript writing	√	
11. Other (work supervision)		√