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CONSUMERIZATION OF IT – WHERE IS THE THEORY?

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Abstract

Consumerization of IT (CoIT) is a key trend affecting society at large, including organizations of all kinds. A consensus about the defining aspects of CoIT has not yet been reached. Some refer to CoIT as employees bringing their own devices and technologies to work, while others highlight different aspects. While the debate about the nature and consequences of CoIT is still ongoing, many definitions have already been proposed. In this paper, we review these definitions and what is known about CoIT thus far. To guide future empirical research in this emerging area, we also review several established theories that have not yet been applied to CoIT but in our opinion have the potential to shed a deeper understanding on CoIT and its consequences. We discuss which elements of the reviewed theories are particularly relevant for understanding CoIT and thereby provide targeted guidance for future empirical research employing these theories. Overall, our paper may provide a useful starting point for addressing the lack of theorization in the emerging CoIT literature stream and stimulate discussion about theorizing CoIT.

Keywords: Consumerization of IT, Individual Information Systems, Structural Theory

1 Motivation

Scientific interest in the phenomenon of “Consumerization of IT” (CoIT) is growing, reflected by its extensive discussion in current practitioner literature. Among practitioner publications, it is often defined as the prevalence of smartphones and tablet computers in an enterprise context and equated with a phenomenon called “Bring Your Own Device” (BYOD) (Hiner, 2013). This viewpoint is particularly emphasized by security companies, which are primarily concerned with threats that arise from consumer devices – either preconfigured and owned by the company or owned by the employee. In addition, strategy consultants place heavy emphasis on the managerial and control issues that arise with this trend.

There are deeper layers, however, to CoIT: information and communication technology is no longer a tool for a privileged few who are capable of understanding and using it, but it has become a tool that penetrates everyday life due to its ubiquitous nature. This shift in scope, of which CoIT is an integral part, leads to important transformations, including societal changes (e.g., a shift in usage behaviors of the “digital natives” (Vodanovich, Sundaram, & Myers, 2010)), organizational changes (e.g., a shift in the role of corporate IT), and even political changes (e.g., as a catalyst for the Arab Spring).

It is the aim of this paper to review and analyze existing definitions of CoIT in order to explore which theoretical angles may be particularly helpful to apply to this research phenomenon in order to gain a better understanding of what constitutes CoIT and its consequences. Therefore, we focus on two key questions:

- 1) How has CoIT been defined in prior literature? What are the commonalities and differences?
- 2) Which theories have been applied, and could be applied, to grasp the CoIT phenomenon?

The remainder of the paper is structured as follows: First, we provide a description and discussion of the phenomenon of CoIT and its various aspects. A literature review comparing different state-of-the-art definitions of CoIT follows. Thereafter, we introduce theories that can provide deeper and more theoretical insights into CoIT. Finally, we make recommendations for future empirical research to gain deeper insights into the phenomenon.

2 Consumerization of IT in Practice

While CoIT is often claimed by some to be just another buzzword, Gartner (2005, 2012, 2013) has identified CoIT as a megatrend, while past research has conceptualized it narrowly based on what is observable in certain time frames (e.g., “Bring Your Own”). In order to shed more light on CoIT, it is useful to examine the historical context from which it emerged.

2.1 A Brief History of IT Leading to Consumerization

The arguable starting point of IT was the mid-20th century, with the first programmable computer produced in 1941 and the first electronic transistor in 1948. As the adoption of these new technologies involved significant investment and risk, they were only acquired by either the military or large businesses when they were determined to be profitable in the long term. In the early days, programming electronic computers was complex, and the expert knowledge for doing so (e.g., knowing the right coding for punching cards) was held by a privileged few. These experts were uniquely engaged in translating the business processes that could be supported with IT (mostly accounting and payroll at the time) into the language of the machines. This formed the basis for organizational IT, which grew and developed its own processes over time. As the number of different

systems grew, so did the complexity of interactions between these systems. The attempt to integrate different information systems and reduce the number of separate entities is a relevant topic at the core of Enterprise Architecture Management (Ross, Weill, & Robertson, 2006).

The performance of information technology grew exponentially while cost stayed constant, meaning that the price of a given computational power rapidly decreased; this phenomenon is well known as Moore's law (Moore & Fellow, 1965). New devices such as the calculator, personal computer, notebook, and cell phone emerged, all following a similar diffusion pattern: highly expensive and used in military or corporate environments at first. Users got in touch with the new technologies, learning to use and appreciate them, and wanted these particular technologies to be available in their private contexts as well. When the price diminished, the technologies made their way into the luxury consumer-goods market and finally became commodities (Carr, 2003).

While the market for consumer electronics emerged in the 1980s and has been growing constantly, most devices offered technologies that had already been applied in the corporate environment (e.g., PC, cell phone) or did not make sense there (e.g., hifi, video games). This changed in the mid-2000s with the parallel development of smartphones directly for the consumer market and the growth of web-based applications and services, such as maps or new, interactive email frontends.

The first generation of smartphones (iPhone 2007 and HTC Dream 2009) was designed directly for the consumer market and offered features other than those provided by business-related mobile email and messaging devices (e.g., BlackBerry). They were designed to deliver an intuitive consumer experience and provide multimedia content, but they could not be integrated into corporate IT environments; functionalities such as virtual private networks or the depiction of group access rules were not supported.

However, since they did support mobile email, a task commonly used in business environments, users desired to use these devices in the corporate context and developed a new leveling rule for the intuitive usability IT could have. With mobile operating systems, users are finding that access to any service is literally a fingertip away: the application stores enable a simple search, while the payment and installation process is performed with the touch of a button. The possible combinations of different tools are so numerous that the consumer devices can be considered as individual information systems rather than simple one-purpose tools. Baskerville provides a possible reasoning for the lack of attention information systems research has given to this matter to date: "This individualization of IS may go unnoticed in the IS research discipline, simply because we have traditionally defined the field in terms of social, organizational, and managerial relations" (Baskerville, 2011b, p. 252).

2.2 Individual Information Systems and Consumerization Practice

Baskerville called for research on "individual information systems" (Baskerville, 2011b). He illustrates the issue of people today using complex individual information systems with the case of Jane Doe (a pseudonym for a fictional character), a professional employee in a large government division. In her everyday life, she uses a complex infrastructure consisting of two desktop PCs with over 50 software packages, a laptop, a smartphone, a DSL connection with an Ethernet router and a wireless access point, as well as a printer and a scanner. She uses a few web-based services (usually free) from outside her employer's cloud, including discussion groups, meeting-planning tools, and shared-file folder drop sites. Furthermore, she does most of her travel planning through airline- and hotel-booking websites and frequently shops for other goods via the Internet.

Such complex individually assembled information systems are what Baskerville (2011a, p. 11) later defines as individual information systems: "An activity system, in which individual persons, according to idiosyncratic needs and preferences, perform processes and activities using information, technology, and other resources to produce informational products and/or services for themselves or others." He develops a design theory of how individuals choose and compile the elements of their information

systems in an “experimental design,” i.e., not having a clear process including feedback loops, but rather following a spontaneous trial-and-error principle.

Later on, he expands this design theory for “bindpoints” – the joint contexts created when two information systems connect – of individual to organizational information systems (Baskerville & Lee, 2013). He discusses gaps and interfaces as well as possible security issues and forensics. What is lacking, however, is a theory of *why* these interactions emerge.

For this reason, we want to draw upon his fictive character and enhance the story, describing a typical Friday in Jane Doe’s life and adding four more aspects. At 6:30 a.m., her phone fades into her favorite music; it is time to get up. She takes her phone, mutes the alarm, and glances at the number of messages she has received. Most of them do not seem urgent. Her combined inbox displays a message that she was expecting from a colleague working overseas as well as one from her sister containing pictures of her new shoes (1: combining private and business uses of technology). While driving her son to high school, she receives her first call of the day and answers it in her car, which is connected to her cell phone via Bluetooth (2: enhanced interoperability of technology). She will have to travel to a fair this afternoon, and all appointments are set in her cloud calendar. Upon arrival at her office building, she finds a free desk to connect her laptop. She grabs a coffee, answers a few emails, and coordinates her goals for the day at the fair with her supervisor. Before leaving to the train station, she copies a few public documents of the companies she plans to visit at the fair into her cloud drive. She would not be allowed to do the same for company documents; the security policy is very restrictive for that matter. Only recently was she allowed to have access to her email on all her devices, but she had to accept the condition of installing a mobile device management tool that blocks some features on her devices for security reasons.

Sitting on the train, she reads and annotates the documents on her tablet computer (3: mobile information access independent of device and location). The cellular network is fairly good on the fast train lines, and she is happy she did not have to print and carry around all those brochures. At the fair she meets a couple of her contacts, but after two hours she gets a push message that the train she intended to take back home will be delayed by approximately 60 minutes. Since her family will receive guests tonight, she quickly browses her email to find the cell number of her last contact. She gives him a call and asks whether it would be alright to discuss the matter on the phone and explains why staying as long as she intended would no longer suit her. He agrees, and while talking she quickly sends a message to her husband so that he can pick her up at the station when her earlier train arrives back home.

This scenario is made up, but it is close to reality for many employees today. The interesting thing to note is that work and private life blend (Vodanovich et al., 2010), as does the use of technologies. Although it is commonly agreed that personal and corporate IS will overlap increasingly, there is no theoretical foundation as to why that is and what organizational implications it will carry.

After his call for research, Baskerville (2011a) published a design theory about the individual information systems themselves and yet another to model their bindpoints to “organizational/enterprise information systems” (Baskerville & Lee, 2013, p. 4). However, in the latter publication the authors argue: “The individual designer [of an IIS] is operating within a confined socio-technical context.” Alongside technology, this context happens to change.

3 Definition and Literature Review

To the best of our knowledge, the first appearance of the term “consumerization of IT” was in Moschella et al. (2004). Soon afterwards, Gartner (2005) predicted that consumerization “will be [the] most significant trend affecting IT during [the] next ten years.” According to Gartner’s 2012 Hype Cycle for Emerging Technologies (Gartner, 2012), consumerization was in the phase called “slope of enlightenment” and was predicted to take another two to five years to reach the plateau of

productivity. However, it was excluded from Gartner’s Hype Cycle analysis in 2013 (Gartner, 2013) because the authors argued that it had evolved into a more pervasive phenomenon and could therefore no longer be considered merely a trend. This anecdotal evidence reflects the dynamism of the perceptions and definitions of what CoIT comprises. While over the last couple of years a large number of scholars have made attempts to define CoIT and determine its key constituent components, none of these definitions or mostly descriptive conceptualizations have become established and broadly accepted by the (IS) community.

We performed a literature review for scientific publications related to CoIT, searching for publications containing the term “consumeri[z/s]ation of [IT/Information Technology]”. Although there are quite a few publications containing our search string, not all of them attempt to define the term itself; many use an already published definition. Table 1 lists all definitions of CoIT found in scientific publications that do not refer to a prior publication. Since Moschella et al. (2004) were the first to publish about CoIT, and Harris et al. (2011) were often cited in scientific publications, we made exceptions for these two and also listed practitioner definitions in this case.

Publication	Definition of Consumerization of IT (Quotes)
Moschella et al., 2004	The defining aspect of Consumerization is the concept of dual use. Increasingly, hardware devices, network infrastructure and value-added services will be used by both businesses and consumers.
Cummings et al., 2009	Consumerization has resulted in employees now demanding the same utility and experiences with technology in the consumer market within their job function in the business environment.
Harris et al., 2011	IT consumerization, or the adoption of consumer devices and applications in the workforce, is pervasive.
Ingalsbe et al., 2011	Consumerization involves personal consumer products being brought into the enterprise.
Weiß & Leimeister, 2012	Over the last few years, innovations that originated in the consumer sector have increasingly been infiltrating the corporate environment. This trend, referred to as “Consumerization” [...]
Niehaves et al., 2013	Consumerization of information technology (IT) refers to privately-owned IT resources, such as devices or software that are also used for business purposes.
Dernbecher et al., 2013	[...] the business usage of privately owned devices on the one hand, and the usage of familiar consumer software on the other hand, are subsumed together with other consumer driven innovations as “consumerization”.
Ortbach et al., 2013	[...] behaviour of an individual as the usage of technologies from the private (or dual-use) space for business purposes, i.e. the individualization of the professional activity system by means of consumer IT which is not provided by the enterprise. [...] the intention to use other technologies than those provided by the company to perform work tasks within the next two months

Table 1. Definitions of Consumerization of IT in Scientific Literature.

CoIT definitions vary broadly. However, though there already exist quite a few definitions, they do not lead to a deeper theoretical understanding. While some argue that ownership of an artifact is the determining factor, others consider only a technology’s origin to be defining. Moreover, while some limit their scope to devices, others include broader approaches such as applications, technologies, or artifacts.

Furthermore, some publications solely analyze the consequences of CoIT, such as information security threats and employee satisfaction or stress brought on by the constant availability of several communication channels, without clearly defining what CoIT actually is. Others remain descriptive and present quantitative analyses of mobile device usage in companies. Only a few present theoretical

models for explaining CoIT, such as the model of technology adoption in households and switching theory.

Although there is no clear and uniform understanding of what CoIT actually is, it is interesting to be aware of the commonalities and differences between the different definitions. Going through each of them, five dimensions were identified that were shared by at least two independent definitions: (1) the direction of innovation, which represents the technology push from the consumer context into the business context; (2) the dual use of consumer technologies, which reflects the combined use of consumer technology within the private and business contexts; (3) the classification of “consumer IT” as opposed to “enterprise” or “corporate IT;” (4) the ownership of consumer devices that can be either privately owned or owned by the enterprise (not to be confounded with the previous classification); and (5) the potential impact or challenges that CoIT entails. Table 2 depicts these dimensions and the definitions that make use of them.

Publication	Private/Work Dual Use	Corporate vs. Consumer IT	Direction of Innovation	Ownership	Impact of CoIT
Moschella et al., 2004	X	X			
Cummings et al., 2009	X				
Harris et al., 2011		X			X
Ingalsbe et al., 2011	X		X	X	
Weiß & Leimeister, 2012			X		X
Niehaves et al., 2013	X	X		X	
Dernbecher et al., 2013	X	X	X	X	
Ortbach et al., 2013	X	X	X	X	
<i>Total</i>	<i>6</i>	<i>5</i>	<i>4</i>	<i>4</i>	<i>2</i>

Table 2. Usage of Different Defining Aspects for CoIT in Various Publications.

Ownership is an important category for Niehaves et al. (2013) and Dernbecher et al. (2013). However, the question arises of whether the phenomenon would be significantly different if employees asked their employers to pay for the device instead of using their own device that they consider useful for work.

There is no clear line dictating when IT is considered consumer IT versus corporate IT in the CoIT literature stream. Though Ortbach et al. (2013) provide two strikingly opposite examples, i.e., entertainment systems for consumer IT and CRM systems for corporate IT, most publications leave it up to the reader to determine the difference. Another approach for building the differentiation is to somehow determine the origin of the artifact, coming from either the consumer or the business IT market.

Furthermore, definitions disagree about whether CoIT criteria are fulfilled when consumer devices are simply brought into the work context or if there is a need for a dual use.

Depending on the definition applied, the authors draw upon various theoretical lenses to examine CoIT. Though Ortbach et al. (2013) use the model of adoption of technology in households while Dernbecher et al. (2013) use the switching theory, both rely on quantitative methodologies (ultimately based on the theory of planned behavior). Gens et al. (2011) demonstrate statistics of (mobile) device usage in enterprises as a foundation to illustrate CoIT. All other publications identified either focus only on the consequences of what they defined CoIT to be or on describing the phenomenon without relating it to theory.

Publication	Theoretical Lens
Moschella et al., 2004	Practitioner literature: description of the phenomenon.
Cummings et al., 2009	Development of a quantitative measure for “Web 2.0 Proclivity” (an individual’s natural inclination or propensity to use Web 2.0 tools in his/her current function within the organization).
Harris et al., 2011	Practitioner literature: description of the phenomenon.
Ingalsbe et al., 2011	Suggestion of how to model the consequences of consumerization with a threat-modeling methodology using UML deployment diagrams (Ingalsbe, Shoemaker, Mead, & Drommi, 2010).
Weiß & Leimeister, 2012	Literature review that models the consequences of consumerization using the information-management model of Krcmar (2010).
Niehaves et al., 2013	Case study that models the consequences of consumerization with the cognitive model of stress (Lazarus and Folkman, 1984), but not consumerization itself.
Dernbecher et al., 2013	Switching theory (Bhattacharjee, Limayem, & Cheung, 2012) based on UTAUT (Venkatesh, Morris, Davis, & Davis, 2003), which is based on the theory of planned behavior (Ajzen, 1991).
Ortbach et al., 2013	Behavioral intention measure of Brown and Venkatesh’s (2005) model of adoption of technology in households; ultimately, theory of planned behavior (Ajzen, 1991).

Table 3. *Theoretical Lenses Employed in CoIT Definitions.*

4 Broadening the Theoretical View

New information technology has always had the power to alter organizations and their structures. With the advent of desktop computing in the 1980s, the vision was about autonomous knowledge, workers, and empowered clerical staff. In the 1990s, when computers became networked, virtual organizations were predicted, and the growth of the Internet made researchers envision boundaryless organizations (Robey & Boudreau, 1999).

To date, we lack a clear understanding of CoIT, including its antecedents and consequences related to the above-mentioned individualization of IS, ubiquitous information systems, and digital natives. Existing studies focus on aspects such as permanent reachability, work-life balance and blending, as well as the technical issues of different digital ecosystems interacting with each other. We suggest that CoIT has a deeper impact that requires a more holistic and theoretical approach.

There are, however, interesting opportunities for theorizing CoIT. We propose structuration theory and its subsequent theoretical advancements that have built upon this theory as promising lenses through which to explore the impacts that CoIT will have on organizations, their structures, and thus (work) life.

4.1 Structuration Theory

Structuration theory and its subspecies could be an interesting stance regarding individualization; the relationship between individuals and society is central to Giddens’ structuration theory. It rejects the dualistic view that social phenomena are determined either by objective social structures or by autonomous human agents. In view of structuration theory, both elements are intertwined and interdependent. Giddens identifies three dimensions of structure – structures of signification, domination, and legitimation – that are all ultimately tied to the concept of power. While structures of signification inform about a person’s role, structures of domination inform about the powers a person is considered to hold, and structures of legitimation delineate appropriate behavior towards this person.

All these structures are created continuously in everyday social practice. Giddens defines structures as “rules and resources, organized as properties of social systems” (Giddens, 1984, p. 25). These resources can either be allocative, “generating command over objects, goods or material phenomena,” or authoritative, “generating commands over persons or actors” (ibid., 33).

Although Giddens is a sociologist and does not make much reference to technology in his own works, his theory has had a major impact on information systems research, though not yet on CoIT. Jones and Karsten (2008) provide a review of the application of structuration theory in information systems research by critically analyzing 331 publications that have drawn on Giddens’ work in the time frame of 1983 to 2004. They identify three different classes of papers: research applying structural concepts, developments and applications of IS-specific versions of structuration theory, and critical engagement with structuration theory.

Baskerville (2011a, p. 8) argues for the use of structuration theory for further research on individual information systems: “The individual information system is a definable form of IS. It is a socio-technical activity system (at the very least, it is socially constructed) that performs processes and activities using information, technology, and other resources to produce informational products and/or services. This trait means that a subset of existing theories about information systems is likely to hold for individual information systems theories. The exact boundaries of the subset are yet to be determined.” However, taking Giddens’ stance in looking at CoIT, we suggest that it is not only the system that matters but also the change in structure itself and its perception and use they create.

In the application of structural IS research, Jones and Karsten (2008) argue that there is a research opportunity for IS studies that address structural processes in broader contexts and explore how technological artifacts can be examined from a structural perspective. They claim that it seems to be a useful way of understanding work practices in emerging contexts where “information and communication technologies are mediating traditionally face-to-face interaction” (Jones & Karsten, 2008, p. 149).

Three applications and extensions of structuration theory have been adapted particularly to research in information systems: duality of technology (Orlikowski, 1992), adaptive structuration theory (DeSanctis & Poole, 1994), and sociomateriality (Orlikowski & Scott, 2008).

4.1.1 Duality of Technology

In the spirit of structuration theory, Orlikowski (1992, p. 403) conceptualizes technology as “material artefacts (various configurations of hardware and software [... being] created and changed by human action, [but] also used by humans to accomplish some action.” These two aspects form the duality of technology. Barley (1986, p. 107) regards the influence of technologies on organizational structures as depending “on the specific historical process in which they are embedded.” She offers a structural model of technology as presented in Figure 1.

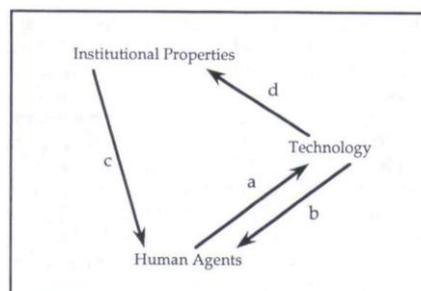


Figure 1. The Structural Model of Technology (Orlikowski, 1992, p. 410)

It is this two-way interaction of technology and organization that is particularly relevant for CoIT research. Technology is the medium of human action (arrow a). Because technology is used by workers, it mediates their activities. Using consumerized technologies such as mobile devices or web services facilitates the performance of certain kinds of work. However, the use of this technology also brings along constraints such as comfort or security issues.

Regarding CoIT, the use of consumer technology can be analyzed following this four-step approach. Before getting in touch with consumerized IT, employees have a clear set of tools provided by the enterprise, which shapes their idea of how tasks should be performed (arrow c). With the emergence of consumer IT as a mass phenomenon, they learn to use and appreciate these technologies (e.g., smartphones, web services) in their private lives, leading to evolving ideas of how certain tasks (e.g., reading and answering emails) can be performed comfortably (arrow b). They adapt this technology, which is not designed for integration into a corporate context, by finding workarounds, thus changing the technology itself (arrow a). This finally has an impact on the organization, which must subsequently deal with changes in its structural properties due to the different use of technology within (arrow d).

4.1.2 *Technological Frames*

Understanding people's interpretations of technology is critical to understanding their interactions with it. To achieve this, Orlikowski and Gash (1994) introduce the concept of technological frames, which describe the assumptions, expectations, and knowledge that organizational members use to understand technology itself, as well as the specific conditions, applications, and consequences of that technology in particular contexts. From this perspective, technologies are social artifacts that can and will be interpreted differently by various social groups, based on their interactions with it. In their initial work, they find three domains to characterize the interpretations: people's perception of the technology and their understanding of its capabilities and functionality ("nature of technology"), the way the organization acquires and implements the technology ("technology strategy"), and people's understanding of how the technology is used on a day-to-day basis as well as the conditions and consequences of such use ("technology in use").

Interestingly, two major groups are developed in their field study. "Technologists" (in this case study, employees actually developing the corporate IT artifacts) choose technology and decide how to roll it out, being "caught up in the advanced capabilities of the technology, rather than on its role as a means to some specific organizational end" (Orlikowski & Gash, 1994, p. 189). "Consultants" (in this case study, employees intended to use the IT artifacts), on the other hand, are described as users who do not fully understand what the technology is good for, even though the technologists assumed that the technology "was an end-user tool, and hence could be learned and used by the consultants with relative ease [...] even [by] people who haven't used computers before" (ibid.). A conflict arises, as the technologists do not explain and describe in detail what the tool is capable of and how it works.

Applying the concept of appropriation to CoIT could result in finding the opposite setting today: employees choose technologies without justifying in detail the reason why they prefer their own to the possibilities offered by corporate IT, so that IT suffers a lack of understanding of the business needs. In this scenario, the users are introducing IT for which the technologists do not fully understand the need into the organizational setting. It would be an interesting approach to analyze the frames of technology towards consumerized technologies in field studies to analyze whether the assumption of incongruence in frames between the technologists and users could be confirmed.

4.1.3 *Adaptive Structuration Theory*

Poole and DeSanctis (1994) adapt the structuration theory, originally describing the mutual influence of individuals and society, to describe the interconnection between technology and social processes.

One of their core propositions is that “social structures serve as templates for planning and accomplishing tasks [...]. Designers incorporate some of these structures into technology [...] thus creating new structures within the technology” (DeSanctis & Poole, 1994, p. 125). They see two facets that should be used to describe advanced information technology: its structural features, drawing on Giddens’ definition, and the spirit of this feature set, consisting of “(a) the design metaphor underlying the system; (b) the features it incorporates and how they are named and presented; (c) the nature of the user interface; (d) training materials and on-line guidance materials; and (e) other training or help provided with the system” (ibid.).

Another important enhancement is the description of the way in which groups can appropriate structural features. There is a distinction between “faithful” appropriation, which means that they use the technology in the spirit with which it was designed, and “unfaithful” appropriation, which means appropriating features for “different instrumental uses or purposes.” In their original publication, they chose researching group-decision support systems (GDSS) as the object of their research because they combine “computing, communication, and decision support capabilities” and its features “can be arranged in a myriad of ways and social interaction is intimately involved in GDSS use” (DeSanctis & Poole, 1994, p. 122).

Applying these thoughts to CoIT, one could state that all this is also true for what we call “consumerized technologies” in this paper. As defined, the functionalities of smartphones can be enhanced by installing applications (apps) for almost any purpose. All these apps are permitted to use the connectivity these devices are offering, so communication – and thus social interaction – plays a major role. The same holds true for web services; their (application programming) interfaces can be used to combine them freely. Depicting live events on mashups using Google Maps is a prominent example of this.

The process of CoIT could also be regarded as appropriation move for consumer technology. The appropriation of smartphones in a business context could serve as an example for an application of the (adaptive) structuration theory. To elucidate this, differentiation between smartphones and feature phones is of great help (Becher, 2009, p. 11). The important features of a smartphone are that it is a mobile device capable of being addressed in a cellular network using an identifier card (SIM), offering a wide range of communication interfaces (most prominently, Wi-Fi, Bluetooth, USB, etc.), and – most importantly – being extensible in the range of its capabilities using apps. What is not distinguishing is the connectivity to mobile Internet and the possibility of receiving emails, as this was already possible with so-called feature phones, which had a fixed range of applications, including a web browser and a mail client, but were not extensible in their functionality. The first generation of smartphones was designed exclusively for the consumer market. It was capable of displaying a wide range of multimedia content, including high-resolution videos and music. However, there were no features for embedding these devices in a corporate IT environment for several reasons: common security features such as VPN were not supported, and the devices could not apply rules from central servers.

However, becoming used to the intuitive handling of these devices, users began to use at least the email functionality for business reasons, an example of unfaithful appropriation of technology. This use of consumer smartphones in companies – discouraged and often even forbidden by corporate IT departments – is becoming increasingly standard, thus altering corporate routine and reality and developing into part of the structure. When smartphone producers realized that their consumer devices were being used more and more within companies, the appropriation of the devices changed. Newer versions of smartphones and their operating systems now incorporate features that are important for companies, such as mobile device management and secure connections.

4.1.4 Sociomateriality

The sociomaterial approach goes beyond the assumptions of structuration theory and claims that there cannot be any divide between the technology itself and the social construction of it. There is an “ontological inseparability” between these two aspects, or in simpler words: they are two sides of the same coin, and analytical approaches trying to explain a phenomenon with just one side, or trying to justify a separate analysis of each side, are doomed to fail. Latour (2004, p. 227) gives the following example: “Imagine, first, a group of soldiers and officers stark naked; second, a heap of paraphernalia – tanks, paperwork, uniform – and then claim that ‘of course there exists some dialectical relation between the two.’” In addition, Orlikowski (2008, p. 464) argues in favor of using sociomateriality as lens by positing that “Some salient research questions would include how particular, inherently sociomaterial, organizational forms pattern practice, for example: very-large-conversations using web-based discussion forums; [...] habitats of connectivity formed through extensive use of Blackberries and wearable mobile technologies.” These two examples fit well into the research area of CoIT.

In the case of CoIT, this would mean that mobile devices – ubiquitous access to web-based services independent of device, location, and time – become a part of people, a layer of them, thus making it hard to separate the influence of consumerized technologies from the people actually taking them for granted. This goes along well with the Vodanovich et al.’s (2010, p. 711) concept of digital natives and ubiquitous information systems, which claims that “technologies, networks, and associated systems [...] have woven themselves into the very fabric of everyday life” of so-called “digital natives,” and that those would “have intertwined the digital world and its numerous technologies as a part of their daily lives” (ibid. 2010, p. 712).

5 Discussion and Suggestions for Further Research

We have shown in our literature review that, to date, the concept of CoIT is frequently referred to, but only vaguely defined and rarely conceptualized. There exists only some research on antecedents or consequences of the phenomenon. Nevertheless, the phenomenon is described either by the action of employees in an organizational setting taking their consumer devices with them or by the intention to use devices other than those provided by the employer, without examining the broader cognitive and behavioral shifts that come along with these developments. In this paper, we proposed a combination of theoretical angles to empirically examine and conceptualize CoIT.

Although all theory lenses presented are based on Giddens’ structuration theory, which is unrelated to CoIT or technology, each of them can help to shed light on different interrelated aspects that should be viewed in conjunction. Table 4 provides a summary.

All lenses described above sensitize scholars to analyzing the origin and process of CoIT. While there is already some research about the reasons for people bringing their private devices to work (Ortbach, Koeffler, et al., 2013), this research focuses on behavioral aspects. It stands in the tradition of the theory of planned behavior (Ajzen, 1991) and the technology acceptance model, which operationalizes behavioral, normative, and control beliefs as antecedents of intention and behavior. Although it recognizes the social influence of individual behavior in trying to capture the normative influence of colleagues, superiors, family, and friends, the process of attitude and behavior change is not given full attention. This is a valid option for portraying a given status quo, but does not advance the body of knowledge concerning how and why CoIT unfolds as a process. In their first publication about technological frames, Orlikowski and Gash (1994) illustrate a simplified four-step process that could be applied to CoIT as exemplified in section 4.1.1.

The perspective of analyzing the existing technological frames would advance the justification for why consumer IT is chosen by users for certain work tasks rather than employing the IT offered by the internal provider. Additionally, it could help in clarifying both what is actually perceived as consumer

and corporate IT by enterprise end users and corporate IT providers as well as how the IT function might have to adapt to these developments from a managerial and strategic perspective. Though Harris et al. (2011, p. 2) define CoIT as “the adoption of consumer applications, tools and devices in the workplace,” they do not define what consumer applications actually are. Murdoch et al. (2010, p. 2) claim that consumer technologies “promise greater freedom and more fun,” while Niehaves et al. (2012, p. 2) conceptualize CoIT as a combination of private ownership with business purpose, which makes no claim about the technology itself.

Lens	Summary of lens	Helpfulness for theorizing CoIT
Duality of technology (Orlikowski, 1992)	<ul style="list-style-type: none"> - Technology consists of various configurations of hardware and software being created and changed by human action but also used by humans to accomplish some action. 	<ul style="list-style-type: none"> - Helping to understand CoIT not as an event but rather as a process
Technological frames (Orlikowski & Gash, 1994)	<ul style="list-style-type: none"> - Technologies are social artifacts that can and will be interpreted differently by various social groups. - Technological frames consist of people’s perception of the technology and their understanding of its capabilities and functionality, the way the organization acquires and implements the technology, and people’s understanding of how the technology is used on a day-to-day basis as well as the conditions and consequences of such use. - Technology is understood primarily by the corporate IT introducing it and secondly by the users. 	<ul style="list-style-type: none"> - Helping to gain a better understanding of users and IT functions’ perceptions of IT and IT services - Explaining the expectations from and the need for consumerized technology within the company - Examining how and why IT end users in organizations decide to use consumer IT to address their work-related needs rather than drawing on enterprise end user IT
Adaptive structuration theory (DeSanctis & Poole, 1994)	<ul style="list-style-type: none"> - Designers incorporate logic structures in their technology products. - Users can use the products either as they were intended or create creative “workarounds” to enable functionalities that were not intended by the designers (unfaithful appropriation). 	<ul style="list-style-type: none"> - Helping to understand the properties and functionalities employees miss in corporate IT tools - Understanding the way users appropriate consumer technology to design more intuitive tools
Socio-materiality (Orlikowski & Scott, 2008)	<ul style="list-style-type: none"> - There is no way to distinguish users from technological artifacts; they are two sides of one coin. - Technologies offer a set of affordances (or features); however, different users perceive different affordances as meaningful and use artifacts in diverse ways. 	<ul style="list-style-type: none"> - Understanding the impact CoIT has, not only on the technology, but rather on the organization as a whole - Analysis of the affordances that make users desire the utilization of technologies

Table 4. Theory Lenses and Possible Benefits for CoIT Research.

The approach of regarding appropriation in the sense of the adaptive structuration theory of a technology’s features as “faithful,” meaning in the way the designer of the functionality intended, and “unfaithful,” meaning in a different way than originally designed, could be helpful for defining CoIT. Since most definitions agree that CoIT is at least somehow related to using private, consumer, or own technology or devices in a business or work setting, there must be some (perceived) value of appropriating consumer technology for performing corporate tasks. The application of the adaptive structuration theory could help deliver an approach of defining what CoIT is as an occurrence of unfaithful appropriation moves. This is in contrast to the duality of technology, examining the process-

related aspects of adaption inside an organization, and the technological frames, explaining how users develop their own expectations about IT and thus accessing the consumer IT market where they assume their new expectation to be met. Although consumer IT is widespread and its appropriation might be hard to reconstruct, applying proven and tested methodologies for appropriation moves might help in reconstructing the process or even predicting the appropriation of employees for technologies yet to come.

From the perspective of sociomateriality, it would be interesting to elucidate the changing organizational structures through the emergence of ubiquitous computing and individual information systems. Research today focuses on the antecedents and consequences of CoIT for the individual (Niehaves et al., 2013; Ortbach, Bode, et al., 2013) or IT management (Copeland & Crespi, 2012; Harris et al., 2011). However, to the best of our knowledge, there has not yet been an analysis of the impact on the relationship between the organization and individual or the organization itself.

A combination of different theoretical lenses would support research in gaining a more holistic picture of the phenomenon. Integrating findings about the technological frames regarding what kind of consumer IT they bring into the corporate environment and why, adaptive structuration theory about how the appropriation occurs, and a sociomaterial stance that analyzes possible structural consequences would provide a much deeper insight into the phenomenon of CoIT than merely analyzing isolated and quantifiable aspects.

Every theory needs a solid structure, which means being aware of the dimensions of causal agency, logical structure, and level of analysis (Markus & Robey, 1988). To date, CoIT is approached from the technological imperative point of view, meaning that external forces cause change and the emergence of new technologies is seen as the source of stress and change. We still lack research integrating the emergent perspective, considering the interaction of people and events for a deeper understanding of CoIT. Furthermore, existing research is based solely on variance models, in which a given input (e.g., user beliefs) and output (e.g., CoIT behavior) are operationalized quantitatively. However, to the best of our knowledge, there is not yet an emergent perspective on CoIT assuming that uses and consequences of IT are unpredictable and are emerging from complex social interactions (Markus & Robey, 1988, p. 588). We want to propose an approach in which technology is regarded as “an ensemble of equipment, applications, and techniques that carry social meanings” instead of “a tool with identifiable benefits, costs, and skill requirements” (Kling & Scacchi, 1982, p. 7).

6 Conclusion

In this paper, we reviewed existing research on CoIT and revisited key theoretical lenses that may guide future empirical research in this domain. We illustrated that research on CoIT is still in its infancy and that much-needed empirical research may benefit from applying a combination of various established theoretical lenses.

In particular, we find that the CoIT phenomenon is so multifaceted that it deserves a multi-theoretical perspective. For example, applying a technology frames perspective may shed light on how and why beliefs associated with CoIT are so different from established technology beliefs within traditional organizations. However, a technology frames perspective alone will not yield insights into the important interplay between individual-level interactions with technology and the overarching governing structures imposed on technology users by organizational IT functions; a sociomaterial theory perspective would be much more useful for theorizing such interactions. Therefore, based on our review of CoIT domain literature as well as applicable theoretical lenses, we argue that a combination of different theoretical lenses is recommended for examining CoIT in order to understand both the changing beliefs and values associated with consumer IT developments as well as the changes in interactions with technology and how they shape, and are shaped by, the surrounding organizational structures (e.g., the role of IT inside the organization, the role of the IT function).

CoIT is a phenomenon that changes our beliefs about technology as well as the very concept of technology in organizations, i.e., its role and scope. This has important implications for IT-related relationships both within and across organizations that must be examined empirically.

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