Managing BYOD: how do organizations incorporate user-driven IT innovations?

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Abstract

Purpose – In reference to increasing consumerization, this article investigates how organizations react to employees' adoption and use of personal devices at work, such as by incorporating innovative, individual, IT-driven changes into their corporate practices. The paper aims to discuss these issues.

Design/methodology/approach – Four in-depth, longitudinal case studies, conducted between 2006 and 2010, feature 92 interviews and observations to ensure triangulation.

Findings – We identify three types of organizational reactions (induction, normalization, and regulation) that depend on specific dimensions and affect the nature of subsequent IT-based organizational change.

Research limitations/implications – Continued research into the consumerization of IT can explore how it affects organizations today and whether different effects might arise in other contexts and with different kinds of organizations.

Practical implications – Reversed IT adoption logics have deep consequences for organizations; companies could achieve great gains from them, if carefully considered and managed.

Originality/value – This article addresses a topic that has been analyzed only scarcely and rarely, namely, the consumerization of IT and the tactics organizations use to incorporate user-driven IT innovation. Although this article presents only a few cases, it constitutes an initial attempt to explore this research area theoretically and investigate the ways organizations can harness employees' personal IT adoption logics to promote creative, IT-driven change in firms.

Keywords Organisational change, End user, Adoption, Multiple case studies

Paper type Research paper

Introduction

In 1994, Markus and Keil established a notable goal: *designing information systems that people want to use*. For years, information systems (IS) research has studied the organizational implementation of IS, which requires employee users to accept new technologies, methods and practices for achieving organizational performance. In search of an answer to the productivity paradox (Brynjolfsson and Hitt, 1998), IS research also has strived to determine why technically successful organizational information technology (IT) systems often wind up unused or even just underused by employees, costing companies millions of dollars. This extensive research has shown that IT success depends not only on IT investments but also on whether and how organizational members use those IT systems (Davis, 1989; DeLone and McLean, 1992). Because organizational members must appropriate IT-based organizational changes and incorporate them into their work practices (Orlikowski and Hofman, 1997), research has worked to find ways to "build systems that users want to use" (Malhotra and Galletta, 2004, p. 89).

More recently, the technological environment of organizations has changed dramatically due to the "consumerization" of IT. Consumerization refers to the adoption and adaptation of consumer applications, tools, and devices in the workplace, as a means to carry out work tasks (Harris *et al.*, 2011; Ortbach *et al.*, 2013). It consists of "abandoning

enterprise IT—both hardware and software—in favor of consumer technologies that promise greater freedom and more fun" (Murdoch *et al.*, 2010, p. 2). According to Gartner (2012), IT consumerization will be the most significant IT trend affecting companies for the next decade. Through IT consumerization, employees establish complex, personalized setups that combine privately owned with company-provided IT (Ortbach *et al.*, 2013). The resulting process of IS individualization extends the end-user computing phenomenon and continues to grow increasingly common (Baskerville, 2011; Ortbach *et al.*, 2013).

In particular, the boom of smartphones, broadband Internet access at home, worldwide mobile phone networks, wireless Internet access, and Web 2.0 have disrupted classical IT adoption logics in organizations (Baskerville, 2011; Crowston *et al.*, 2010; Isaac *et al.*, 2006). As a result of the concomitant lower knowledge barriers, decreased costs, pervasiveness, and availability of mobile devices and telecommunication networks, many people now use mobile technologies in both private and professional contexts (Henfridsson and Lindgren, 2005; Crowston *et al.*, 2010). Users' behaviors also have changed; more than ever before, they are technologically savvy, connected to sophisticated devices, and willing to use personal technologies in professional spheres, such that they offer the potential to introduce IT-based changes to their companies (Leclercq, 2008). Through their own initiative to bring and use their personal devices at work, individual users might initiate IT-driven transformations that allow organizations to evolve and rethink their processes. For example, workers use applications on their personal technologies (e.g. location-enabled mapping applications, expense management applications, consumer applications such as Google Docs and Yahoo! Messenger) to serve business purposes, so for example, "A Canadian hospital recently reported […] that a nurse's innovative use of her camera phone lowered costs, enhanced patient care and reduced staff frustration" (Harris *et al.*, 2011, p. 3). If such initiatives lead to the emergence of new practices, those practices can be favored, formalized, and further extended (or not) by organizations to improve their processes and productivity.

To date, organizational reactions to and acceptance of such personal devices have been studied mainly in practitioner studies and from two perspectives: security and cost efficiency. Thus some studies focus on security issues and the risks associated with these practices, which may inhibit organizational acceptance of such practices. Yet organizations also seem attracted to new IT adoption logics, which enable them to reduce their technological costs. Some companies even have started implementing "bring-your-own-device" (BYOD) programs, encouraging employees to use their personal devices for work-related activities. However, an organization's reaction to and appropriation of these renewed adoption logics demands more than just a balance between security problems and cost efficiency (Gens *et al.*, 2011). Furthermore, the organization might have a lot to gain from reversed adoption logics and could benefit from the innovative and creative practices to which they give rise.

Because of the lack of IS research on these issues (Baskerville, 2011; Crowston *et al.*, 2010), several questions remain unanswered though, such as, How do organizations react to user-driven adoption logics and incorporate user-driven IT innovation? Our research goal is to explore how organizations react to, accept, and incorporate IT-driven change initiated by organizational members through the uses of their personal technologies at work. To address this goal, we explore four cases in which organizational members have introduced their own devices to serve business purposes.

In the next section, we contrast two perspectives on IT implementation and IT-driven change: (1) organizations building IT systems that users want to use and (2) users introducing IT systems that organizations want to incorporate. Following this literature review, we present our research methods and four case studies. Finally, we discuss the key findings and offer several conclusions.

Two contrasting perspectives on IT implementation
This section highlights the similar and contrasting concerns associated with two perspectives on IT implementation and IT-driven change (Figure 1).

Organizations build IT systems that users want to use, or not
In the past, organizations decided what IT systems workers would use, as well as why, how, and when. In response, IS research focused on organizational "technochange" or technology-driven organizational change (Markus, 2004). Organizations strategically adopt and implement IT systems, which then diffuse among users to improve the organization's performance (Cooper and Zmud, 1990; Kwon and Zmud, 1987). Because it represented a priority to both practitioners and researchers, technochange and IT systems implementation created a research area that has received substantial attention in the past 30 years (Moore and Benbasat, 1991). In this research area, IT implementation is defined as "an organizational effort directed toward diffusing appropriate information technology within a user community" (Cooper and Zmud, 1990, p. 124). In line with Lewin's (1952) theory, the various models of IT-driven change generally include six stages, from IT initiation to routinization and infusion (Cooper and Zmud, 1990; Kwon and Zmud, 1987).

Beyond change models that follow a linear logic, extensive IS research has identified several main causes of a lack of return on the investment in most IT projects. Users' acceptance of organizational IT systems rapidly emerged as one of the most important
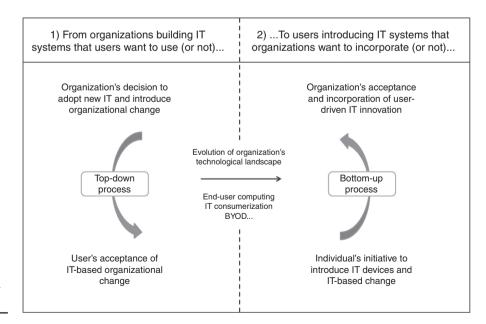

Figure 1.
Two contrasting perspectives on IT implementation and IT-driven change

factors (Davis, 1989). According to Markus (2004, p. 4), "one major risk in technochange is that people will not use information technology and related work practices," which would obstruct the IT systems' expected benefits, leading to the "paradox of productivity" (Venkatesh and Davis, 2000). That is, IT investments by organizations produce operational, financial, or competitive value for the firm only if they transform into systems or applications that individual employees perceive favorably and use effectively. Even after they have been adopted at the organizational level, IT systems must be accepted, adopted, and used by the organizational actors. Thus, it is crucial that organizational actors perceive IT systems favorably for them to be used and considered effective (DeLone and McLean, 1992). The questions of why "some information systems that companies have invested millions of dollars in developing" are "never used or avoided by the very people who are intended to use them" (Markus and Keil, 1994, p. 11) leads to answers related to users' acceptance and usage of organizational IT systems. In seeking such answers, IS researchers identify several specific factors and dimensions.

Balance between perceived benefits and perceived risks. One of the main factors is the balance between perceived benefits and perceived risks. Organizations generally weigh the perceived benefits of an IT system, such as users' expectations, the IT system's ease of use, perceived utility, and user friendliness (Davis, 1989; Markus and Keil, 1994), against the perceived threats, risks, and drawbacks, such as system complexity and required level of effort (Davis, 1989), perceived unfairness, loss of status, loss of power (Lapointe and Rivard, 2005; Markus, 1983), and threats to self-identity (Barrett and Walssham, 1999). Furthermore, perceived threats affect resistance to change (Bhattacherjee and Hikmet, 2007), which in turn has a significant influence on IT acceptance.

Users' role (involvement, background and motives). Another notable factor is users' involvement and background. Their experience, knowledge, and participation in the IT system development are key determinants of users' acceptance and usage of organizational IT systems (Barki and Hartwick, 1994; Ives and Olson, 1992). Furthermore, organizations must build systems that people want to use, leading to recommendations that organizations "design performance-improving systems with use built-in" so that "users really will come" (Markus and Keil, 1994, p. 24). Yet even the best designed IT systems will not get used if they are not aligned with users' motivations and commitment (Malhotra and Galletta, 2004), so user commitment and motivation are crucial for the adoption of IT systems, as well as for their sustained use and IT-driven change efficiency.

Organizational support. Organizational support has also been identified as an important driver of IT usage by people in organizational contexts. For example, managerial attitudes and line managers' efforts (Burkhardt and Brass, 1990; Leonard-Barton and Deschamps, 1988; Markus and Keil, 1994) are key to the ways employees accept and use organizational IT systems.

Contextual variables and characteristics. Some individual characteristics might act as contextual variables, affecting both IT acceptance and usage, such as gender (Gefen and Straub, 1997), intellectual capabilities (Lederer *et al.*, 2000), experience (Venkatesh and Morris, 2000), age (Venkatesh *et al.*, 2003), and cultural background (Igbaria *et al.*, 1995).

In summary, prior research has emphasized organizational IT adoption decisions and the subsequent role of users' acceptance of organizational technochange. But today, new technological trends and users' altered behaviors force businesses to rethink the way

they manage IT adoption logics and deal with IT-driven change. In turn, IS researchers must focus on understanding how users introduce the consumer IT devices they want to use and how organizations can incorporate their practices.

Users introduce IT systems that organizations want to incorporate, or not
Employees are not just recipients of and indirect participants in organizational IT-driven change. They also initiate IT-based change, through their choices to bring their own devices to work and use them for work purposes (Harris *et al.*, 2011). Recent innovations, such as broadband or wireless Internet access and Web 2.0, have lowered the knowledge barriers to new technology (e.g. mobile technologies, social media), such that more people now experience them first in private contexts (Crowston *et al.*, 2010) and then consider ways to use them in professional contexts. For example, since their initial launch in 1985 as expensive executive tools, mobile phones have become standard, pervasive communication devices (DeSaulles and Horner, 2011), subject to a wide contagion effect. This evolution of the technological landscape and user behaviors in turn has reversed the implementation evolution of IT systems in organizations (Baskerville, 2011; Crowston *et al.*, 2010; Moschella *et al.*, 2004). Whereas IT systems generally had been decided and diffused at the organizational level, then assimilated by users, IT increasingly are adopted by individuals, then used later in organizational contexts (Crowston *et al.*, 2010). The adoption of IT systems is not top-down; rather, the shift reveals the emergence of a bottom-up process (Figure 1), through which people might take the initiative to acquire and use IT systems to serve their business purposes, especially if they have not been sufficiently equipped by their organizations or believe they could be more efficient using their personal devices. Such technologies might be adopted by individuals, then formalized and diffused across organizational contexts, and finally incorporated into official work practices. Such adoption logics force businesses to rethink not only the way they provide and manage IT systems, as commonly stated in practitioner studies (Harris *et al.*, 2011; Brousell, 2012; Gartner, 2012), but also how they conceive of, manage, and assimilate IT-driven change introduced by users.

Through users' initiatives to bring and use their own devices in companies, new forms of technochange likely occur in organizations, allowing them to evolve and improve their processes (Harris *et al.*, 2011). For example, increasing adoption of mobile technologies by U.S. citizens has led the government to rethink its main processes and reconsider the way it provides public services, such as tax payment. Harris *et al.* (2011, p. 3) describe a U.S. Army captain who "invested \$26,000 of his own money to develop a smartphone application for soldiers fighting on the battlefields of Iraq and Afghanistan […] to help servicemen and women locate the enemy, direct artillery fire and summon helicopters for evacuating wounded soldiers." Unlike previous and unsuccessful IT-based changes, this application "was developed and deployed in just a few weeks." Similarly, business transformations might be expected from innovative workers' uses of their personal devices in professional contexts.

The emphasis on the role of individuals in change management and innovation processes is not new. Prior research in strategic management and organizational theory has investigated decisions at the individual level in a bottom-up logic, which can further affect the overall organizational strategy. Strategic innovations are not always the result of strategic decisions made by senior management; they also appear as a result of autonomous initiatives at the operational level by individual workers, who act as internal entrepreneurs (Bower, 1970; Burgelman, 1983; Goshal and Bartlett, 1994;

Noda and Bower, 1996). Similarly, IT-based change may derive not only from strategic decisions at the top of the organizations but also from local initiatives, especially in a technological era marked by consumerization and BYOD. In contrast with practitioner studies that present BYOD as a completely new phenomenon though, it actually extends a technological trend that began in the late 1980s, called "end-user computing" (Baroudi *et al.*, 1986; Davis and Olson, 1985; Doll and Torkzadeh, 1988, 1989; Rockart and Flannery, 1983), which started changing the role of users and the way they interact with and obtain information. The widespread deployment of home and business microcomputers and the availability of mass-market applications software enabled business employees to access substantial computing power through direct interaction with sophisticated computing tools (e.g. reporting programs, spreadsheets, databases, programming languages). Users' autonomy and influence over IT systems and their uses thus are not new; rather, BYOD might be presented more accurately as a second wave of a revolution that started 30 years ago. However, the stakes for organizations are "exponentially higher" today (Harris *et al.*, 2011, p. 2), because of the vast availability of IT devices for personal use and the resulting spillover effect, such that users want the same devices introduced in the workplace. These technologies are so numerous, diverse in their functionalities, and affordable that they have led to an "employee-driven IT revolution" (Harris *et al.*, 2011, p. 2), with valuable opportunities for organizations.

However, to the best of our knowledge, no in-depth IS research has investigated how new technological trends and IT adoption logics lead individual users to initiate IT-based change (Baskerville, 2011) that organizations can capitalize on and harness as business transformations. The structurationist model proposed by Orlikowski (1992) and DeSanctis and Poole (1994) offers insights into how end-users influence IT system design and use through various appropriation moves. Social structures in technology and action shape each other, so that organizational innovations and technological innovations combine unpredictably and in an emergent manner (DeSanctis and Poole, 1994). Recognizing the recursive interaction between people and technologies over time, Orlikowski (1992) also investigates how users enact particular technologies-in-practice, which may reproduce existing structural conditions or produce IT-based local changes, leading to deeper structural transformations. Similarly, echoing the well-known distinction between deliberate and emergent strategies (Mintzberg, 1994), Orlikowski and Hofman (1997) argue that the use of a new technology in an organization always involves series of anticipated, emergent, and opportunity-based changes, which are simultaneously planned by organizations in advance and result from local, spontaneous innovations. This conceptualization still assumes that the introduction, deployment, and appropriation of a new IT system by users start with the organizational decision to change though. No academic research explores employees' decisions to bring their own devices to work or how such user-driven IT innovations get incorporated by organizations. As Sawyer and Winter (2011) note with concern, IS research has not adapted yet to new technological trends that go beyond the scope of organizational IT systems. Instead, new technological trends mainly have been investigated in practitioner studies, from the viewpoints of productivity, cost efficiency, and security risks, not in relation to an organization's reaction to, adoption of, or incorporation of innovative practices.

To help us in this task, we analyze the reverse adoption logic in light of dimensions identified in classical research on IT adoption and thereby seek to explain employees' acceptance of IT-based organizational change (Table I). Although the two perspectives

| Dimensions | 1. Organizations build IT systems that users want to use, or not | | 2. Users introduce IT systems that organizations want to incorporate, or not | |
	Factors	References	Factors	References
Balance between perceived benefits / perceived threats, risks, and drawbacks	User's expectations of IT use, perceived ease of use, and usefulness, user-friendliness / System complexity and required level of efforts; perceived unfairness; loss of status or loss of power; threats to self-identity	Davis, 1989; Markus and Keil, 1994; Davis, 1989; Lapointe and Rivard, 2005; Markus, 1983; Barrett and Walssham, 1999	Increased employees productivity and satisfaction, diminution of the firm's technological costs / Security risks, data loss, compatibility problems with existing IS	Brousell, 2012; D'Arcy, 2011; Gartner, 2012; Niehaves et al., 2012; Unisys, 2010; Kaneshige, 2012; Vile, 2011
User's role (involvement and background)	Users' experience, commitment, motivation, and knowledge, participation in IT system development	Barki and Hartwick, 1994; Ives and Olson, 1992; Markus and Keil, 1994; Malhotra and Galletta, 2004	User's background and experience, individual drivers that lead business employees to bring their own device at work	Gartner, 2012; Harris et al., 2011; Niehaves et al., 2012
Organizational /internal support	Managerial support and attitudes, line managers' efforts	Burkhardt and Brass, 1990; Leonard-Barton and Deschamps, 1988; Markus and Keil, 1994	Managerial approach to IS, role of the IS department in the organization [Lack of research on this dimension]	Harris et al., 2011
Contextual variables and characteristics	Individual characteristics: gender, intellectual capabilities, experience, age, cultural background	Gefen and Straub, 1997; Lederer et al., 2000; Venkatesh and Davis, 2000; Venkatesh et al., 2003; Igbaria et al., 1995	Organizational characteristics: organizational structure, formalization, culture, nature of activity, management style [Lack of research on this dimension]	Harris et al., 2011

Table I.
Comparison of the two perspectives on IT implementation

differ, they share similar interest in the dimensions that might explain adoption logics and change management. The analysis in turn helps us identify some gaps in academic literature on BYOD that have prevented a full understanding of the real impacts of this employee-driven revolution on organizational change (Harris *et al.*, 2011).

Balance between perceived benefits and perceived risks. Recent studies (e.g. Brousell, 2012; D'Arcy, 2011; Gartner, 2012; Niehaves *et al.*, 2012; Unisys, 2010) demonstrate that companies generally acknowledge the positive perceived benefits of BYOD, which helps employees be more productive and feel more satisfied with their jobs. The organization's perceived benefits also relate to the diminution of its own technological costs, because it no longer has to provide employees with sophisticated and costly devices or update them repeatedly. However, organizations also perceive risks, threats, and drawbacks associated with this reverse adoption logic (Kaneshige, 2012; Vile, 2011), including security risks and data loss, leading them to express reluctance toward developing such practices. As a consequence, organizations may adopt various strategies to manage IT consumerization (Harris *et al.*, 2011): *anarchy*, such that management allows external devices to enter the enterprise without restriction; *authority*, a tactic by which management restricts the number of devices entering the enterprise; or *adoption*, in which case management recognizes the inevitability of IT use. Yet despite some valuable contributions, extant practitioner studies cannot reveal why and how organizations adopt a particular strategy.

Users' role (involvement, background and motives). Practitioner studies also denote different reasons that lead employees to bring their own IT devices to work, such as the search for productivity, flexibility, ease, or pleasure (Gartner, 2012; Harris *et al.*, 2011; Niehaves *et al.*, 2012). However academic IS research has not yet explored employees' decisions to bring their own devices to work or how such user-driven IT innovations get incorporated by organizations.

Organizational support. Internal support, characterized by managerial approaches to IS or the role of the IS department in the organization (Tarafdar and Vaidya, 2006), also might affect companies' reactions to BYOD initiatives. For example, practitioner studies suggest that BYOD practices might affect the role of and support provided by IT departments in organizations (Harris *et al.*, 2011; Murdoch *et al.*, 2010). More in-depth research is required to understand the full implications of these new IT-based practices.

Contextual variables and characteristics. Finally, practitioner studies suggest that not all organizations can adapt to a reverse adoption logic, depending on their inherent characteristics, leading to calls for more research on this dimension. For example, the three approaches adopted by organizations (anarchy, authority, or adoption; Harris *et al.*, 2011) seemingly depend on the firms' inherent characteristics, such as structure, level of formalization, organizational culture, nature of activity, and management style. Various organizational characteristics thus might explain organizational reactions to IT consumerization. That is, the incorporation of individual IT-based changes might take various forms (beyond anarchy, authority, and adoption), and these connections require a closer investigation.

Table I provides a synthesis of both approaches, structured along the same dimensions.

In summary, despite recent advances in practitioner studies, a lack of in-depth analysis of the BYOD phenomenon and its underlying dimensions makes it crucial to investigate the reasoning that underpins organizations' reactions and incorporation (or not) of user-driven IT innovations. An in-depth academic study can go beyond the

practical aspects of practitioner studies, to explain the impacts of renewed adoption logics on organizations (Baskerville, 2011; Sawyer and Winter, 2011; Vodanovich *et al.*, 2010), and thus provide vital information to organizations, including suggestions of ways they can incorporate potential business transformations arising from individual initiatives.

Research methodology

To investigate this under-researched phenomenon, we selected an exploratory approach. A case study method is particularly appropriate for exploring new topics, because it supports in-depth descriptions and analyses of specific situations (Yin, 2003). Our goal was to contrast diverse situations; considering the various potential dimensions in prior literature, it is conceivable that different organizations exhibit different attributes on these dimensions. We thus explored four cases in terms of their size, structure, and sector of activity. They offer high diversity and rich insights into why and how workers brought their own devices into a company setting and used them for business purposes (Table II)[1]. Furthermore, this in-depth exploration enables us to attend closely to individual adoption processes, usage contexts, and potential IT-driven change initiatives. We also explore how organizations react to various initiatives and incorporate them into their own practices.

This method depends on interviews and observations over time, which helps ensure triangulation. The case studies were part of a larger research project conducted for almost four years, beginning in 2006 and ending in 2010. First, we conducted 92 interviews with employees across companies (see Table II). The semi-structured interviews were adapted to each type of respondent in the four companies, but they were all based on open-ended questions (see Appendix 1), derived from implementation, user acceptance, and change management literature, as well as from practitioner publications (Moschella *et al.*, 2004). Further themes emerged about users' adoption decisions and experiences with mobile technologies, their behavior and usages over time, the IT-based changes they introduced into their organizations, and the way organizations reacted to and incorporated—or did not—such initiatives. Second, we conducted observation studies at the respondents' workplaces to enrich our analysis. Third, we collected secondary data, including internal documentation, meetings, and press reviews, to gain insights into the case situations.

We subjected all our data to a qualitative content analysis using a thematic coding procedure (Miles and Huberman, 1994) with Nvivo software. We employed double-coding to check the reliability of our analysis and applied a three-step coding procedure (Richards, 2005).

Descriptive coding involves storing information that describes the cases. The Nvivo software creates "attributes" that store information about people, consumer IT, and groups involved in BYOD (users, business employees, managers, IT departments, CIO and CEO), their jobs, roles and activities, and contextual elements related to the organization and users.

Topic coding allocates passages to topics that correspond with conceptual entities. The qualitative analysis followed both deductive and inductive reasoning. First, we identified a priori the main topics (which informed the interview guide) related to the nature and motives of individual BYOD initiatives, the dimensions that might explain the different reactions from organizations, and the possible strategies adopted by organizations. Second, we gathered themes that emerged from the data

Company	BYOD initiatives	Respondents	Number of interviews
INDUSPROD As a French, medium-size, family-owned company, in which the CEO exerts strong authority, INDUSPROD specializes in business-to-business (B2B) distribution It sells industrial products to companies located in the aeronautics and automotive industries	At the time of this case study (2006-2008), the commercial force consisted of 25 sales representatives, located all over France, who organized their visits to clients every day, within a 250 km radius from their place of residence. They often spent a night or more at hotels to cover their area and optimize their rounds. They had been equipped with laptops by their company, so that they could send their sales reports to their sales manager. However, battery and connection problems prevented them from using their laptops as intended, such that they simply postponed their reporting to the end of the week and sent the reports via e-mail or fax. Such practices were tolerated by management, out of recognition of the difficulties and lack of convenience linked to the use of laptops, though the CEO regretted this lack of efficiency. Local managers gave up on the expectation that they would receive daily reports from representatives and accepted feedback, whether in paper or digital format, at the end of each week. However, some sales representatives decided to use their own mobile phones and smartphones to perform business activities and be more efficient	Sales representatives, sales manager, CEO, IT manager	21
BUILDCORP BUILDCORP is a very large multinational building company, located in the in the public works sector, whose core business centers on construction sites	Site forepersons, supervised by site managers, are responsible for managing their teams, as well as organizing and coordinating resources on roadwork sites. They were responsible for completing a weekly paper report, informing the accountancy department of the various orders and invoices related to their construction sites. For example, their reports indicated the quantity of building materials ordered for sites, the engines hired, and the number of temporary staff employed. Because of a lack of clear policy about this reporting though, many site forepersons offloaded their reports to their site managers,	Site forepersons, accountants, head of local agency, project head, HR manager, CIO	32

Table II.
Description of the
case studies and
surveyed population

Table II.

Company	BYOD initiatives	Respondents	Number of interviews
	who regularly visited the construction sites. Frustrated by the lack of technological equipment, a small group of site forepersons took the initiative to use their personal laptops to complete and digitalize their reports		
COMPLUS A French large communication company, COMPLUS provides communication devices and Internet access to both business-to-consumer and B2B clients	In this fiercely competitive industry, the sales force has become crucial. Sitting at the technology cutting edge, the company decided in the mid-2000s to equip its sales force with tablet computers to increase its efficiency and productivity. The organizational goal was to improve the visibility of sales force activity, through formalized, stricter, faster, and more detailed reporting requirements related to their contacts with clients and sales. This deployment failed though, in that nearly half of the sales force refused to use the new IT system. They were accustomed to freedom in the way they managed their activity and their geographical area, so salespeople perceived the organizational IT system as a project that would track their productivity and challenge their very identity as free commercial workers. The company had to abandon the project almost two years after its launch. Several managers (e.g. CIO, sales manager) were fired, and a major reorganization was launched After 2008, to remain its innovative reputation and respond to new technological trends, COMPLUS management made conscious efforts to determine employees' expectations and demands. It had always cultivated an internal culture that favored staff loyalty, autonomy, innovation, and open discussion, which likely explained the massive rejection of the previously imposed project. In contrast, it progressively gave salespeople more flexibility to telecommute and allowed them to use their personal devices at home or at work. In this context, salespeople brought their own mobile technologies, thus compensating for the failure of a previous organizational IT project	Sales staff, commercial director, CIO	19

Company	BYOD initiatives	Respondents	Number of interviews
CONSULT			
CONSULT is a small French structure that is part of large consulting company	CONSULT classifies its employees into three categories (junior consultants, senior consultants, managers). Consultants are very mobile and spend most of their time at their clients' workplaces—one estimate suggested that they spend four days each week at a distance from their company's office. However, smartphones are assigned only to top managers and managers, which represents a statutory logic, because they spend most of their time on the company's premises, unlike the mobile consultants. Except for laptops, consultants do not receive any professional mobile technology from their company. They are left to find their own equipment for professional purposes	Managers, senior consultants, junior consultants	20
Total Number of Respondents			92

Table II.

(e.g. nature of subsequent organizational IT-based change). Third, we identified four major categories (BYOD initiatives, dimensions of organizational reactions, strategies adopted by organizations, and further IT-based organizational change), each of which included multiple themes and dimensions (in total, 18 themes and 66 dimensions) (see Appendix 2).

Finally, *analytical coding* helped us define and interpret the meaning of the data in their context. We applied rich thematic coding, which can attribute the same extract to different nodes. We analyzed the data using cross- and within-case analyses (Miles and Huberman, 1994; Tarafdar and Vaidya, 2006; Yin, 2003). Using the cross-case analysis, we identified the factors and dimensions of the BYOD phenomenon. Then the within-case analysis helped us specify the nature of the three organizational approaches to BYOD and map each organization onto one approach. It also enabled us to analyze how each reaction affected the nature of subsequent organizational change.

Findings

Cross-case analysis

Our findings confirm the existence and relevance of reversed IT adoption logics in organizations, a process that is not just top-down but also bottom-up. The cross-case analysis included the dimensions identified in our literature review; in turn, this analysis helped us confirm and specify the dimensions that explain these BYOD initiatives and affect the way companies incorporate the latter. (For clarity, we start with the user's role, followed by the balance between perceived benefits and perceived risks, internal support, and contextual variables).

Users' role. According to our analysis, various, specific motives drive individual BYOD initiatives, which affect how employees undertake such initiatives. These various motives can be clustered into two categories in the companies we study.

First, in some cases, it is the desire of employees to be more efficient and improve their productivity or time optimization that leads them to introduce their own IT at work. In this situation, the most techno-savvy employees—who are motivated by a deep sense of initiative and find pleasure in using their own IT at work—usually drive BYOD initiatives and influence other employees. Employees may also be driven by a sense of challenge, empowerment, and autonomy in the way they carry out their mission, which leads them to bring their own consumer IT to work. Emulation goals also explain why they are naturally involved in BYOD initiatives, making them willing to share initiatives and provide support to others.

For example, the INDUSPROD case reveals that some sales representatives, especially the youngest and most technologically savvy, relied on personal technological devices such as personal digital assistants (PDA) or sophisticated mobile phones to be more efficient. They appreciated their functionalities and progressively began using them for professional reasons. For example, they used PDAs to keep track of their customer visits and follow up with customers, as well as to reach their sales manager, as the following quote reveals: "*I had bought a very cool and smart PDA—I've always loved technologies! […] I realized it could enable me to be more efficient at work, so it became really natural for me to use it for professional reasons, for example to send a daily report to my manager, telling him how it went with my customers during the day.*"

In a similar vein, as a young, modern, high-tech company, COMPLUS featured mainly young, technologically savvy employees, who wished to use their sophisticated personal devices at work and expected the same technological standards in both

private and professional environments: "*I think I'm already very well equipped, I really enjoy using my smartphone, so I don't see why I should use another device. It's handier, and more efficient to use mine!*" Therefore, salespeople received encouragement to bring their modern, cutting-edge mobile technologies (smartphones, tablets), which they had bought for themselves, to work.

Second, in other cases, BYOD initiatives can be explained by employees' dissatisfaction with their company's equipment policy. In this situation, employees are not necessarily technically sophisticated. It is a kind of disappointment with the initial policy of their company, followed by an implicit pressure to conform to what they perceive as implicit norms of behavior, that drive them to introduce their own devices at work.

For example, CONSULT did not provide consultants with mobile technological devices. Our field observations revealed the lack of any strong technological equipment policy. Not all the consultants initially were happy with this equipment policy, and they sensed increasing needs to use their personal devices for business purposes. The necessities of their jobs in terms of responsiveness, time optimization, efficiency, and availability prompted more consultants to bring their own devices to work. For example, consultants used their personal mobile phones and smartphones to reach clients, managers, and peers, and they provided their personal number to others who needed to reach them. Over time, such professional uses of their personal devices became habitual, as explained a junior consultant: "*When I entered the company, I was really disappointed not to get any mobile or smartphone. So I've started using mine. I really don't know how I could do without my PDA and my mobile phone. They are essential to my job now.*"

Similarly, in the BUILDCORP case a small group of site forepersons in one local agency, who were somewhat frustrated by the lack of professional technological equipment, took the initiative to bring their own laptops or recuperate old laptops formerly used by their managers to structure their reports more clearly and then send them directly to the accountancy department and their manager. This small group consisted of young, newly graduated site forepersons, who had some experience with computing and already used personal computers at home. They found some practices in their company "*archaic and inefficient,*" as one of them put it: "*We don't understand why the company has not equipped us with appropriate technologies, which would allow us to structure our report, to be more efficient, and to avoid wasting time by writing the same information every week on our reports […]. You cannot imagine the time we lose by filling the report by hand.*" These innovative site forepersons decided to introduce their own chosen technologies to improve their efficiency—and were very pleased to do so. Their mobile, computer-based system supported the remote transmission of information directly from the building site to the accountancy department. As one of them explained, "*We developed a little computer-based system with Excel sheets […]. We gathered our personal computers, we added three or four old laptops that were formerly used by the managers, and then we started processing our reports. It was more convenient for us, it helped us gain time, and our reports were really cleaner.*"

Balance between perceived benefits and perceived risks and drawbacks. Our results also show that the balance between the perceived benefits of employees' initiatives to bring their own devices to work and the perceived risks of such initiatives affect the ways companies incorporate those initiatives. We identify three main scenarios.

First, in some situations, the potential of users' IT in the workplace is clearly recognized as a way to introduce change, innovate, and maintain a modern image.

In such situations, companies seem aware of potential risks (e.g. security, compatibility), but they generally perceive the benefits as stronger than the risks and threats. For example, at COMPLUS, management came to realize that it had much to gain from the initiatives of its salespeople. As they started using their own personal devices (PDA, smartphones, tablets) to perform their tasks, the company started considering the IT-based innovations as crucial to the performance of the whole organization; it thus encouraged emulation among salespeople, suggesting they should introduce changes to their practices that would increase their self-efficiency. Regular informal meetings and incentive-based systems prompted salespeople to share ideas about applications, IT-based changes, and process improvements that they used on their own personal mobile devices. Some of the shared IT-based best practices included improvements to the process for approving expenses, vacation requests, distant e-mail and scheduling, tracking real-time sales performance, identifying "who's on top," recording customer information, applications for customer presentations, content sharing, and round mapping. Such practices, which the company encouraged salespeople to share, enabled them to increase their self-efficiency; then the practices could be promoted by management for consideration and possible adoption by every salesperson, which increased the company's efficiency. As explained by a sales manager: "*The company and employees are in a "win–win" situation. They are happier to use technologies they like, they try to do better with them, and to find tricks to be more efficient, and to make the company more efficient as a whole.*" Of course, the company, and especially the IT department, had to work closely with salespeople to avoid security problems and ensure their personal devices were appropriately connected to the corporate e-mail and wi-fi network. But the company focused first on salespeople's needs and potential gains, before dealing with IT infrastructure and security issues, as mentioned by the CIO: "*Our priority is to answer the users' expectations, which is also beneficial for the company as a whole. We are not in an era any more in which the IT department tells employees what applications to use, how and when. More than ever, we have to adapt to their demands. Of course, there are some issues and concerns in terms of information security, but I would say this is not the most important for us. They are our internal clients, we have to satisfy them.*"

Second, users' IT might be considered not an opportunity but simply as a normal practice. No clear benefit is highlighted, except technological cost efficiency. Specific behaviors associated with consumer IT use (e.g. continuous availability, total involvement in the company) appear totally normal. In parallel, such situations imply that management does not perceive any particular risks of BYOD initiatives. For example, the CONSULT case shows that management did not consider any potential benefit or risk associated to BYOD initiatives. Management simply attempted to normalize behaviors that the consultants had initiated first through their decision to use their own devices. Over time, implicit norms of behavior became embedded in the consultants' professional uses of their personal technologies. The specific values that consultants associated with their job, such as involvement, responsiveness, efficiency, and peer competition, pushed them to stay connected with the company and their clients, beyond traditional work hours, through specific usages of their personal technologies outside organizational boundaries. Shared expectations (e.g. mobile IS use anywhere, anytime; continuous availability) thus emerged from consultants' professional uses of their mobile technologies. Such practices spread even further when management encouraged consultants to internalize such norms. The related practices (e.g. remaining connected anywhere, anytime through their own devices) were largely relayed by management, which presented them as normal parts of the job.

Consider one manager's perception: *"I think that, in their job, using their personal technologies anywhere-anytime to stay connected have become part of everyday life. It's normal. It's part of their job and of their life. We all have personal technologies that help us being connected, and I don't see why we should do without it."* Consultants accepted these norms and implicit organizational expectations as their own, which they had contributed to co-construct.

Third, management might believe that BYOD initiatives need to be carefully controlled and regulated, in an effort to introduce deeper, unplanned, and often more constraining IT-based organizational change. In these situations, companies generally regard the risks of developing BYOD and letting employees bring their own devices to work as greater than the potential benefits. Such individual initiatives thus provide opportunities or springboards to formalize new IT uses and practices. For example, at INDUSPROD, some sales representatives, by starting using their own IT, introduced small changes into the organizational reporting process, which the company then used to modify its rules and introduce deeper IT-based changes. Salespeople progressively adopted the habit of transmitting simple, regular daily reports to their managers about the number of customer visits they had conducted and the results of each visit. Such behaviors then affected a sales manager's expectations, who progressively considered regular and accurate feedback from representatives reasonable, as he explained: *"Of course, when some people send you detailed information about their performances, you end up expecting the same from everybody. After few months, I think it became a necessity for the company to modify the reporting process, so that every salesperson would respect the same procedure."* The salespeople's feelings and expectations evolved simultaneously; representatives who were not personally equipped with advanced technology regretted the lack of equity they suffered and began using this gap to explain or justify their lack of responsiveness. In contrast, well-equipped representatives argued that the process could be optimized and asked management to give them greater access to the company's IS and client applications, so they could gain efficiency. However, management rejected these requests, fearing that such access would threaten the firm's IS security and cohesiveness. Therefore, the company established new rules regarding reporting processes, which structured the representatives' activities: Each sales representative received a cutting-edge Blackberry, directly connected to the company's IS, that allowed them to enter customer information directly into the firm-wide customer relationship management application.

In the BUILDCORP case, company management similarly decided to regulate the practices of some site forepersons and introduce broader IT-based organizational change. The initiative of some site forepersons initially engendered resistance from various organizational actors: Accountants feared that their jobs would evolve in response to the evolution of the reporting process. Members of the IT department also expressed fears related to the multiplication of devices in the company, without their approval, and the risks of data loss. The company thus decided to capitalize on such initiatives, which prefigured a broader mobile IT deployment to all site forepersons and featured changes to several processes (e.g. transmission process to the accountancy department, management of building site expenses), as mentioned by the CIO: *"We clearly used the initiatives of some of our site foremen to develop a more structuring project for the whole organization. It was essential to standardize practices in all agencies all over the territory and to ensure a secure transmission of data from sites to agencies and headquarters."* With successful employee initiatives as an example, the company

decided to draw on the site forepersons' usages to create new rules and equip them with tablet PCs directly connected to the company's IS, so they could enter building site data directly into the system. The initial innovations of some site forepersons thus were employed by management to foster deeper organizational changes, which should have been more easily accepted than a classical, top-down organizational IT project, in that forepersons originated this IT-driven change.

Organizational internal support. Internal support within organizations (managerial and IT support) affects the way companies react to BYOD initiatives. Different configurations arose in the companies, depending on their level of internal support and the role of the IT department.

First, in some situations, very strong internal support provided to employees favors the deployment of BYOD initiatives and user-driven IT-based organizational change. Internal support is characterized by top management recognition of the crucial role of IT in the organization's performance, the important role played by the IT department in strategic decisions, and the recognition of the importance of BYOD initiatives in initiating user-driven IT innovation. For example, at COMPLUS, management was listening closely to employee's demands and legitimized their initiatives. The new, cutting-edge, dynamic IT department contributed to the purchase costs of diverse technologies that employees wished to use, both personally and professionally. As explained by the sales manager: "*As commercial manager, I really encourage my team to use their personal devices if they want to, or to tell me what kind of technologies they would like to use. As a communication company, it's a duty for us, and especially for the IT department, to do so and to understand our employee's demands.*"

Second, in other cases, internal support was limited to the strict regulation of BYOD initiatives, designed to formalize them and introduce deeper IT-based changes. For example, at INDUSPROD, the CEO's priority was to regulate BYOD initiatives to maintain the firm's cohesiveness. Even as he recognized the potential business opportunity, he feared that the lack of formalization of such practices might harm corporate cohesiveness. With the help of the IT department, he thus developed a specific application to satisfy both representatives who wanted to use cutting-edge technologies at work and access the company's IS and those who were not ready to equip themselves: "*I was aware of the necessity to make things evolve […]. Some young employees were very well equipped and expected much from us. But as a CEO, I could see the risks, and I was not ready to give them more freedom over the data they manage […]. And we had other employees, most of them in fact, who simply didn't want to change their habits and even less to personally buy a tool for professional reasons.*" In this case, the IT department developed clear IT policies in line with top management expectations. Our content analysis also revealed that the recognized role of the IT function in such organizations sometimes led them to limit BYOD initiatives, out of fear of the loss of power and control. For example, at BUILDCORP, the CIO emphasized "*the need to control IT-based practices and the initiatives of foremen, to be sure to maintain the upper hand over them. The IT department is better suited than them to know what kinds of tools to deploy.*"

Third, internal support for BYOD initiatives may be almost nonexistent, with the belief that IT has a marginal role. For example, in the CONSULT case, no separate IT department existed. The management of the company did not really recognize the existence of BYOD initiatives as such. Consumer IT were simply considered and discursively built as normal tools, which each consultant should use to perform his or her work. As mentioned by the founder of the company, "*it would be useless to equip*

them with sophisticated technologies. All our consultants generally already have their own devices; they are used to them all day long, and I don't see any necessity to equip them more, or to provide any specific support. We don't specifically ask them to use their personal phone for professional activities, but the fact is that they naturally do so. For us, it has the advantage to avoid any superficial cost and to have an IT function dedicated to that."

Contextual variables and characteristics. Finally, our analysis shows that the employees' initiatives take place in an organizational context, characterized by a specific structure, size, culture, and management style, which can enable or prevent particular reactions and likely explain the type of incorporation of user-driven IT innovations.

In some cases, these contextual variables play an enabling role. For example, at COMPLUS, the inherent characteristics of the organization (e.g. openness, low level of formalization and hierarchy, culture of IT innovation, freedom of choice, employees' empowerment) favor employees' initiatives to bring their own devices and largely explain the organization's reaction to and incorporation of such practices. In contrast, other contextual variables linked with organizations' inherent characteristics serve constraining or prevention roles. For example, INDUSPROD and BUILDCORP are two large, very structured organizations, characterized by a directive management style, where management considers it necessary to "regulate" BYOD initiatives, use them to formalize IT-based practices, and introduce deeper IT-based organizational changes. The inherent characteristics of CONSULT also affect how its management considers and incorporates BYOD initiatives: CONSULT is characterized by a very hierarchical, bureaucratic management style, featuring centralization and a small size, which likely explains management's policy decision about consultants' equipment and the weak formalization of IT-based practices.

Within-case analysis
This section presents the results of our within-case analysis. We matched common aspects among all the companies, based on the dimensions highlighted in the literature review and previously specified, such that we could explore how organizations draw on individual initiatives to incorporate user-driven IT changes. We identified three types of reactions: induction, normalization, and regulation, which result from a combination of the aforementioned dimensions. These three types of reactions then affect the nature of further organizational IT-based changes, developed from user-driven IT innovations (Weick and Quinn, 1999).

Induction
The first type of reaction, induction, implies that organizations proactively encourage employees to introduce consumer IT to initiate IT-driven changes. Companies with an induction policy find real business opportunities in proactively advocating the use of cutting-edge consumer IT, such as to increase employees' efficiency, improve communication with more demanding or tech-savvy customers, and develop richer internal interactions. The benefits of BYOD are clear to these organizations, which regard it as a way to innovate continuously and maintain a modern image. These organizations are aware of the possible threats and risks engendered by such practices (e.g. compatibility problems with existing IT systems, security risks), but the perceived benefits are superior to the perceived risks and drawbacks. This type of reaction can

also be explained by the role of users and the nature of their initiatives: Business employees appear technologically sophisticated and very autonomous in their BYOD initiative. They want to use technologies that they like and find valuable. The induction type of reaction also results from internal support for BYOD, which appears necessary to promote user-driven IT-based innovations, and is largely enabled by the organization's inherent characteristics. As a result, induction seems to involve continuous IT-based organizational change (Weick and Quinn, 1999), which implies a gradual, evolutionary, or developmental change. Changes of this nature enable continuous improvements to practices, which enhance the organization's overall performance.

Example of induction: COMPLUS

We identify COMPLUS as having an induction policy. In this case, salespeople were invited by their organization to bring and use their own devices at work, which promoted changes that would have been difficult to accept if mandated by a classical organizational IT project. After its previous project failure, the company decided to focus on employees' demands and openly encouraged them to bring technologies they liked to work, or to request those tools, which helped it initiate changes that could increase employees' own and the company's overall efficiency. (For example, salespeople wished to use their personal, sophisticated devices at work and then were encouraged to apply them for business purposes too.) In this high-tech communications company, technically literate employees already were generally familiar with leading-edge technologies, so they did not hesitate to support colleagues, propose initiatives to the IT department, or share ideas with the rest of the organization. Top management had long emphasized the crucial role of IT in business activities, as revealed by the important status of the IT department in this company and its provision of strong support to employees. The whole organization was characterized by a culture of IT innovation, strongly in favor of BYOD practices, and committed to the development of user-driven IT innovations. By favoring such practices, the organization aimed to demonstrate how to employ IT in original, unanticipated ways. Thus, COMPLUS clearly recognized the power of consumer IT to enhance business processes. Employees were motivated by a profound sense of challenge, involvement, and emulation, as encouraged by management, which explained why they expected to be able to use consumer IT to manage their jobs. Such behaviors also were enabled by the organization's openness and low levels of formalization and hierarchy, such that business employees appeared as autonomous entrepreneurs, invited to innovate through their own practices. As a result, the induction policy adopted in this company implied that small, continuous, shared, user-driven IT innovations accumulated to create substantial change at the organizational level.

Normalization

The normalization reaction implies that the organization does not perceive any clear benefit from BYOD. The introduction of consumer IT does not appear to offer any business opportunity; rather, it represents a normal practice, through which business employees use available tools to achieve their mission. In this situation, organizations make employees' initiatives to bring and use their own devices at work seem normative, such that the related behaviors become normal and part of everyday life. These companies also prefer to avoid paying for IT equipment, which they consider basic tools for managing the job, not a potential route to IT-based innovation. Just as these organizations do not see any clear business opportunity (except in terms of cost efficiency), they do not perceive any particular risk associated with BYOD. The IT introduced by employees usually entail simple communication devices (e.g. smartphones, tablets) that can improve responsiveness, availability, and

communication. The organization also does not seem particularly cognizant of any risk of data loss or security problems, because the IT use has only a marginal role in the performance of the organization. Such a reaction is appropriate for organizations that want to implicitly normalize specific practices and behaviors. The lack of internal support and the inherent organizational characteristics also explain this type of reaction. As a result, normalization entails incremental, implicit, subtle change, which is not necessarily planned by organizations but results in invisible shifts in norms of behavior.

Example of normalization: CONSULT
CONSULT adopted a normalization policy that it used to indicate that it was normal for consultants to use their own devices to manage their job and achieve their mission. In this case, the organization normalized the practices of some consultants and created new norms of behavior and implicit rules (continuous availability, total involvement), which applied to all consultants. Consultants' IT adoption and usage logics, even outside organizational boundaries, were discursively constructed by management as normative expectations regarding consultants' behavior. Many factors explained the adoption of this reaction by organizations. First, the user's role and the drivers of BYOD were critical: Consultants brought their own devices to work because they were dissatisfied with the company's equipment policy (which followed a statutory logic). With their very limited initiative margin, the consultants were left to find their own equipment to achieve their mission, according to expected standards in terms of availability and responsiveness. An implicit pressure thus led them to conform to tacit but strong pressure from the hierarchy to obey specific norms of behavior. These employees were not particularly technically sophisticated and thus not really challenged to introduce IT-based innovations. The internal support for consumer IT deployment was nearly nonexistent, because management did not consider IS crucial or a relevant business opportunity, as revealed by the absence of any separate IT department. Some organizational characteristics, such as the centralization of the organization, the bureaucratic management style, and its small size also helped explain the adoption of a normalization policy. Finally, the CONSULT case shows how subtle changes appeared at the organizational level, through the emergence of subtle and implicit norms of behavior.

Regulation
The third type of reaction, regulation, involves organizations that clearly perceive the business opportunities they can draw from BYOD but also recognize the risks associated with employees' initiatives, so they tend to "regulate" their practices and capitalize on them to develop further organizational IT-based changes. These organizations generally recognize the business advantages of BYOD, but the perceived risks of letting employees bring their own devices to work are considered substantial, especially in terms of security problems and data losses. Yet in such organizations, employees generally have good, valuable ideas and recognized initiatives, such that they play an important role in introducing user-driven IT innovations to their organizations. They are motivated by the desire to be more efficient and improve their productivity or time optimization. However, because of the perceived risks associated with such practices, these organizations continue to exert some control over them, to regulate and standardize them at a global level. This process even can lead to deeper organizational change, especially if the IT department in these large organizations has a strong role and develops clear policies in line with top management expectations. The need to control employees' initiatives thus appears related closely to the power of IT department, which resists allowing employees to make their own IT decisions.

Because of the size and directive management style of these organizations, management concurs about the need to control employees' practices. However, these preferences do not keep the organization from recognizing the emergence of these initiatives or capitalizing on them to harness further organizational change. They may capitalize on employees' initiatives to extend and reinforce specific practices, leading to broader organizational change. Employees' initiatives to bring their own devices lead to local IT-driven changes, which are formalized and harnessed by organizations to review complete processes and deploy bigger IT projects. Finally, regulation invokes episodic, revolutionary change (Weick and Quinn, 1999), which alters the very processes of the organization. The regulation and formalization of, as well as capitalization on, user-driven IT innovations lead companies to introduce more radical changes for the whole organization, which might even constrain users. Organizations use such changes to remedy current situations, such as improving poor performance or resolving problems in specific processes.

Examples of regulation: INDUSPROD and BUILDCORP
The case of INDUSPROD reveals how the company not only resisted employees' demands to connect the company's IS to their own technologies but also exploited their initiatives to introduce a larger, IT-driven change that reinforced their productivity and tracked their performance. The company formalized, regulated, and extended local initiatives by asking sales representatives to send their reports in real time, just after each visit, to increase their productivity. In the end, this IT-based project was welcomed by most sales representatives, who had been equipped with a cutting-edge technology of which they were proud, which also helped reestablish some equity among them.

The BUILDCORP case also showed how the organization drew on, controlled, and regulated the local initiatives of site forepersons to formalize, promote, and justify deeper changes in the reporting process, through the deployment of a company-wide IT system that affected the whole organization and even constrained the site forepersons' activity.

Both cases reflect individual initiatives used by management as opportunities to develop more structuring changes, from formalization and modification of existing practices to the extension and rebuilding of core processes.

Table III synthesizes each type of reaction and its relevant dimensions, as well as the subsequent nature of organizational change.

Conclusion
By investigating BYOD practices, consumerization, and the revolution of organizational technological landscapes—a modern process that has extended the end-user computing phenomenon that began in the 1980s—this article details how organizations react to employees' adoption and use of personal devices at work, such that they incorporate potential IT changes into their practices. Four in-depth case studies enable us to identify three main reactions by companies to user-driven IT innovation (induction, normalization, and regulation). We relate these reactions to various dimensions and describe how they affect subsequent organizational IT-based changes.

Conceptual contributions
This article addresses a topic that previously has been only minimally analyzed in IS research, specifically, the consumerization of IT and its consequences for organizations (Baskerville, 2011; Crowston *et al.*, 2010; Sawyer and Winter, 2011). The idea that end-users influence IT systems is not new; IS research has detailed the end-user computing

Type of Reaction Company	Induction COMPLUS	Normalization CONSULT	Regulation INDUSPROD BUILDCORP
Dimensions			
Balance between perceived benefits and Perceived threats, risks and drawbacks	The potential of users' IT in the workplace is clearly recognized as a way to introduce change, innovate, and maintain a modern image	Users' IT is not a business opportunity but considered as a normal practice. No clear benefit is highlighted (except technological cost efficiency); specific behaviors (continuous availability, total involvement) become normal	If carefully controlled and regulated, BYOD is an opportunity to introduce deeper IT-based organizational change
	Awareness of potential risks (security and compatibility) but belief that perceived benefits are stronger than perceived threats	No particular perceived risk	However, the perceived risks of letting employees bring their own devices to work are higher than perceived benefits (security problems and data losses), thus explaining the need to regulate IT-based practices
User's motives and role	Empowerment, autonomy, sense of challenge, emulation, involvement, motivation, technical sophistication, positioning to provide technical support to others and share initiatives, pleasure at using IT at work	Dissatisfaction with the company's equipment policy; limited margin of initiative; not particularly technically sophisticated; implicit pressure to conform	Desire to be more efficient and improve productivity or time optimization; techno-savvy employees; sense of initiative
Organizational / internal support	Very strong internal support Top management recognition of the crucial role of IT and BYOD practices in initiating user-driven IT innovation, strong role of the IT department Enabling role	Non-existent support No real managerial support; marginal role of IT; no separate IT department Constraining/preventing role	Limited support. Development of clear IT policies in line with top management expectations; fear of a loss of power; need to control. Constraining/ preventing role
Contextual variables and characteristics	Openness, low levels of formalization and hierarchy, culture of IT innovation, freedom of choice, employees' empowerment	Very hierarchical; bureaucratic style of management; centralization; small structure	Large and very structured organizations; directive management style

Table III.
Types of reactions, corresponding dimensions, and nature of organizational change

Table III.

Type of Reaction Company	Induction COMPLUS	Normalization CONSULT	Regulation INDUSPROD BUILDCORP
Nature of organizational change	*Continuous* Gradual, evolutionary, developmental change Enables continuous improvements to practices Small, continuous, shared IT innovations accumulate to create substantial change at the organization's level enhances the organization's overall performance	*Incremental* Implicit, subtle, marginal change Not planned in advance Evolution of behavioral norms, which turn into a further evolution of organizational rules and practices	*Episodic* Irregular, revolutionary, broad change Individual, local opportunities are regulated, formalized and harnessed to review complete processes Broad IT-driven, which restructures the whole organization
Examples of quotes	"I think we have a lot to gain from our salespeople 's initiatives. We really invite them to be proactive in the way they bring and use their own technologies at work. They like technology, they 're young and motivated, and they always have good ideas, which we probably wouldn't have imagined, to make the organization more efficient" (Sales manager)	" There is no need to provide our consultants with mobile technologies, they are all equipped already. Progressively, as they realized that everybody was using these technologies to be available, they have all taken the habit to be connected. We've not explicitly asked them to be available all the time, or to answer an email right away.But the fact is that now they're doing so because it's normal for them ". (Founder)	"We clearly used the initiatives of some of our site foremen to develop a more structuring project for the whole organization. It was essential to standardize practices in all agencies all over the territory and to ensure a secure transmission of data from sites to agencies and headquarters." (CIO)

phenomenon (Davis and Olson, 1985; Doll and Torkzadeh, 1988, 1989; Rockart and Flannery, 1983), and the structurationist approach outlines the ways that users appropriate system design and use (DeSanctis and Poole, 1994; Orlikowski, 1992). Such contributions affirm that the effectiveness of any IT system relates to how its processes unfold inside organizational structures and depends on the behavior of individual users. This article therefore extends understanding by exploring how the large-scale availability of computing and communication devices for personal use has prompted user-driven IT innovations and created potential business opportunities that organizations can incorporate in different ways. The effectiveness of modern IT-based changes depends not only on users' acceptance but also on how organizations react to and incorporate employees' initiatives to introduce and use their own devices for business purposes.

Current practitioner studies focus on concerns related to BYOD (e.g. technological costs, security risks) to specify the motives that drive individual BYOD initiatives and explicate how such changes get incorporated by organizations. Our research provides scholarly development of studies that address possible strategies for managing IT consumerization (Harris *et al.*, 2011), in that we describe the dimensions of these strategies and address their consequences for the nature of organizational IT-based changes. For example, we identify different forms of an "adoption" strategy; uncover the elements of an "authority" strategy (e.g. regulation reactions, by which organizations restrict, control, and formalize users' initiatives to harness them); and demonstrate that an "anarchy" strategy is deliberate, rather than a lack of strategy (Harris *et al.*, 2011). With an induction reaction, organizations deliberately allow employees to introduce their own consumer IT without restriction, to induce user-driven, IT-based changes that support continuous organizational change.

Practical implications
For managers, this study identifies some potential strategies for anticipating and planning for BYOD initiatives. Few organizations have proactively or effectively tackled the challenges and consequences of BYOD and IT consumerization (Harris *et al.*, 2011). As this study shows, induction, normalization, and regulation offer promising strategies for managing this growing technological trend, with repercussions for the whole organization. Consumerization and BYOD are not simply one more challenge for IT departments to overcome. Rather, adoption and usage logics have deep consequences for organizations, and they can gain great insights if they consider and manage them carefully. This study suggests that contextual factors (linked with the specific organizational structure, size, culture, and management style) may govern the choice of a particular strategy, which could constitute a potential valuable area of future research. Moreover, these practices offer a relatively easy way to introduce IT-based organizational change. Our case studies reveal that, regardless of the reasons people introduce their own devices or how organizations incorporate them, the underlying changes are generally easier for employees to accept than large organizational IT projects, because the people themselves have initiated and co-constructed the changes. Past IS research has already focused on acceptance of a particular co-constructed technology, in particular in the context of participatory system design. Our research also contributes to this field by showing that employees accept, seemingly naturally, even those changes that represent more constraints for them (e.g. stricter processes, behavioral norms, rules) when they have contributed to making them emerge.

Limitations and further research

This research is subject to some limitations, which suggest different potential paths for research. The study is part of a larger project, conducted between 2006 and 2010—a period that witnessed the beginnings of modern technological trends and adoption logics. Since then, new technologies have emerged (as evidenced by the more widespread availability of easy-to-use hardware and ubiquitous connectivity-enabling software, such as What's app and Viber) that might play a key role in BYOD practices. It would be useful to explore how consumerization and BYOD affect organizations today and whether different effects might arise in other contexts or with different kinds of organizations and technologies. Induction, normalization, and regulation are three reactions; other types of organizations could display other types and incorporate user-driven IT innovations through different routes. This research thus offers a first contribution to what needs to be a larger research program that extends our case studies and proposes a typology of all potential organizational reactions. It also would be interesting to investigate how the IT-based changes we highlight have evolved over time. In particular, we recommend studying the reactions and appropriation moves made by employees who did not directly initiate such changes. Despite its limitations, this study potentially informs future work: it offers a first attempt to explore a new IS "research arena" (Baskerville, 2011) and investigate the ways organizations can harness employees' personal IT adoption logics to promote innovative, creative IT-driven change.

Note

1. We use pseudonyms throughout to protect the companies' anonymity.

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(The appendix follows overleaf.)

Appendix 1. Question guide

A. BYOD initiatives

   a. What?

      i. Applications?

      ii. Technologies

   b. Why? Reasons?

   c. When?

   d. Who?

   e. Incentives

   f. Perceptions by users of management/organization's reactions

   g. Any problems?

   h. Resistance?

   i. Evolution over time?

B. Perceived benefits of BYOD initiatives

   a. By users

   b. By the organization/management

   c. Technological cost

   d. Satisfaction of employees

   e. Motivation

   f. Productivity, efficiency

   g. Business impacts

   h. Others

C. Perceived risks, threats, and dangers of BYOD initiatives

   a. By users

   b. By the organization/management

   c. Security issues

   d. Data loss

   e. Compatibility problems

   f. Complexity

D. Users' role

   a. Individual characteristics (age, gender, position, function)

   b. Nature of involvement in BYOD initiatives

   c. Specific motives and drivers of BYOD initiatives

   d. Perception of his or her role in the organization

   e. Expectations/BYOD

    f.   Background

    g.   Technical sophistication

    h.   Personal experience with IT

E.   IS/IT role in the organization

    a.   Status

    b.   Role in strategic decision-making process

    c.   Role played by the IT department in the organization

    d.   Skills and competencies of the IT department

    e.   Role of IS in the organization's performance

    f.   Management conception of IT

F.   Organizational support

    a.   Reactions to BYOD

    b.   Top managerial support and attitudes

    c.   Operational, line managers' efforts

    d.   IT champions

G.   Organizational characteristics

    a.   Number of employees

    b.   Annual turnover

    c.   Countries

    d.   Competitors

    e.   Environment

    f.   Structure, size

    g.   Culture

    h.   Management style

    i.   Critical key success factors

    j.   Long-term objectives

Appendix 2

Categories	Themes	Dimensions	Codes
BYOD initiatives	Motives	Dissatisfaction with past system	BYOD-MOTIV-DISSAT
		Pleasure	BYOD-MOTIV-PLEAS
		Efficiency need	BYOD-MOTIV-EFFIC
	Adopter profile	Group	BYOD-ADOP-GROUP
		Individual	BYOD-ADOPT-IND
		Tech-savvy	BYOD-ADOPT-TECHSAVVY
		No tech-savvy	BYOD-ADOPT-NOTECH
		Local level	BYOD-ADOPT-LOCAL
		Global level	BYOD-ADOPT-GLOBAL
	User	Initiative	BYOD-USER-INITI
		Autonomy	BYOD-USER-AUTON
		Pressure	BYOD-USER-PRESS
		Sense of pride	BYOD-USER-PRID
		Challenge	BYOD-USER-CHALL
		Emulation	BYOD-USER-EMUL
	Innovation	Improvement in processes	ITADOPT-INNOV-IMPROV
		New applications	BYOD-INNOV-APPL
		Communication improvement	BYOD-INNOV-COM
		Evolution of norms	BYOD-INNOV-NORM
Dimensions of organizational reactions	Perceived benefits	Cost reduction	ORGREAC-BENEF-COST
		Productivity	ORGREAC-BENEF-PROD
		Motivation	ORGREAC-BENEF-MOTIV
		Satisfaction	ORGREAC-BENEF-SAT
	Perceived risks	Security	ORGREAC-RISK-SECUR
		Data loss	ORGREAC-RISK-DATA
		Compatibility	ORGREAC-RISK-COMPAT
		Lack of cohesion	ORGREAC-RISK-POW
		Loss of power	ORGREAC-RISK-COH
	Internal support	IT department	ORGREAC-INTERNSUP-IT
		IS role in business activities	ORGREAC-INTERNSUP-ISROLE
		Management view of IT	ORGREAC-INTERNSUP-MANAG
	Nature of reaction	Restriction	ORGREAC-STRAT-REST
		Control	ORGREAC-STRAT-CONTR
		Formalization	ORGREAC-STRAT-FORM
		Openness	ORGREAC-STRAT-OPEN
		Capitalization	ORGREAC-STRAT-CAPIT
		Enc ouragement	ORGREAC-STRAT-ENCOUR
	Organizational characteristics / Moderating variables	Structure	ORGREAC-CHARAC-STRUC
		Culture	ORGREAC-CHARAC-CULT
		Size	ORGREAC-CHARAC-SIZ
		Management style	ORGREAC-CHARAC-MANSTY
Strategies adopted by organizations	Induction	Balance between perceived benefits and risks	STRAT-INDUC-BAL
		User's role	STRAT-INDUC-USER
		Org. Support	STRAT-INDUC-SUPPORT
		Inherent organizational characteristics	STRAT-INDUC-CHARAC

Table AI.
Thematic coding
extract

Categories	Themes	Dimensions	Codes
	Normalization	Balance between perceived benefits and risks	STRAT-NORMAL-BAL
		User's role	STRAT-NORMAL-USER
		Org. Support	STRAT-NORMAL-SUPPORT
		Inherent organizational characteristics	STRAT-NORMAL-CHARAC
	Regulation	Balance between perceived benefits and risks	STRAT-REGUL-BAL
		User's role	STRAT-REGUL-USER
		Org. Support	STRAT-REGUL-SUPPORT
		Inherent organizational characteristics	STRAT-REGUL-CHARAC
Further IT-based organizational change	Nature	Continuous	CHANGE-NAT-CONTINUOUS
		Incremental	CHANGE-NAT-INCREMENTAL
		Episodic	CHANGE-NAT-EPISODIC
	Appropriation of individual initiatives	Incorporation	CHANGE-APPROP-INCORP
		Non incorporation	CHANGE-APPROP-NONINCORP
	Visibility	Implicit	CHANGE-VISIB-IMPLIC
		Gradual	CHANGE-VISIB-GRAD
	Goal	Remedial	CHANGE-GOAL-REMED
		Developmental	CHANGE-GOAL-DEVEP
	Depth	Evolutionary	CHANGE-DEPTH-EVOL
		Revolutionary	CHANGE-DEPTH-REVOL
	Planification	Planned	CHANGE-PLAN-PLAN
		Unplanned	CHANGE-PLAN-UNPLAN

Table AI.

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