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# Towards an IT Consumerization Theory – A Theory and Practice Review

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# Contents

# 1 Introduction

Consumerization of information technology (IT) refers to privately-owned IT resources, such as devices or software that are “co-used” for business purposes. In this context, co-use refers to the phenomenon that privately-owned IT is used for business purposes in addition to being used for its original private purposes. Although the general idea of consumerization has been discussed for many years (Gartner 2005; Moschella, Neal, Opperman, and Taylor 2004), it has been only recently that renowned market research institutes picked up the topic and carried out numerous quantitative studies. This shows that, especially in practice, the topic is regarded as highly relevant. Gartner (2012) views consumerization as one of five major IS trends and argues that although the topic has been discussed for a decade, the big wave of changes is still to come. Accordingly, (Fenn and LeHong 2011) state that this trend cannot be stopped.

IT Consumerization is considered to be a major driver that redefines the relationship between employees (in terms of consumers of enterprise IT) and the IT organization. While existing IT infrastructure often leads to frustrations among employees towards corporate IT (Moschella et al. 2004), consumer IT is showing everybody how enjoying and efficiently IT can be designed. Today, employees are more aware of the portfolio of devices available and expect to be able to pick and choose the software and devices that best suit their work. They no longer accept being forced by their IT department to adopt a certain solution (Dell and Intel 2011a). As a result, there is an conspicuous change in the IT innovation paradigm from a top-down to a bottom-up approach (Moore 2011). This ‘consumerization catch-22’ (D’Arcy 2011) is one of the reasons why “consumerization will present one of the biggest tests […] for business and IT executives within the next five years” (Harris, Ives, and Junglas 2011a). In this context, Andriole (2012) states that “[…] there’s a reverse technology-adoption life cycle at work: employees bring experience with consumer technologies to the workplace and pressure their companies to adopt new technologies”.

The trend is perceived as contributing significantly to work performance. This influence of consumerization on productivity is heavily discussed in literature. Consumerization is seen as enabler for the next wave of productivity but also associated with the necessity of enterprise IT and process change (Andriole 2012b; Moore 2011). Many studies report that employees are more productive when able to choose IT tools on their own (e.g. (BBC News 2011a; Brousell 2012; Schadler 2011), suggesting that it is worth adjusting corporate policies in this direction. However, it remains unclear as to what constitute the underlying forces that promote IT consumerization (Avenade 2012) and under which circumstances they may be considered beneficial (Kaneshige 2012; Vile 2011).

Consumerization has different dimensions and elements. In practice literature, it is common to associate consumerization with devices and software applications (Harris et al. 2011a). Concerning hard- and software aspects, both advantages and disadvantages are mentioned in the studies. For instance, modern mobile devices come preloaded with access to powerful applications and enable employees to work premise-free and more productive. The flip side of the coin is that the variety of devices implies a higher complexity combined with major challenges for IT departments to provide end user service.

However, it is not only hard- and software that is affected, but also the way of working. The increasing number of knowledge workers (Logan, Austin, and Morello 2004) in combination with a more tech-savvy staff changes the requirements regarding information systems (IS). Some studies indicate differences how the effects of IT consumerization affect distinct generation of workers, raising the question whether a gap exists between “digital natives” and older workers (Dell and Intel 2011b). Certainly, this is only one aspect that needs to be taken into account when rethinking organizational policies with regard to consumerization. While there has been an extensive debate on these matters in practice, IS research has neither developed a clear theoretical understanding of the phenomenon nor undertaken efforts to analyze the advantages or disadvantages of it by means of a rigor research process.

Against this background, this working paper seeks to make a contribution towards a well-grounded theoretical perspective and gives answers to the following research questions:

- RQ1: What areas of information systems are specifically affected by consumerization?
- RQ2: What are advantages and disadvantages of consumerization from both employee and organizational perspectives?
- RQ3: Which theories in the IS context can increase our understanding of the relationship between IT consumerization and employee (work) performance?

The remainder of this working paper is structured as follows. Section 2 presents a theory review, where the existing literature on consumerization is reviewed and a clear definition of the concept is developed. After describing our research approach (Section 3), the results of our practice review are presented in section 4. These themes are then used to identify and exploit potential theories in the IS context and to derive a structural model of IT consumerization (Section 5). In section 6, the constructs and relationships of this model are briefly validated using an embedded single-case study. The summary of the paper and its implications for theory and practice is followed by a discussion of the limitations and research outlook in section 7.

# 2 Theory review

The traditional direction of technology diffusion from enterprises into private households is increasingly changing to a more consumer-driven one. This shift from top-down innovation in IT to a bottom-up approach has been recognized in early research on the topic and is seen as a constituting element of consumerization. However, there is no clear definition of what is meant by the term 'consumerization'. It was coined within a position paper by Moschella et al. (2004) recognizing that consumer IT had been increasingly used in an enterprise context. Here, 'dual-use' was seen as defining aspect meaning that "increasingly, hardware devices, network infrastructure and value-added services will be used by both businesses and consumers" (Moschella et al. 2004, p. 2). Thus, in this early definition of the concept, the blurring of business and personal boundaries is considered the key element. While this trend is also recognized by more recent studies (e.g. Gens et al. 2011), it is widely acknowledged that consumerization should focus on one direction of it, i.e. the use of consumer technologies in a work context. For instance Murdoch, Harris, and Devore (2010, p. 2) see consumerization as „abandoning enterprise IT – both hardware and software – in favor of consumer technologies that promise greater freedom and more fun" whereas Harris, Ives, et al. (2011, p. 2) define it as "the adoption of consumer applications, tools and devices in the workplace".

Thus, while there is a common understanding regarding the direction of technology adoption covered by consumerization, most definitions are based on the concept of consumer technologies which is fuzzy and hard to grasp. This is why several authors use ownership of the related devices and applications as distinguishing criterion (e.g. Deloitte 2011; Harris and Junglas 2011). For instance, one study relates consumerization to a scenario where workers invest "[…] their own resources to buy, learn, and use a broad range of popular consumer technologies and application tools" in a work context. For the purpose of this working paper, we adopt this perspective and see consumerization as being concerned with privately-owned IT resources that are co-used for business purposes. This understanding is visualized in Figure 1, which relates the topic to the dimensions ownership and purpose. The narrow focus potentially allows for a clearer analysis of threads and benefits with regards to both the individual and the enterprise perspective. While it may become problematic if employees do not have the discipline to avoid wasting time surfing the web or checking private email and social media accounts (Davenport 2011), this – in our understanding – is a different perspective on the subject and, thus, will be neglected for the purpose of this study.

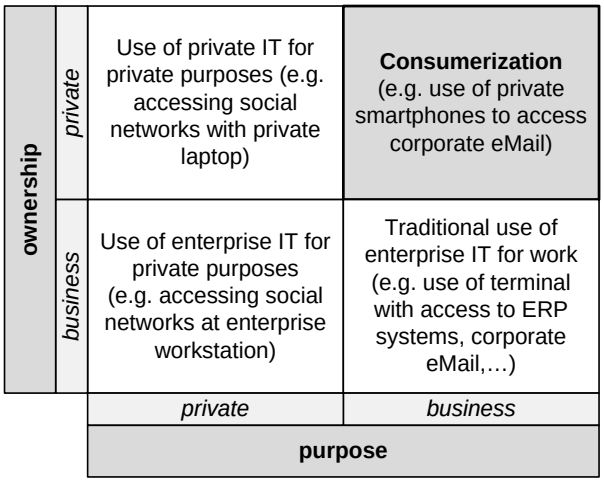



**Figure 1: Conceptualizing IT Consumerization**

Overlooking the few publications on the topic, we make out that little scientific research has yet been conducted in this area. Most studies on the topic were executed by consulting firms and offer mostly descriptions of the phenomenon as well as normative advice for executives. From an IS research perspective, a rigorous application of methods and theory to help practitioners understand the phenomenon of IT consumerization in general, and its implications for employee performance in particular, remains lacking. This has also been found by Sawyer and Winter (2011) who pointed out that the reach of information and communications technology (ICT) nowadays extends far beyond that of previous large organizational centered systems and that the IS scholarly community has not yet adapted to this transformation. They stated that "[…] the 'consumerization' of ICT is growing at the very same time that the IS field is struggling" (Sawyer and Winter 2011, p. 96). The same issue was recently raised by Baskerville (2011) who pointed out the need to address individual information systems within IS research.

While gains in work performance are generally associated with the trend in practice, research in the field lacks a systematic evaluation of the underlying forces leading to these increases. However, without a clear understanding of these forces, organizations are unable to reveal the full potential of IT consumerization and are more likely to just see the negative aspects. For instance, Gens et al. (2011) found that currently, 80% of IT departments agree that IT consumerization will increase their workload. Due to the fact that IT consumerization has only recently become a research focus, the body of IS(-related) journals is unable to provide a specific vocabulary and theory to grasp the phenomenon. However, several well-established theories in the IS context cover different aspects of IT consumerization and often directly address work performance. For instance, recent IS top-basket research has focused on the acceptance of consumer technology (Venkatesh, Thong, and Xin Xu 2012), the influence of autonomy on motivation and task effort (Ke and Zhang 2010) or task-technology fit for mobile information systems (Gebauer and Shaw 2010).

# 3 Research approach

In order to address RQ1, we draw on core IS literature to identify possible areas of IS that could be used to structure our analysis. Here, literature commonly identifies hardware, software, data, people and procedures as major aspects of an information system (Bernus and Schmidt 2006; Silver, Markus, and Beath 1995; Tatnall, Davey, and McConville 1995). This distinction will be used as analysis groups for the classification of our findings from the literature review.

In the context of IT consumerization, we relate the term “hardware” to all kinds of consumer devices entering the workplace. Those devices are for example smartphones, tablets and laptops. All types of applications, including cloud-based ones, are associated with the term “software” (e.g., social networks, Google’s web applications, smartphone apps). Under the term “data”, we assume all issues that are related to any kind of data handling, for instance data security and data governance. All enterprise actions related to their employees, including trainings and motivational aspects, are summarized under the term “people”. Finally, “procedures” classifies all topics of corporate rules and policies as well as processes that were affected by consumerization. Figure 2 visualizes this perspective.

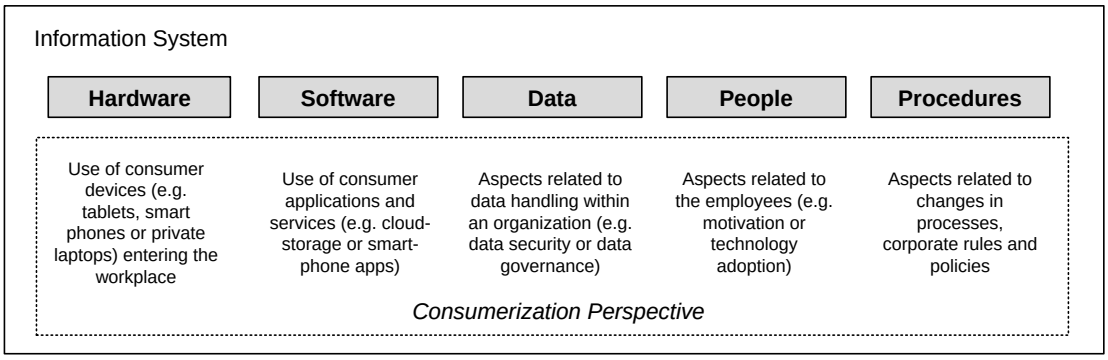



**Figure 2: Consumerization Perspective on Areas of an Information System**

We conducted a structured literature review as proposed by Webster and Watson (2002). We identified relevant literature using a variety of search terms including “consumerization”, “consumerized IT”, “consumer IT”, “bring your own device” and “BYOD”. Our search process included a database search (ISI web of knowledge, Google scholar) as well as a forward and backward search starting with the previously identified articles. Due to the fact that consumerization has only recently become a focal point of attention in research, we could not find any publications in IS-related journals on the topic. Therefore, we included practitioners’ reports, which comprised both qualitative and quantitative studies. Following the divergent search process, we selected a total of 22 studies that – from our perception – would contribute to the research questions. These studies were then coded using several steps. We used iterative open coding (Strauss and Corbin 1990) to break down the data and to identify major advantages and disadvantages of consumerization mentioned in the studies. This was done independently by three researchers. From the studies, we derived 113 codes. Afterwards, the results were consolidated and refined in a group effort.

To address RQ2 we selected 104 suitable codes from the original ones that were then assigned to one or more fields of the advantage/disadvantage matrix. In addition to this coding procedure, the codes were also assigned to the previously developed classification scheme of an information system in order to address RQ1.

In a next step, themes that emerged from the different codes were identified and discussed to come up with a set of categories. Here, selective codes which seemed to have a double meaning were interpreted in group work. The 104 suitable codes could be clustered into three argumentative streams for the perspective of the individual (Advantages: Autonomy, and Competence. Disadvantage: Workload) and nine streams for the perspective of the organization (Advantages: Employee satisfaction, speed of adoption, employee availability, customer focus, and employee investments. Disadvantages: Security issues, support complexity, loss of process control, and performance concerns). Those streams will be described in detail in section 4.2.

To address RQ3, we use both psychological and IS theories to build upon and integrate the causal relationships suggested by the practitioner studies and to create a preliminary theoretical model of IT consumerization. During our coding process, we recognized that some emerging categories resembled those from psychological macro theories. The strongest agreement could be found in self-determination theory (Ryan and Deci 2000) and cognitive model of stress (Lazarus and Folkman 1984). We applied both theories to develop twelve research propositions, which are represented in a conjoint research model (see section 5).

In order to perform an initial check of both the constructs and the relationships within our research model, as well as to investigate possible extensions, we performed an embedded single-case study (Yin 1984). We collected data at both the corporate level as well as in different sub-units. The case company “CouplingCo” (name changed to protect anonymity) was selected because they operate internationally, have a firm-wide IT infrastructure and recently started a program on policy development with regard to IT consumerization. CouplingCo is a medium-size manufacturing enterprise focusing on the development of coupling technology. It has more than 2000 employees world-wide and created a turnover of over $400 million in 2011. A total of 13 semi-structured expert interviews were conducted within the firm (60,000 words of transcript). Interview partners included the CEO, CFO, CIO, as well as sub-unit executives and employees. The data was analyzed in a two-step approach. First, we coded the different aspects of the research model using confirmatory coding. In a second step, we conducted a more explorative analysis of the data using open coding (Strauss and Corbin 1990), with the aim of identifying constructs and relationships that were not covered by the current model.

# 4 Practice Review

## 4.1 Areas of information systems affected by consumerization

Table 1 shows how the reviewed studies arrange consumerization in the context of IS. An “x” in one cell represents at least one code in the particular area of IS, related to an advantage or disadvantage for employees or organizations. The highest impact can be determined in the area of people and procedures. Furthermore, it is immediately obvious that codes in the data area are primarily associated with negative aspects (e.g., compatibility problems with legacy systems or data security concerns), while codes in the people area are linked with positive consequences (e.g., better employee morale or faster knowledge creation). Mostly, the advantages and disadvantages for people and procedures can be directly linked to those for employees and organizations (see following sections).

| IT Consumerization Studies | Hardware | | Software | | Data | | People | | Procedures | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Adv. (+) | Disa. (-) | Adv. (+) | Disa. (-) | Adv. (+) | Disa. (-) | Adv. (+) | Disa. (-) | Adv. (+) | Disa. (-) |
| 1. Aerospace Industries Association 2011 | | x | | | | x | x | | x | x |
| 2. Avenade 2012 | | | | | | | x | | | x |
| 3. Brousell 2012 | | | | | | x | x | | x | |
| 4. Cisco 2011 | x | | x | | | x | x | | x | x |
| 5. Compuware 2011 | | | | x | | x | | | | x |
| 6. D’Arcy 2011 | x | x | | x | | x | x | x | x | x |
| 7. Dell and Intel 2011a | x | | x | | | | x | x | x | |
| 8. Dell and Intel 2011b | | | x | | | | x | x | | |
| 9. Dimensional Research 2012 | | | | | | | x | | | |
| 10. Gens et al. 2011 | x | x | | x | | | x | | x | x |
| 11. Harris, Ives, et al. 2011 | x | x | x | | | x | x | | x | |
| 12. Harris, Junglas, et al. 2011 | x | | x | | | x | x | | | x |
| 13. Moschella et al. 2004 | | x | | | | | x | x | x | x |
| 14. Moore 2011 | | | | | | | | | | x |
| 15. Murdoch et al. 2010 | | | x | | x | x | x | | | x |
| 16. Networkworld 2012 | | x | | | | x | | | | x |
| 17. Prete et al. 2011 | | x | x | | | x | x | | | x |
| 18. PWC 2011 | | | | | | x | x | | x | x |
| 19. Sybase 2011 | x | | | | | | x | | x | |
| 20. Trend Micro 2011 | x | x | | | | x | x | | x | |
| 21. Unisys 2010 | | | | | | | x | | x | |
| 22. Vile 2011 | | | | | | x | x | | | x |
| **Sum** | **8** | **8** | **7** | **3** | **1** | **13** | **19** | **4** | **12** | **14** |

**Table 1: Distinct Aspects of IT Consumerization Addressed by the Studies Analyzed**

## 4.2 Potential effects for Individuals

Workload (5 Codes). Although a considerable part of the workforce appreciates flexible working procedures (Dynamic Markets 2011), they may also lead to heavier workloads for employees (Dell and Intel 2011b). The Aerospace Industries Association (2011) frankly states that member associations may benefit from longer employee work hours as a consequence of IT consumerization. For instance, if employees use their private devices for business-related communication, private time is no longer clearly defined and the boundary between private life and working hours dissolves. In this scenario, managers know that employees are able to work off-hours and are thus more likely to give them work tasks during these times. In many cases, IT consumerization leads to a pressure to work longer hours and employees are "less able to switch off from work" (Dell and Intel 2011a, p.8). As a consequence, Volkswagen, for instance, reacted to this development by restricting its mobile device access after work hours (BBC News 2011b).

Autonomy (12 Codes). On the positive side, consumerization is often associated with ‘greater freedom’ or ‘new freedoms’ for employees (Dell and Intel 2011a; Murdoch et al. 2010). Consequently, there is an increased autonomy and independence for employees, as they may make IT decisions on their own or provide technical support for themselves (Harris et al. 2011a; Price Waterhouse Coopers 2011). Greater responsibilities for employees, particularly younger ones (Avenade 2012), are closely related to more autonomy. A Cisco study (2011) showed that students prefer to have a budget to purchase their own notebook or mobile device. Chances are that not all employees agree with more autonomy as unrestricted advantage (D’Arcy 2011), but especially capable workers may enhance their earning potential if provided with a higher degree of autonomy (Dell and Intel 2011a). Furthermore, freedom of choice regarding work organization and structure contributes to the happiness of knowledge workers (Davenport, Thomas, and Catrell 2002; Vile 2011).

Competence (7 Codes). Firstly, end users perceive their consumer applications and devices as easier to use and more intuitive (Harris et al. 2011a; Murdoch et al. 2010). This seems obvious, because the employees are working with tools they purchased themselves. Secondly, employees use their IT not only in a business setting, but also privately and are therefore more familiar with it. Consequently, it can be assumed that individuals benefit personally from greater competence, i.e. being able to solve problems more easily (Dell and Intel 2011b), when using private IT. In contrast, existing corporate IT infrastructures create innovation barriers and lead to frustration among employees (Moschella et al. 2004). Thus, if employers introduce consumer tools into their organizational portfolio, they can expect existing technological competence among their employees to accelerate the adoption of new technologies (Prete et al. 2011).

From the practitioner literature review, we were able thus to derive three distinct arguments from the codes that address the relationship between IT consumerization and work performance: 1) an increased workload, 2) elevated employee autonomy and 3) a higher level of perceived competence in the context of IT. Table 2 provides an overview of practitioner studies which contribute to these three lines of argument (indicated by an “x”). For a more detailed analysis see Table 4 to Table 6 in the appendix.

| Study | Concept 1: Workload | Concept 2: Autonomy | Concept 3: Competence |
|---|---|---|---|
| Aerospace Industries Association 2011 | x | | |
| Avenade 2012 | | x | |
| Cisco 2011 | | x | |
| Dell and Intel 2011a | x | x | x |
| Dell and Intel 2011b | | x | x |
| Gens et al. 2011 | | x | |
| Harris, Ives, et al. 2011 | | x | x |
| Harris, Junglas, et al. 2011 | | | x |
| Moschella et al. 2004 | | | x |
| Murdoch et al. 2010 | | x | x |
| Prete et al. 2011 | | | x |
| Price Waterhouse Coopers 2011 | | x | |
| Sybase 2011 | | x | |
| Vile 2011 | | x | |
| **Sum of studies / codes** | *2 / 5* | *10 / 12* | *7 / 7* |

**Table 2: Advantages and disadvantages for individuals according to the studies analyzed**

## 4.3 Advantages for Organizations

Employee satisfaction (21 codes). Among all positive aspects about consumerization employee satisfaction was most mentioned. According to the study of Dell and Intel (2011b) six out of every ten employees enjoy work more, if they are able to use their own technologies. Enjoyment by technologies plays a role over all age groups, but the effect is strongest among younger workers. The motivation and work satisfaction is supposed to be an important asset for organizations. Hence, this point is obviously related to employee satisfaction as organizational benefit. Indeed, according to Gens et al. (2011) half of the IT organizations name employee satisfaction as primary benefit of consumerization. Organizations can address the functional needs of their employees and satisfy them by introducing consumer tools into the company (Dell and Intel 2011a). Employee morale and productivity will rise, resulting in a better productivity of the workforce. Companies should not underestimate the effect of consumerization on recruiting new staff. To appeal the new generation of tech-savvy workers, companies must be seen as desirable places to work (Dell and Intel 2011b; Unisys 2010). Consumerization contributes to that and is already an important factor for job decisions (Cisco 2011; Unisys 2010).

Speed of adoption (14 codes). Commonly most of the studies argue that consumerization helps companies to increase the speed of adoption for new technologies. If end users already know a technology from private life, companies do not have to provide training sessions and can immediately start with technology implementation (Murdoch et al. 2010; Unisys 2010).

Furthermore a new generation of tech-savvy employees is able to build up their own solutions with IT tools available at the market (Harris et al. 2011a). This quick tool creation by capable employees fosters the company's innovation process and further increases adoption cycles (Aerospace Industries Association, 2011).

Employee availability (11 codes). Enterprises increasingly want to have a workforce, which is flexible enough to be available, when business needs occur. Consumerization already contributed a major piece to establish those just-in-time resources (Dell and Intel 2011a). In addition, companies benefit from "free" longer work hours of their employees because of the blurring of work and lifetime. By using their own consumer tools employees implicitly accept tradeoffs in terms of work-life balance (Dell and Intel 2011b) and work more off-hours (Prete et al. 2011).

Customer focus (5 codes). Changes in the way enterprises approach new and existing customers can be seen as a minor factor of consumerization. Similarly to the aforementioned modified ways to recruit new tech-savvy employees, the same thing holds true for attracting tech-savvy customers. Consumer technology and flexibility in working times can help "[…] to appeal to a new generation of customers" (Unisys 2010, p. 10) and enhance customer communication (Dynamic Markets 2011).

Employee investments (6 codes). A few studies mention cost benefits through employee investments as another implicit advantage for organizations (e.g. Aerospace Industries Association 2011). Most of the companies currently do not have an elaborated "Bring Your Own Device" (BYOD) strategy. However, some employees tend to value their personal productivity higher than the guidelines of the company and just buy the desired IT support at their own expense. The general need to cut IT costs brings companies to accept this kind of procedure because despite all resulting drawbacks for the organization, the employee makes a capital investment that benefits the company (Dell and Intel 2011a).

## 4.4 Disadvantages for Organizations

Security issues (25 codes). It is not surprising, that security issues are the most mentioned concern with respect to consumerization of IT. Companies oftentimes struggle to establish effective security guidelines for employee-owned devices and software. The fear to loose company data or make data visible to non-authorized third parties is widespread and it is often justified (Aerospace Industries Association 2011; Compuware 2011). Careless employees do not believe that they are responsible for the security of consumer IT and use it inappropriately (Cisco 2011; Dimensional Research 2012). Moreover, if end users ignore existing corporate policies, store company data on their private devices or use private cloud service, additional risks will arise. Externally stored company data is difficult to protect and can be an easy target of disastrous attacks (Price Waterhouse Coopers 2011).

Support complexity (17 codes). Many study authors share the opinion that the consumerization trend will increase the workload of the IT department. It has been found that "more devices, times more apps, equals exponentially more complexity for IT to support and manage" (Gens et

al. 2011, p. 4). This calculation can be extended with additional costs for integrating legacy systems (Murdoch et al. 2010) and supporting nonstandard personal devices (Aerospace Industries Association 2011). It is often hard enough to ensure connectivity of legacy systems and mobile devices to enterprise IT. Manifold consumer applications and software make this task even more difficult and add more complexity.

Loss of process control (12 codes). Consumerization of IT can be seen as another challenge, which doubts the process control of the IT department. Due to the lack of up-to-date policies tackling consumerization, employees have taken the lead and make their own IT decisions (Harris et al. 2011b; Price Waterhouse Coopers 2011). A good example for this are cloud-storage services like Dropbox that – due to their easy handling – are more and more adopted by people in a work environment. However, this not only leads to a knowledge loss for the company if the employee retires or takes a job in another organization but also bypasses existing policies and security guidelines. This is a major issue for executives. On the one hand, CIOs must find a suitable adoption strategy for the consumerization of IT to stay strong and leverage its benefits (Gens et al. 2011; Moore 2011). On the other hand, the complexity for policies of multi-tool support and data monitoring has significantly increased and needs to be handled.

Performance concerns (8 codes). Consumer applications come along with more computing power in contrast to enterprise IT (Murdoch et al. 2010). However, companies are anxious about the performance of consumer IT. Besides compatibility problems for mobile devices, there are in particular reliability concerns (e.g. Harris, Ives, et al. 2011). Companies do not always feel comfortable if their applications and data rely on “external networks”, for instance in form of cloud providers (Compuware 2011, p. 1).

Table 3 provides an overview over the advantages and disadvantages of consumerization for both employees and organization as identified in the studies. The number in brackets represents the frequency of appearance within this code category. Again, the detailed analysis can be found in the appendix (Table 7 to Table 15).

| | **Advantages** | **Disadvantages** |
|---|---|---|
| **Employee** | Autonomy (12)<br>Competence (7) | Workload (5) |
| **Organization** | Employee satisfaction (21)<br>Speed of adoption (14)<br>Employee availability (11)<br>Customer focus (5)<br>Employee investments (6) | Security issues (25)<br>Support complexity (17)<br>Loss of process control (12)<br>Performance concerns (8) |

**Table 3: IT Consumerization from the Employee and the Organizational Perspective**

# 5 Related theory

In our theory and practice literature review, we derived increased workload, a higher autonomy and competence as potential effects of IT consumerization for individuals. To investigate the relation of these effects on work performance, we draw on the cognitive model of stress and self-determination theory (cf. section 3).

## 5.1 Cognitive Model of Stress

In their cognitive model, Lazarus and Folkman (1984) define stress as the result of an interaction between an individual and the environment, including stressful situations or conditions, which they refer to as “stressors”. Especially in an organizational context, stressors emerge when individuals cannot cope with new technologies or a high workload (Cooper, Dewe, and O’Driscoll 2001). As a result, the individual’s well-being and hence the organizational productivity is influenced negatively (McGrath 1976). Within the IS literature, the effects of stress have recently been discussed in the context of turnover intention (Ahuja, Chudoba, Kacmar, McKnight, and George 2007; Moore 2000), job satisfaction (Joshi and Rai 2000; Li and Shani 1991) and innovation with IT (Ahuja and Thatcher 2005). Recently, a couple of authors have discussed the concept of “technostress”, i. e. the role played by information and communication technology in creating higher stress levels of individuals (Ayyagari and Grover 2011; Tarafdar, Tu, Ragu-Nathan, and Ragu-Nathan 2007). Technostress is the result of constant multitasking, relearning and insecurity, as a consequence of frequent IT paradigm changes (Tarafdar, Tu, and Ragu-Nathan 2010).

Numerous studies have demonstrated the influence of stressors on employee stress perception. Our (practical) literature review revealed that an increase in workload and greater autonomy are familiar effects of the IT consumerization trend. High workloads and a lack of autonomy are essential stressor variables in both the psychological (Kahn and Byosiere 1992; Maslach and Leiter 2008) and IS literature (Ahuja and Thatcher 2005; Moore 2000). Tarafdar et al. (2007) mention that telecommunicating and constant connectivity have extended the workplace into other areas of life, leading to a sometimes dangerously higher workload. Ahuja and Thatcher (2005) note that contemporary work environments are characterized by both work overload and autonomy, providing workers with more freedom, but simultaneously with greater responsibilities.

While it is plausible that, after all, higher workloads lead to a higher work performance, the downside of work extension can be employee exhaustion, especially in the long run. Workload changes become work overload, if, amongst other factors, an individual perceives that there are critical resources lacking to fulfill a particular task. Possible reasons include limitations imposed by the environment, such as time (quantitative overload) or the fact that employees are assigned to work tasks that exceed their capability or skill level (qualitative overload) (Ahuja and Thatcher 2005). Thus, it is likely that the consumerization of IT contributes to this development. Through corporate influence on private IT, the workplace is extended into the private sphere and there are higher expectations concerning connectivity and willingness to work, which

extend into what would normally be off-hours (Dell and Intel 2011a). Based on the above considerations, we propose:

*$P_1$: Employees who co-use private IT for business purposes experience higher workload.*

*$P_2$: Workload has a positive influence on work performance.*

*$P_3$: Higher workload raises the stress level at work.*

Hackman and Oldham (1976) define autonomy as "the degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling the work and in determining the procedures to be used in carrying it out". Maslach and Leiter (2008) cite several studies which found a strong relationship between a lack of job control, a variable similar to autonomy, and work exhaustion. Moore (2000), subsequently replicated by Ahuja et al. (2007), demonstrated that a lack of job autonomy is correlated with work exhaustion for IT professionals. Ahuja and Thatcher (2005) found that an increase in autonomy lessens the effect of work overload. As IT consumerization is considered to provide employees with greater autonomy, for instance, by allowing them to choose their own IT equipment (e.g. Murdoch et al. 2010), hence:

*$P_4$: Employees, who are given the choice of using private IT for work purposes, perceive a greater autonomy at their workplace.*

*$P_5$: Autonomy lowers the stress level at work.*

The influence of stress on human performance has been widely discussed in the psychological literature (Cohen 1980; Kavanagh 2005; Staal 2004), with many authors supporting an inverted-U shaped relationship. Following this hypothesis, moderate stress is optimal for employee performance, because it is stimulating and challenging. By contrast, very low and very high stress level trigger boredom and anxiety respectively, which impacts negatively on performance (Zivnuska, Kiewitz, Hochwarter, Perrewé, and Zellars 2002). In the present research-in-progress paper we focus on high stress levels and propose:

*$P_6$: High stress levels have a negative influence on work performance.*

## 5.2 Self Determination Theory

IT consumerization affects user autonomy and choice to select and to use IT tools in the work context. The practitioner literature suggests that this increased autonomy enhances work performance, because users select devices and software with which they are familiar and are able to handle more productively (Cisco 2011; Dell and Intel 2011b). This direct relationship is also supported by recent IS research. For instance, Elie-Dit-Cosaque et al. (2011) stated that "[…] autonomy is what enables individuals to cope effectively with changing work conditions, including those from IT" while Ahuja and Thatcher (2005) found a significant correlation between autonomy and IT innovativeness. Hence,

*$P_7$: Perceived autonomy exerts a direct positive effect on work performance.*

From a psychological perspective, the relationship between autonomy and performance can be explained using self-determination theory (SDT). Autonomy is an commonly cited construct in the context of intrinsic motivation (Deci, Connell, and Ryan 1989; Ryan and Deci 2000). For instance, Deci and Ryan (2000) stated that "[...] the experiences of competence and autonomy are essential for intrinsic motivation". In turn, intrinsic motivation leads to more excitement and interest towards the particular subject and thus to higher performance (Ryan and Deci 2000). On the other hand, if a high level of external control is imposed, performance may decline, for example due to task monotony (Melamed, Ben-Avi, Luz, and Green 1995). In the IS literature, little attention has so far been paid to SDT in the context of performance research. While several studies have elaborated on the effects of autonomy on technology acceptance (Malhotra, Galletta, and Kirsch 2008; Roca and Gagné 2008), few have directly addressed the relationship between autonomy and performance. One exception is Ke and Zhang (2010), who found that satisfying needs for autonomy may raise motivation and task effort in the context of open software development. Thus, we expect:

*$P_8$: Perceived autonomy raises intrinsic task motivation.*

*$P_9$: Higher intrinsic motivation positively influences work performance.*

In addition to an increase in autonomy, the practitioner literature also suggests a positive influence of IT consumerization on competence, because private devices are generally easier to use and existing knowledge and skills gained through their usage may be easily transferred to and utilized in a work context (Prete et al. 2011). This is underlined by a recent IS study that found a significant positive correlation between perceived competence and perceived ease of use (Roca and Gagné 2008). Thus, if a technology is perceived as easier to use, the general perceived competence with regard to this technology will also rise. Hence, we propose:

*$P_{10}$: The co-use of private IT for business purposes exerts a positive effect on perceived competence.*

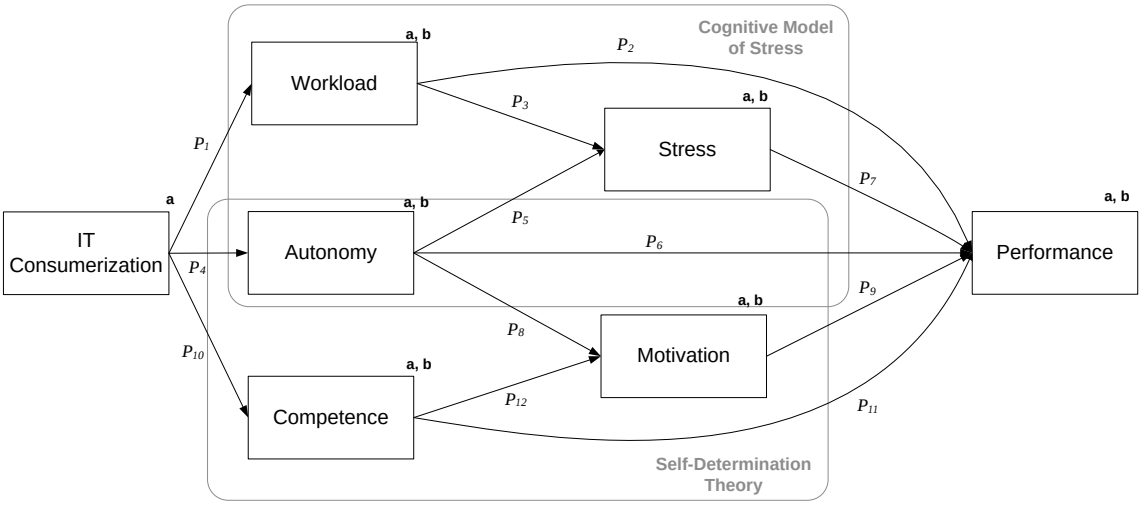
In this context, perceived competence is closely related to the concept of computer self-efficacy. Compeau and Higgins (1995) define computer self-efficacy as "[…] an individual's perceptions of his or her ability to use computers in the accomplishment of a task […] rather than reflecting simple component skills". This resembles definitions of perceived competence from self-determination theory (Ryan and Deci 2000). Also, very similar to perceived competence, IS studies have revealed a positive correlation between computer self-efficacy and ease of use (Brown 2005). The concept has a clear task focus and, in IS theory, is often directly related to task performance (Compeau and Higgins 1995a; Marakas, Yi, and Johnson 1998). Computer self-efficacy affects choices about how to behave and act, as well as the persistence and effort exerted when facing obstacles (Compeau and Higgins 1995b). Thus, if people feel more self-confident in the use of IT, it is likely that they will find more innovative and faster ways for dealing with a particular task and will thus be more productive. Therefore, we propose:

*$P_{11}$: Perceived competence exerts a direct positive effect on work performance.*

In addition, SDT suggests an indirect relationship between competence and performance, with motivation as an intermediary construct (Baard, Deci, and Ryan 2004). In this context, cognitive evaluation theory (CET) – a sub-theory within SDT – claims that social-contextual factors leading to a feeling of competence may positively increase intrinsic motivation towards the task (Ryan and Deci 2000). This relationship has also been validated with respect to IS-based tasks (Ke and Zhang 2010). Thus, task performance may not only increase because of a more effective IT tool selection, i.e. the task-technology fit, but also due to an elevated level of intrinsic motivation. Hence, we propose that:

*$P_{12}$: Increased perceived competence raises intrinsic motivation.*

Figure 3 shows our theoretical model including the individual propositions. For each concept, it is specified whether it is grounded in theory and/or found in the practitioner literature.




**a** Construct found in the practitioner literature

**b** Construct grounded in theory

**Figure 3: Theorizing IT Consumerization**

# 6 Case study: Preliminary results

Drawing on the related theory, the investigated case offered a variety of insights to perform an initial check of the proposed research model. With regard to workload, we could find supporting evidence for our propositions $P_1$ and $P_2$ within the case study at "CouplingCo". Several interviewees conceded that by using private IT, there is a tendency to extend working time. Exemplary, one employee stated:

> *"Inevitable, I spend a lot of time at 'dead places' where I am not able to do anything except working with my smartphone. By using it, I can start working on open tasks."*

Similarly, the private life of employees is affected by work extension, indicating an advancing work-life overlap. One unit manager stated that some employees with high IT-capability put some work tasks in their briefcases on Friday, solve the problems at home with their private tools over the weekend, and show up on Monday with the results. Most of the employees admit that considerable work-life overlap makes it difficult to switch-off from work. Several employees consider that as a negative consequence of consumerization. A service manager stated:

> *"It leads to a state where free time is not really free anymore, and you always feel connected to work, think about work issues and even work on some stuff during your off-times."*

However, few interviewees had a negative perception of this trend. Instead, they appreciated the increased flexibility to schedule work times and the chance to carry just one device for private and work purposes.

The freedom of hardware and software choice is not a decisive factor for most employees, because the current IT infrastructure of CouplingCo is satisfying. However, several employees support with their actions our proposition $P_4$, proposing the relation between consumerization and autonomy. One employee stated:

> *"If I were allowed to use private software, this would make me more independent […] depending on the rights granted or not granted. […] All in all I would be more flexible."*

In general, the positive effect of increased autonomy was far more strongly supported in the case than the negative aspects related to workload and stress, thus supporting our proposition $P_5$. The CIO stated:

> *"If employees can decide themselves which tools to use, they will commit to tasks that, I guess, we wouldn't even have time for otherwise."*

Moreover, the case supports the general perception that IT consumerization leads to a higher level of employee motivation. However, the interviewees did not elaborate on the reasons of this increase in motivation ($P_8$, $P_{12}$). An IT project manager stated:

> *"The possibility of using private IT will certainly have a positive effect on motivation. Whether this effect is high or low will depend on the people. Some would cut corners, if they were told that they could do everything they wanted with their android device."*

The proposed positive influence of the use of private IT on competence ($P_{10}$) was also evident in the case. Employees use private IT tools to perform work tasks, because they enable the exploitation of privately gained competences and thus enhance performance. An employee stated:

> *"Concerning performance, usability, and speed, I could work better with my private device because I am used to it and can carry out standard procedures."*

Overall, we found evidence to support most of our theoretical constructs and relationships. However, while we have found several statements about motivation, stress levels and employee competence employees, we were not able to distinguish between different effects from the qualitative study on work performance ($P_6$, $P_7$, $P_9$ and $P_{11}$). Nonetheless, we found substantial evidence to support the positive relationship of IT consumerization on work performance. Interviewees talked frequently about practices and scenarios, where the use of their private hardware and software enabled them to work faster or more efficiently. Examples included checking business E-Mails from private devices at home, continuing with work tasks after hours on the private PC, using private cameras to take pictures of the production process and bringing along the private iPad to business meetings or on business trips.

# 7 Discussion and Conclusion

This working paper contributes to a theoretical understanding of IT consumerization. The phenomenon of IT consumerization, defined here as the co-use of privately-owned IT resources for business purposes, is gaining immense attention in practice. IS research, however, has yet to provide the necessary vocabulary and a systematic understanding of this important phenomenon. This study contributes to closing this research gap (Sawyer and Winter 2011). Our analysis shows, first, which fundamental aspects of IS (hardware, software, data, people, and procedures) are affected by consumerization. Secondly, we provide an overview of major advantages and disadvantages for employees and organizations by conducting a systematic analysis of current literature available on the topic.

Third, we lay the basis for an integrated and specific IT consumerization theory. On the basis of a comprehensive, practice-oriented literature review, we extracted potential (direct) effects of IT consumerization on individuals, namely increased workloads, perceived autonomy, and perceived competence. We then connected IS theory, namely the cognitive model of stress and self-determination theory, with these lines of argument and concepts. While both theoretical perspectives originate from the field of psychology, they have already been applied effectively in IS. Our resulting theoretical model of IT consumerization and its effects on individual work performance consists of seven constructs and twelve hypothesized relationships.

In an initial effort to test and to potentially extend this model, we conducted an embedded case study at CouplingCo that relied on 13 semi-structured interviews as the primary source of data. The results of this initial case study (pre-test) encourage us to proceed with the given model for two reasons. Firstly, we found the major case study concepts and arguments to be covered by our theoretical model and, secondly, the data supports the majority of the hypothesized relationships. One exception is the negative relationship of (high) stress and performance which is, however, dealt with comprehensively in the literature. We assume this discrepancy to be a result of employee self-assessment and self-reported information. Overall, we contribute to the IS body of knowledge, an initial theoretical model for understanding IT consumerization and, specifically, its multi-facetted consequences for individual work performance.

## 7.1 Implications for theory

Our literature search process provides evidence that not much has yet been published on theory development in the area of IT consumerization. The presented discussion on differences within these definitions as well as the development of a clear understanding with regard to the dimensions ownership and purpose may be a starting point for future theory development in this area. Furthermore, our research shows that people and procedures are highly affected by consumerization. While this is not surprising because the trend has been triggered by consumers and their individual needs, it shows that IS research in this context needs to have a more interdisciplinary focus. In order to develop a theory perspective on IT consumerization and its implications, it is inevitable to take into account psychological aspects as well.

## 7.2 Implications for practice

While there is a plethora of studies available for practitioners to read, our analysis provides a potentially valuable differentiated overview over important advantages and disadvantages of particular IT consumerization aspects. The categories that were identified during our coding procedure may enable practitioners to take more informed decisions. While it is likely that, over time, certain disadvantages may turn into advantages or vice-versa, our research may present a good starting point for discussions between practitioners on the topic. For executives, it is important to closely evaluate advantages and disadvantages with respect to the organizational context to determine whether or not to change IT policies and procedures. Thus, our framework may be used as guideline for IT policy evaluation within an organization by pointing out important aspects to consider by CIOs rethinking the IT strategy of their company.

## 7.3 Outlook and limitations

We have to note that there might exist some advantages and especially disadvantages of consumerization apart from what has been mentioned in the discussed studies. We only analyzed 22 studies, mostly from analysts and consulting firms. Against this background, it could be argued that there might be a positive bias in the data set. Because the firms' primary interest is to promote their market position and sell their solutions, the studies may have a certain focus on positive aspects, i.e. opportunities, rather than issues associated with IT consumerization. Potential drawbacks of consumerization for individuals may be somewhat underestimated within the reviewed studies. As an example, employees have to fear sincere legal consequences, if they violate the corporate policies on purpose by using their own IT. Currently, the procedures are not clearly defined and end users believe that securing their work devices is not within their responsibility (Cisco 2011). Thus, additional research has to focus on the validation and extension of the categories that have been developed within the coding process of our research.

On the basis of the proposed research model in this study, we plan a quantitative analysis as the next major step. CouplingCo has committed to send out a survey questionnaire to its employees in (still to be determined) selected departments, such as sales or R&D. The measurement model we need to develop for this endeavor will be able to rely on the academic literature and can be complemented by qualitative information/quotes from the case study. For instance, the IS literature does not yet provide a measurement instrument for IT consumerization as a theoretical concept and our qualitative data can help to develop just this.

Moreover, we assume that a quantitative-empirical analysis will be able to contribute to solving still prevailing discrepancies between theory and qualitative interview data (e. g., the stress-performance relationship). In addition, a sound definition of constructs and corresponding measurement instruments can potentially help to overcome "under-defined" statements in the practitioner literature. For instance, motivation, stress, productivity, and other (psychological) aspects relevant for IT consumerization are often "laundry-listed" in the practitioner literature, rather than being formulated in terms of a systematic relationship. Only a systematic understanding of the relationship between IT consumerization and individual work performance will enable a positive manipulation of specific effects. In turn, enabling organizations to benefit

from the full performance-related potential of IT consumerization, despite concerns about, for instance, security and maintenance (Gens et al. 2011).

Nonetheless, our approach is limited in several respects, which opens up the field for additional future research. The current model has been developed on the basis of IS practice literature as well as IS theory. However, this is certainly not exhaustive and other theoretical perspectives could potentially contribute to explaining how IT consumerization relates to work performance. Furthermore, future studies could analyze how certain areas of IS are influenced by IT consumerization, i.e. identify causal relationships, and apply different theoretical perspectives on the matter to come up with a holistic and thorough understanding of the phenomenon.

We hope that, in such contexts, our model can serve as a viable starting point and general framework that is open to extension. Moreover, we identified individual autonomy as one of the key concepts relevant to IT consumerization. Privately-owned hardware and software are, by definition, part of ongoing information system individualization (Baskerville 2011a, 2011b). We note that consumerization thoroughly embodies this phenomenon in prevailing IS practice and see a potentially fruitful avenue for future research in investigating the relationship between consumerization and the individualization of information technology/information systems.

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# Appendix

### Advantages and Disadvantages for Individuals

| Study | Workload |
|---|---|
| Aerospace Industries Association 2011 | Workers work longer hours |
| Dell and Intel 2011a | Workers cannot "switch off from work, heavier workloads and stress, pressure to work longer hours |

**Table 4: Example codes for workload**

| Study | Autonomy |
|---|---|
| Avenade 2012 | Greater responsibilities to younger employees |
| Cisco 2011 | Students prefer to have a budget for design choice |
| Dell and Intel 2011a | Autonomy and choice, work enjoyment |
| Dell and Intel 2011b | Earning potential for capable workers |
| Gens et al. 2011 | Work satisfaction |
| Harris, Ives, et al. 2011 | Self-support for end users |
| Murdoch et al. 2010 | Greater freedom for employees |
| Price Waterhouse Coopers 2011 | Independence of users, Self-support among employees |
| Sybase 2011 | Being available on a mobile device is more likely to help them get ahead at work. |
| Vile 2011 | Employees want their freedom to use own devices |

**Table 5: Example codes for autonomy**

| Study | Competence |
|---|---|
| Dell and Intel 2011a | More easily to solve a problem |
| Dell and Intel 2011b | Ease-of-use devices |
| Harris, Ives, et al. 2011 | Easier to use software |
| Harris, Junglas, et al. 2011 | Easier usage of IT |
| Moschella et al. 2004 | Simple systems, more intuitive to use |
| Murdoch et al. 2010 | More intuitive technologies |
| Prete et al. 2011 | Learning of new technologies |

**Table 6: Example codes for competence**

### Advantages and Disadvantages for Organizations

| Study | Security Issues |
|---|---|
| Aerospace Industries Association 2011 | Loss of company data; Data authorization when device owner changes; Malware/Virus protection |
| Avenade 2012 | Security breaches |
| Brousell 2012 | IT becoming too consumer-centric |
| Cisco 2011 | End users believe they are not responsible for securing their devices. |
| Compuware 2011 | Loss of corporate data |
| D'Arcy 2011 | Security capabilities will create obstacles for organizations |
| Dimensional Research 2012 | Concerns about data privacy of corporate data |
| Gens et al. 2011 | Security concerns, Introduction of viruses |
| Harris, Ives, et al. 2011 | Data security concerns |
| Harris, Junglas, et al. 2011 | Data security concerns |

| | |
|---|---|
| Moore 2011 | Vulnerabilities and Liabilities |
| Moschella et al. 2004 | Security issues |
| Murdoch et al. 2010 | Risks around data security, scalability and data governance |
| Networkworld 2012 | Validating security through risk assignments |
| Prete et al. 2011 | Data protection, Disaster recovery |
| Price Waterhouse Coopers 2011 | Vulnerability to disastrous attacks |
| Trend Micro 2011 | Several ways that corporate data is exposed to unauthorized parties |
| Vile 2011 | Significant concerns around security, data protection |

**Table 7: Example codes for security issues**

| **Study** | **Support Complexity** |
|---|---|
| Aerospace Industries Association 2011 | Additional integration costs |
| Compuware 2011 | Support for mobility is almost impossible due to their reliance on external networks; Greater complexity into the infrastructure |
| D'Arcy 2011 | IT departments will face tremendous challenges to deliver end user service and support |
| Gens et al. 2011 | Users adopt devices faster, than IT can support them |
| Moschella et al. 2004 | Potential conflicts between exciting new consumerized services and ageing business infrastructures |
| Murdoch et al. 2010 | Complication of operations with legacy systems. |
| Networkworld 2012 | BYOD support by IT department expected |
| Prete et al. 2011 | Challenges for service-level guidelines. |
| Vile 2011 | Worried about the ability to provide users with effective support |

**Table 8: Example codes for complexity**

| Study | Loss of Process Control |
|---|---|
| Aerospace Industries Association 2011 | No way to locate, clean or recover devices. |
| Avenade 2012 | Executives and IT are still working to put the right policies, procedures |
| Cisco 2011 | Students expect their employer to pay for future mobile data subscription. |
| D'Arcy 2011 | Difficult to control employee technology usage |
| Gens et al. 2011 | Need for better policies |
| Harris, Junglas, et al. 2011 | Employees make IT decisions |
| Moore 2011 | Adaption of control and governance definitions. |
| Moschella et al. 2004 | Need for better policies. |
| Prete et al. 2011 | Compliance gaps |
| Price Waterhouse Coopers 2011 | Employees take own action; No monitoring of data tracking |

**Table 9: Example codes for loss of process control**

| Study | Performance Concerns |
|---|---|
| Compuware 2011 | Ensure that business applications perform effectively on a range of devices |
| Harris, Ives, et al. 2011 | Reliability concerns |
| Harris, Junglas, et al. 2011 | Reliability and performance concerns |
| Moschella et al. 2004 | Public infrastructure technologies are often significantly less reliable |
| Prete et al. 2011 | Performance challenges |
| Price Waterhouse Coopers 2011 | Vulnerability to disastrous attacks |

**Table 10: Example codes for performance concerns**

| Study | Customer Focus |
|---|---|
| D'Arcy 2011 | Mobile ecommerce is expected to grow to one quarter of ecommerce |
| Trend Micro 2011 | Higher customer satisfaction |
| Unisys 2010 | Appeal a new generation of consumers; Leapfrog competititors |

**Table 11: Example codes for customer focus**

| Study | Employee Availability |
|---|---|
| Aerospace Industries Association 2011 | Workers work longer hours |
| Dell and Intel 2011a | Just-in-time resources, More flexible labor market |
| Dell and Intel 2011b | Employees accept tradeoffs in terms of work-life balance |
| Gens et al. 2011 | Employees squeeze more out of their day, and work from alternative locations. |
| Harris, Junglas, et al. 2011 | 24/7 availability of employees |
| Prete et al. 2011 | Employees work more off-hours. |
| Price Waterhouse Coopers 2011 | Flexibility benefits |
| Sybase 2011 | Employees always available |

**Table 12: Example codes for employee availability**

| Study | Speed of Adoption |
|---|---|
| Aerospace Industries Association 2011 | Increase adoption cycles |
| Dimensional Research 2012 | Effectiveness of workers |
| Gens et al. 2011 | Faster adoption of consumer technologies |
| Harris, Ives, et al. 2011 | Employees provide technical support for themselves |

| | |
|---|---|
| Harris, Junglas, et al. 2011 | Quicker implementation |
| Moschella et al. 2004 | Employees are now being trained by these consumer systems |
| Murdoch et al. 2010 | No training sessions necessary. Less worries about data compatibility |
| Prete et al. 2011 | Faster time to market |
| Price Waterhouse Coopers 2011 | Users support themselves and each other |

**Table 13: Example codes for speed of adoption**

| **Study** | **Employee Satisfaction** |
|---|---|
| Avenade 2012 | Improved employee morale |
| Brousell 2012 | Positive impact on user satisfaction |
| Cisco 2011 | Flexibility in device choice is a factor for job decisions. |
| D'Arcy 2011 | End user technology is increasingly becoming a talent recruitment and retention issue |
| Dell and Intel 2011a | Satisfying the more functional needs of employees. |
| Dell and Intel 2011b | Employees enjoy work; Companies will be seen as desirable places to work |
| Gens et al. 2011 | Benefit of employee satisfaction |
| Harris, Ives, et al. 2011 | Employees see tools as more useful and more fun. |
| Price Waterhouse Coopers 2011 | Benefit of employee satisfaction |
| Sybase 2011 | Employees value to do their jobs from their mobile devices. |
| Trend Micro 2011 | Hire the desirable professionals from millennial generation |
| Unisys 2010 | Appeal a new generation of employees; More engaged workforce |
| Vile 2011 | More satisfied employees |

**Table 14: Example codes for employee satisfaction**

| Study | Employee Investments |
|---|---|
| Dell and Intel 2011a | Cost benefits |
| Gens et al. 2011 | Individual smartphone purchasing. |
| Harris, Ives, et al. 2011 | Inexpensive tool creation |
| Harris, Junglas, et al. 2011 | Less money than traditional enterprise IT |
| Trend Micro 2011 | Capital expenditures for IT done by users |

**Table 15: Example codes for employee investments**

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