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Research Article

Voluntary use of information technology: an analysis and synthesis of the literature

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Abstract

Voluntariness is recognized as an important influence on individual and collective technology acceptance. We conducted a comprehensive review of this literature and identified a rich set of voluntariness concepts and methods of operationalization. However, while considerable empirical evidence is reported in the literature, our review also revealed inconsistent results concerning the relationship between voluntariness and other concepts. Against that backdrop, we synthesized the literature into three types of voluntariness – perceived, intended and realizable voluntariness (RVOL), and showed how prior literature had not adequately accounted for RVOL. Moreover, we examined the multiple mechanisms that influence voluntariness and created a model to describe how to advance new knowledge about the important relationships among the three types of voluntariness and between voluntariness and user behavior. We argue that these concepts and relationships may help advance our knowledge of how a new technology is used individually and collectively in organizations.

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Introduction

Understanding why and how individuals adopt and use technology within organizations continues to be a critical focus for research. Because achieving the intended value from a technology depends on how it is used at the individual level (DeLone and McLean, 2003; Burton-Jones and Grange, 2012) and because user resistance continues to be a problem in technology implementation (e.g., Bhattacherjee and Hikmet, 2007; Lapointe and Rivard, 2007; Leonardi, 2009; Rivard and Lapointe, 2012), individual technology acceptance remains a critical management challenge. Research on technology acceptance and user behavior over the last 30 years has helped to clarify the broad categories of factors that influence technology acceptance and user behavior – including beliefs about performance expectancy, effort expectancy, social factors and perceived behavioral control (Venkatesh *et al.*, 2003) across a wide range of contexts, such as professional work, home use and educational settings (Chan *et al.*, 2010; Elie-Dit-Cosaque *et al.*, 2011; Kane and Labianca, 2011; Aguirre-Urreta and Marakas, 2012; Hsieh *et al.*, 2012; Wu and Du, 2012; Kuan *et al.*, 2014).

One area of technology acceptance research that remains somewhat unclear is the concept of voluntariness. Voluntariness is variously hypothesized as a direct influence on behavior (e.g., Compeau *et al.*, 2007; Hester, 2010; Chen *et al.*, 2015), as a moderator of the influence of subjective norms on behavior (e.g., Venkatesh and Bala, 2008; Abbasi *et al.*, 2011) or as a boundary condition for attitude models (Igbaria *et al.*, 1997). In addition, the findings continue to be inconsistent with positive, negative and no support for most of the hypothesized relationships (e.g., Templeton and Byrd, 2003; Compeau *et al.*, 2007; Hsu *et al.*, 2007; Hester, 2010). The presence of these diverse views of voluntariness and the mixed findings in the literature suggest an underlying weakness in the existing understanding of the phenomenon.

We view this lack of consensus as a concern for both researchers and managers. For researchers, the possibility of competing, yet unclear, views of and roles for voluntariness makes the development of research models more challenging and this may hinder theoretical progress. For managers seeking to apply research findings, the lack of clear guidance about whether voluntariness influences use directly or

moderates the effect of other concepts on use (or plays still a different role) makes it difficult to form clear action strategies. This is especially true in light of research which suggests that decreasing voluntariness may have unintended negative consequences. For example, research has shown that innovative use of technology at work depends on the deliberate actions of individuals, which also implies a voluntary decision (Amoako-Gyampah and Salam, 2004; Ahuja and Thatcher, 2005; Jasperson *et al.*, 2005). Other studies have suggested that taking choices away from employees may engender employee resentment, if not resistance (Lapointe and Rivard, 2005; Ferneley and Sobreperez, 2006). Imposing decisions regarding the use of technology for one's work on employees may trigger psychological reactance (Brehm and Brehm, 1981), a tendency for employees to seek to restore lost freedom and could negatively impact the level of employees' satisfaction and loyalty (Wang and Butler, 2007).

Against this backdrop, we decided to undertake a theoretical reconsideration of voluntariness in the use of information technology (IT). Through a comprehensive review of the literature, we develop a new conceptualization of voluntariness that captures varied elements of an individual's use of a specific technology. We retain the well-known conceptualization of perceived voluntariness (PVOL), but refine the parallel concept of environment-based voluntariness proposed by Wu and Lederer (2009) to recognize two distinct elements embedded within it: intended voluntariness (IVOL) and RVOL. On the basis of this new framing, we show how the three types may be linked, and we construct a model to illustrate how different combinations of intended and RVOL result in different behavioral outcomes. In conclusion, we demonstrate how the proposed view of voluntariness helps us better interpret the results in the literature with implications for future research.

The review methodology

We conducted a detailed review of the literature, following the guidelines laid out by Webster and Watson (2002). We began by conducting an online search of academic articles using ProQuest, EBSCO and Google Scholar. The search criteria were publication types, language, and various synonyms and antonyms of voluntariness (e.g., discretionary, voluntary, volitional, mandate, required and mandatory). We focused on articles in peer-reviewed journals and conference proceedings written in English. We did not include working papers, master theses or doctoral dissertations, except the one by Gary Moore in 1989, because his doctoral dissertation contained more tests on voluntariness than the published paper (i.e., Moore and Benbasat, 1991). We identified additional articles by examining the references for selected articles and by conducting citation searches on the papers written by Moore and Benbasat (1991) and Hartwick and Barki (1994).

The searches generated approximately 1800 hits. Most of these made only passing references to voluntariness or referenced other papers using the term voluntariness in their titles. We also eliminated articles that did not relate voluntariness to other concepts in the technology acceptance literature (e.g., comparing the average PVOL score between men and women). This left us with a pool of 50 studies (see those references that end with an asterisk). These articles, published between 1991 and 2015, use data collected from a variety of subjects (e.g., university students and professors, IT professionals, sales representatives, health-care professionals, engineers, librarians) and examine the adoption of different IT artifacts, including hospital bedside terminals, productivity tools, knowledge management systems, library cataloging systems, distance learning technologies, system development process innovations, Web 2.0, blu-ray players and smart cards.[1]

Once we had identified the articles for our review, we constructed a matrix to identify the way in which voluntariness was defined in each article, its operationalization, the relationships tested (if applicable) and the support (or the lack of thereof) for those relationships. This allowed us to tabulate the findings for different relationships tested (e.g., the relationship between voluntariness and use) and to identify the different ways in which voluntariness was defined.

Voluntariness in the literature

Since its inception by Moore and Benbasat (1991),[2] the definition of voluntariness in most technology-adoption studies (if defined explicitly) has been similar to the original. However, various treatments and assumptions have emerged over the course of a quarter century. According to Bagozzi (1984), concepts derive meaning not just from their definition, but from how they are operationalized and how they are related to other concepts. Thus our review looks not just at the formal definition but also at the measures and the roles accorded to voluntariness in technology acceptance models. On the basis of this review, we identify two broad categories of voluntariness, as discussed below.

Definition and theoretical foundations

When Moore and Benbasat (1991) introduced the concept into the technology acceptance literature, they acknowledged that voluntariness could be either a perception (i.e., cognition) or an attribute of the environment, what they called actual voluntariness. They chose to focus on the perception, arguing that '[i]t is often not actual voluntariness which will influence behavior, but rather the perception of voluntariness' (196). PVOL, a continuous variable at the individual level, was defined as 'the degree to which use of the innovation is perceived as being voluntary, or of free will' (195). They developed a four-item scale to capture PVOL (see the left column in Table 1) and showed how it was distinct from other perceived characteristics of using an innovation.

The operationalization of PVOL has been consistent across studies. The majority of researchers used the short form of the scale (i.e., PVOL3 and PVOL4), except a few who added PVOL2 to the short form (Croteau and Vieru, 2002), or replaced PVOL4 with PVOL2 (Hsu *et al.*, 2007). Compeau *et al.* (2007) expanded Moore and Benbasat's scale to include two new items. Typically, PVOL is measured using a 7-point Likert scale (strongly disagree – strongly agree), although Hsu *et al.* (2007) used a 5-point scale.

In contrast to PVOL, actual voluntariness was explained as reflecting corporate policies and compulsion:

> When examining the diffusion of innovations, consideration must be also given to whether individuals are free to implement personal adoption or rejection decisions. For example, use of a particular innovation within organizations

Table 1 Key features of two major conceptualizations of voluntariness

	Conceptualization	
	Voluntariness as cognition	*Voluntariness as an attribute of the environment*
Definition	Voluntariness is an individual's perception of 'the degree to which use of the innovation is perceived as being voluntary' (Moore and Benbasat, 1991: 195)	Voluntariness is 'a context-dependent freedom in adopting an information system … that stems from a physical context, and is independent of personal biases and points of view' (Wu and Lederer, 2009: 421)
Theoretical Foundation	• Theory of Planned Behavior (Ajzen, 1985) • Kelman's (1958) internalization	• Kelman's (1958) compliance
Operationalization	• PVOL scale: ○ PVOL1: My superiors expect me to use the system. ○ PVOL2: My use of the system is voluntary (as opposed to required by my superiors or job description). ○ PVOL3^{+}: My boss does not require me to use the system. ○ PVOL4^{+}: Although it might be helpful, using the system is certainly not compulsory in my job.$^{+}$ short form	• Measured with a question (Hartwick and Barki, 1994) • Judged by researchers (Igbaria *et al.*, 1997; Lee *et al.*, 2006) • Confirmed with the PVOL scale (Venkatesh and Davis, 2000) • EBVOL scale (Wu and Lederer, 2009) ○ EBVOL1: The survey participants' superiors/professors expect them to use the system. ○ EBVOL2: The survey participants' use of the system is voluntary (as opposed to being required by their superiors/professors or job/program description). ○ EBVOL3: The survey participants' boss/professor does not require them to use the system. ○ EBVOL4: Although it might be helpful, using the system is certainly not compulsory in the survey participants' job/program.
Influence and Example	Predictor of: • PCIs (Moore, 1989) • Current use (Agarwal and Prasad, 1997) • Intention to adopt (Plouffe *et al.*, 2001) • PBC (Benham and Raymond, 1996) • Infusion (Hester, 2010)	Predictor of: • Relative advantage (Speier and Venkatesh, 2002) Moderator in: • TAM (Wu and Lederer, 2009; Ramayah, 2010) • SN-usage intention (Venkatesh *et al.*, 2003) • SN-utilization (Staples and Seddon, 2004)

> may be either mandated or discouraged by corporate policy. Such policies take the freedom of choice of rejection or adoption out of individuals' hands.… While many studies assume that they have "voluntary" adopters of innovations because adoption is not strictly mandatory, some adopters may in fact feel a degree of compulsion.
>
> (Moore and Benbasat, 1991: 195–196)

Wu and Lederer (2009) further elaborated the distinction between PVOL and voluntariness as an attribute of the environment, which they termed 'environment-based voluntariness,' a term we adopt using the abbreviation EBVOL. Wu and Lederer (2009) defined PVOL as 'a perception-dependent freedom in adopting an information system' and EBVOL as 'a context-dependent freedom in adopting an information system … [that] stems from a physical context, and is independent of personal biases and points of view' (421).

The measurement of voluntariness as an attribute of the environment (whether called actual voluntariness or EBVOL) has been varied, and includes self-reports (e.g., Hartwick and Barki, 1994) and researchers' judgment (Lee *et al.*, 2006). Venkatesh and Davis (2000) interviewed managers in the organization to assess the IVOL, and then confirmed their assessments using a measure of PVOL in the survey distributed to employees. Because most studies using EBVOL have focused on its influence as a moderator (as will be discussed in section 'Influence'), it has largely been conceptualized as a dichotomous variable.

Wu and Lederer (2009), however, modeled EBVOL as a continuous variable and assessed it by instructing raters to review context-relevant information, such as 'information given in the original study concerning the introduction of the information system, where and why it was used, whether the use was required by superiors/professors or job/school responsibility' (425). Therefore, their ability to capture EBVOL in the meta-analysis was contingent upon prior researchers' efforts to contextualize their studies. Raters shifted the referent in Moore and Benbasat's (1991) PVOL scale from 'I' to 'this site' (see the right column of Table 1) in order to evaluate the research sites of 63 TAM-based studies.

Theoretically, the impact of voluntariness has been explained primarily from a normative perspective. The definition and the measures of both PVOL and EBVOL focus on how organizational policies and requirements create a demand for an individual to use a specific technology. In this sense, voluntariness is acting as a form of social influence (Venkatesh and Davis, 2000), specifically following the mechanism of compliance (Kelman, 1958).

Some scholars have also linked voluntariness to volitional control,[3] a boundary condition of the Theory of Reasoned Action (TRA); 'barring physical impediments, a person should do what he intends or tries to do' (Fishbein and Ajzen, 1975: 298). For instance, Adams *et al.* (1992) conducted their study in a setting where usage was deemed voluntary, and Igbaria *et al.* (1997) purposely removed 85 respondents from their data set because they suspected these respondents' usage might have been mandated and thus would have been 'outside the scope of the technology acceptance model' (287). They were trying not to violate this assumption while testing TRA-based theories. However, Hartwick and Barki (1994) argued that the view of voluntariness as a boundary condition for TRA-based models underestimates the ability of employees to exercise control over their behavior (even those that are mandated by superiors). We agree that voluntariness should not be considered as a boundary condition of technology acceptance models because individuals may be capable of creating or exploiting the conditions in which they can circumvent, to some extent, a rule or a mandated system (e.g., Ferneley and Sobreperez, 2006; Alter, 2014). Yet, this particular view of voluntariness is not reflected in the typical operationalization of voluntariness (i.e., 'my job description or my superiors require it of me' reflects only a normative view). Thus, additional theorizing about this aspect of voluntariness is required.

Influence

A total of 32 articles in our review set tested the impact of voluntariness, either as a predictor or a moderator, on user beliefs (e.g., perceived usefulness), behavioral intention or actual behavior. The choice of approach is related to the conceptualization of voluntariness. PVOL is mostly seen as a direct predictor while EBVOL is seen as a moderator. In a few exceptions, PVOL has been used as a surrogate for EBVOL, as either a predictor or a moderator. For instance, Speier and Venkatesh (2002) stated that they were investigating the influence of the organizational environment on employee perceptions, but they used PVOL as one of the independent concepts.

Voluntariness as a predictor

Moore (1989) modeled PVOL as a predictor of Perceived Characteristics of Innovation (PCIs) and use. Since then, researchers have modeled PVOL as a predictor of user beliefs, intention to use or usage behavior. We identified 23 articles encompassing 33 unique tests. The findings were mixed with positive influence, negative influence and no influence. These conflicting results led Compeau *et al.* (2007) to question the direction of the effect. A pattern emerged after we sorted the test results by dependent variables. About 8 of the 13 tests point to a negative relationship between PVOL and use (Appendix A). That is, the lower level of PVOL, the more usage (i.e., I use this technology because I must). By contrast, the pattern is less clear when the dependent variable is behavioral intention (see Appendix B). Eight tests hypothesized a negative effect, while five did not specify a direction. Half of the results in this category were statistically insignificant. As for those that were significant, four were positive and three were negative. Similarly, no clear pattern emerged from the studies in which the dependent variables relate to user beliefs (see Appendix C). We will discuss the mixed nature of these findings in section 'Voluntariness as a predictor'.

Voluntariness as a moderator

We identified 13 tests of the moderating effect of voluntariness, indicating that employees approach technology adoption differently, either based on their perception of voluntariness or the behavioral constraints imposed by the environment. Among the seven studies that tested voluntariness's moderating effect on the relationship between subjective norm and use or intention to use (see Appendix D), six (regardless of the operationalization of voluntariness) were supported and arrived at the same conclusion: Behavioral intention or behavior is influenced by normative considerations only in a mandatory setting.

Three studies tested the moderating effect of voluntariness on the relationship between various user beliefs and use or intention to use, and the findings are mixed (see Appendix E). For instance, in Wu and Lederer's (2009) meta-analysis, the results demonstrated that the strength of the links between user beliefs and behavioral intention attenuated as EBVOL decreased, although this relationship was not statistically significant when the dependent variable was use. In contrast, Ramayah (2010) found PVOL to moderate the relationship between user beliefs and use. The direction of the effect was, however, surprising: The coefficient of the interaction term for PEOU and use is positive, but that for PU and use is negative.

Summary of analysis

Voluntariness has been conceptualized as a perceptual factor that might influence an individual's behavioral intention, and as a manifestation of organizational norms that limits an individual's ability to act in accordance with his or her private opinion. PVOL sometimes promotes use or usage intention, while at other times it discourages use or usage intention. A few explanations for inconsistencies or unexpected results have been offered in the literature. One explanation is temporal dynamics. The factors that affect the initial adoption may be different from those that affect continued use or future intention (Agarwal and Prasad, 1997; Karahanna *et al.*, 1999; Lowry, 2002; Hsu *et al.*, 2007). Also, normative pressure (which is the main component of PVOL and EBVOL) fades as technology use matures (Hester, 2010). Another possible explanation is related to the operationalization of technology use. Self-reported use is a poor surrogate measure of actual use (Wu and Lederer, 2009). The diversity of the operationalization (e.g., self-assessed frequency of use, self-assessed duration of use and actual use based on system logs) also makes the comparison rather difficult (Wu and Du, 2012). The complex nature of technology has been advanced in the literature as a further explanation. Lucas and Spitler (1999) argue that 'a complex system will be used in a number of ways, with users having considerable discretion in exercising different

functions and features. As a result, … [systems] will exhibit both voluntary and mandatory usage that will be very difficult to separate in conducting research on use' (304).

Hartwick and Barki (1994) raise another consideration, related to the range of behavioral reactions that organizational mandates might provoke. Their observation echoes with Klein and Sorra's (1996) model of employees' behavioral reactions to a new technology: Employees differ in their usage frequency (no use, sporadic use, adequate use) and usage quality (compliant use, committed use, innovative use). Even when the adoption of a new technology is mandated, employees are still likely to have a choice in how to use it (Hartwick and Barki, 1994; Ferneley and Sobreperez, 2006), rendering mandatory use an equally important phenomenon for IS researchers (Brown *et al.*, 2002). This broader view of reactions to voluntariness suggests a need for theory development regarding the influence of voluntariness on outcomes in addition to the quantity of use.

The work of Wu and Lederer (2009) has provided an important first step toward clarifying the various potential meanings of voluntariness and elaborating additional ways of theorizing its effects. Yet, there remain issues in the conceptualization and operationalization of voluntariness that warrant further scrutiny if we wish to develop a cumulative tradition that fully articulates the concept. Our review reveals two issues that have not been sufficiently addressed. First is the lack of clear delineation of the control and compliance elements of EBVOL. A second issue relates to the range of behavioral reactions that have been found to accompany the loss of freedom. The predominant view in the literature is that, when faced with a loss of freedom concerning the usage of technology, individuals will align their behavior with whatever is imposed on them. However, the Theory of Psychological Reactance (Brehm and Brehm, 1981), a theory that explains an individual's response to the threat of losing a certain freedom (which will be explained in great detail in section 4.5), shows how resistance and cooperation are both possible effects of the individual's effort to restore the lost freedom. In the following section, we will provide a refined view of voluntariness and explain how it influences behavior.

Voluntariness reconsidered: A tripartite view

In this section, we begin by offering a tripartite framework of voluntariness that synthesizes various aspects of voluntariness that have been either elaborated or implied in the literature. The distinction between voluntariness as perceived by the individual and as it exists in the organizational environment has long been recognized. However, the normative (I'm supposed to) and control (I have no options) considerations, reflecting quite different theoretical mechanisms for the influence of EBVOL, have not yet been explicitly distinguished in prior studies. Research on workarounds and user resistance (Marakas and Hornik, 1996; Boudreau and Robey, 2005; Ferneley and Sobreperez, 2006; Azad and King, 2008; Ignatiadis and Nandhakumar, 2009; Kane and Labianca, 2011; Debono *et al.*, 2013; Alter, 2014) has shown the ability of users to influence their environment and create options even in the face of organizational pressure. Therefore, we propose a tripartite framework of voluntariness – PVOL, IVOL and RVOL – that reflects different aspects of the phenomenon and have different influences on technology acceptance.

Perceived voluntariness (PVOL)

Section 'Voluntariness in the literature' provides an extensive discussion of the definition and application of PVOL, and we thus only briefly describe our position on this concept here. We follow Moore and Benbasat's (1991) definition of PVOL. PVOL refers to an individual's subjective assessment of the freedom to use or to avoid a new technology, and it ranges from strong doubt to strong confidence. PVOL thus reflects the individual's interpretation of the environment, and it is this interpretation that ultimately guides his or her action.

Intended voluntariness (IVOL)

We consider IVOL to be the freedom intended by management regarding the usage of a new technology. It is part of the managerial imperative and a strategic choice. It reflects the intent of the organization (or organizational actors) that may translate into a perception of voluntariness on the part of members or into a requirement to act. An example is Chae and Poole's (2005) discussion of how technology adoption may be mandated in response to external pressures, such as legal requirements (e.g., Health Insurance Portability and Accountability Act in the United States) or an agreement with another partner along the supply chain.

We consider IVOL as an organizational decision formed through a holistic examination of the characteristics of the new technology, purposes of the deployment and the organizational structure for fulfilling these purposes (Chengalur-Smith and Duchessi, 1999). Adopting new technology is often a key component of strategic planning, initiated during business reviews, requested by business managers, reviewed by the IT department and approved by top executives.

IVOL may manifest itself in two forms: One is embedded in software through design and coding intended to direct usage, and the other is in organization policies, job descriptions, implementation plans, presentations in information sessions, meeting minutes and memoranda. An example of the latter can be found in Venkatesh and Davis's (2000) study that assessed voluntariness in part based on senior managers' reports. Geiger and Derman's (2003) study concerning the adoption of a provider order entry (POE) system is an additional example of such decision-making:

> The hospital's EPR implementation committee has chosen a phased-in approach for POE. The first phase will be to implement mandatory POE of labs and images. Clinical decision support and cost information will not be introduced at this phase, and drug and nursing orders will continue to be done on order sheets.
>
> Geiger and Derman's (2003: 405).

The IVOL in this case was characterized as mandatory for some modules and optional for others, at least for a certain period of time. As the implementation progressed, however, the choice would become increasingly constrained, and eventually removed.

Organizations differ in their ability to mandate, as observed by Classen *et al.* (2010) in their study of the adoption of a computerized prescriber order entry (CPOE) system:

> One important difference between community and academic medical centers are expectations of universal physician usage of CPOE; most community hospitals cannot mandate use as can academic medical centers with their house staff. This is due to the heterogeneity of practice patterns and volumes of community physicians and their voluntary status.
>
> Classen *et al.* (2010: 19).

Another example of organizations' abilities (or lack thereof) to mandate can be found in Vehring *et al.*'s (2011) study of collaboration software. This study discusses how the strong pro-privacy culture and the power of the workers' council in Germany prohibited management from mandating the adoption of the targeted technology, which in addition to supporting collaboration could also potentially be used for surveillance. Thus, in this case, management strove to keep the adoption of the software free from pressure.

Realizable voluntariness (RVOL)

We define RVOL as the freedom (both facilitated and inhibited) in the technological environment and the social environment for the individual *not* to use the technology. We believe RVOL is the actual voluntariness to which Moore and Benbasat (1991) referred, though we choose the term 'realizable' voluntariness because it better reflects the power of users to enact workarounds and to recreate their environment in order to circumvent the intentions of management (i.e., IVOL).

Latitude in the technological environment originates from the flexibility of the technology itself (Leonardi, 2011) or from loopholes in the technological environment that would allow the individual to comply with IVOL to various degrees (Ignatiadis and Nandhakumar, 2009), with or without the help from other social actors. For instance, Davidson and Ou (cited in Alter, 2014) observed how a sales manager of an international chain hotel ended up sending the same customer multiple emails with fewer or smaller attachments in order to bypass the hotel's policy on consuming the bandwidth of the internal network. Another example of the latitude in the technological environment can be found in Stein *et al.* (2015) that investigates the adoption of an academic dossier management system at two universities. Some faculty members completed forms and composed curricula vitae by entering data into the new system, but then used Microsoft Word to format their reports, and submitted the documents by emailing them as attachments, instead of using the report-generating function of the system for report submission.

The social environment also provides opportunities that make an officially mandated technology less compulsory, because 'in the extreme, human agents may be resourceful enough to overcome technology's material constraints, thus rendering any technology malleable' (Boudreau and Robey, 2005: 5). Technology use is embedded in a complex social structure where usage can be negotiated locally. Arrangements can be made between a dyad through buddying, bargaining or bullying (Ferneley and Sobreperez, 2006). This type of arrangement is mostly private and personal in a team climate that is strongly innovative (Liang *et al.*, 2010). If this climate is weaker in a group setting, one member might be assigned to use the technology on behalf of the whole team (i.e., brokering), as in the case of designating one physician to use a system for other doctors (Kane and Labianca, 2011). RVOL is also expected to be linked to subtle changes in the task structure within teams. The negotiated practice may be only *quasi*-public in order to minimize potential sanction from management, and the internal work flow of the whole team may be adjusted quietly as a result of this local arrangement. Power embedded in social relationships also enables some individuals to experience more freedom in avoiding the technology than others. For instance, university faculty members and administrators had a relatively higher level of RVOL in using the system, because they could ask staff to retrieve required information for them (Rai *et al.*, 2002). Similarly, a physician may be able to direct a nurse to enter an order on his or her behalf (Bhattacherjee and Hikmet, 2007).

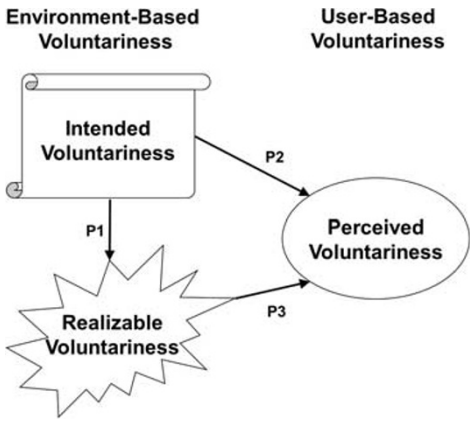

Figure 1 Interactions among PVOL, IVOL and RVOL.

The technological environment and the social environment are not mutually independent. That is, RVOL could be the result of the interaction among the two, as in the example of groupware adoption studied by Vehring *et al.* (2011). Groupware, as the name suggests, is designed to support collaboration among members of a group. Although management was unable to mandate the adoption of a groupware because of the strong culture of pro-privacy and the power of workers' council in Germany, different approaches to voluntariness across teams were observed in this case. Some team leaders asserted pressure on users (which was inappropriate given the policy), some team leaders refrained from encouraging adoption within their teams and others openly discussed committed use of the groupware with their members and reached agreement locally. Despite the differences in team leaders' approaches, members felt pressure to adopt, especially when leaders sent important announcements over the system. The same felt pressure was documented in Grudin and Palen's (1995) study of groupware: Members were caught between being cut off from the group and complying with the group, even though the adoption was intended to be voluntary. However, if a team member could ask another member for updates each the morning when they got coffee in the break room, for example, then the consequences were potentially marginal.

Interactions among PVOL, IVOL and RVOL

We argue that the three types of voluntariness are interrelated as outlined in Figure 1. First, IVOL will affect RVOL, both

initially and over time. The technological environment in which RVOL forms initially is affected by management's decisions. The technological architecture of the organization reflects such managerial intention to varying degrees. If, for example, management intends to set a period of high trialability, the technology is presented as one option among others during that period of time. After that trial period, known alternatives might be removed. Managerial intentions may also exert an influence later in the adoption process. Over time, employees may start to discover latitude in the technological and social environment, and technology use may be redistributed in such a way that is inconsistent with management's intention. If this conflicts with the voluntariness intended by management, managers may further adjust the environment by eliminating known loopholes. For instance, in one study of a hospital order entry system, nurses and pharmacists were told to no longer accept written orders, thus forcing physicians to enter orders electronically (Aarts *et al.*, 2007). Hence, we propose:

Proposition 1: IVOL affects RVOL to set initial conditions and to close loopholes for an individual's use of a technology.

IVOL can also be seen to directly affect an individual's subjective assessment of voluntariness. Perception is, in part, a result of examining the informational cues in the environment regarding what is expected (Salancik and Pfeffer, 1978). When the official stance is communicated through a training session that outlines work procedures, or kickoff meetings, the individual becomes aware of what his or her technology usage behavior should be. Therefore, we propose:

Proposition 2: IVOL affects PVOL by communicating management's desired behavior for an individual's use of a technology (normative influence).

Finally, we posit that an individual's perception of voluntariness is, in part, a result of examining the availability of alternatives in the technological environment and the latitude made possible by interpersonal relationships. In other words, it is influenced by the level of voluntariness that is realizable in the environment. If such freedom does not exist, the individual is likely to perceive no ability to avoid the technology; otherwise, the perception of having some freedom deviates from the reality. If opportunities do exist in the environment, they may be discovered through an individual's intentional search, trial-and-error, serendipity or social learning (e.g., overhearing in the break room about ways to circumvent the technology). For instance, Stein *et al.* (2015) observed that some ambivalent users exercised their discretion and discovered how they could comply selectively. After such discovery, the individual processes the information and forms the assessment of voluntariness accordingly. Thus, we propose:

Proposition 3: RVOL affects PVOL for an individual's use of a technology (control influence).

Voluntariness and behavioral outcomes

Although it is important to understand the ways in which PVOL is influenced by IVOL and RVOL, it is equally important to understand the mechanisms through which an individual's understanding of the demands placed on them (e.g., through normative or control mechanisms) affects their behavior. To further develop this line of thinking, we propose a conceptual model (see Figure 2) that depicts how IVOL and RVOL result in various behavioral outcomes. We believe that the individual's ability to perceive IVOL and RVOL is an important filter in the process, but we have excluded it in order to focus on the differential effects of IVOL and RVOL.

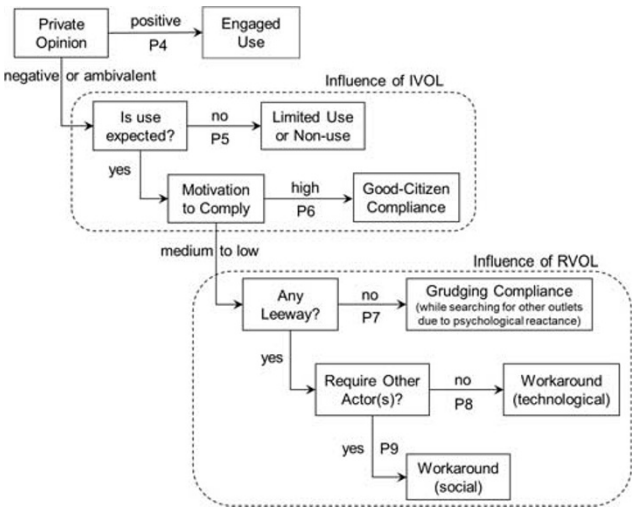

Figure 2 Voluntariness and motivation.

First, we argue that two motives are at work as an individual forms the intention to use (or not to use) the technology. One is the desire to be autonomous, that is, to base technology use on one's own judgment of the technology. The other is the desire to go along with the decision made by others (Malhotra *et al.*, 2008). This motive reflects people's reactions to social influence, and may encompass compliance (i.e., accepting influence in order to gain a favorable reaction from others) or identification (i.e., accepting influence in order to establish a satisfying self-defining relationship with others; Kelman, 1958: 53; Venkatesh and Davis, 2000).[4]

If an individual's private opinion of the technology is positive and congruent with the demands of the environment, then engaged usage behavior is likely (Nah *et al.*, 2004; Hsieh and Wang, 2007; Sørebø and Eikebrokk, 2008; Lapointe and Beaudry, 2014).

Proposition 4: An individual's positive opinion of a technology will likely result in engaged use.

A problem occurs when the individual's private opinion of the technology is undetermined (Stein *et al.*, 2015) or at odds with the adoption decision made by others (Malhotra *et al.*, 2008). This internal conflict arouses ambivalence, and a personal decision must be made in order to address the discomfort of indecisiveness (van Harreveld *et al.*, 2009). If the desire to cooperate overrides the person's private opinion, then it does not matter if there is latitude or not. For instance, Stein *et al.* (2015) observed that some users used a new system to demonstrate 'being a good citizen' regardless of their private opinion.

Proposition 5: An individual's negative or ambivalent opinion of a technology coupled with low IVOL and high motivation to comply with the intended use policy will likely result in 'good citizen' compliance.

Proposition 6: An individual's negative or ambivalent opinion of a technology coupled with high IVOL will likely result in limited use or non-use.

Alternatively, if the motivation to cooperate is lower, then the individual may seek out or pay attention to alternative options within the environment, as suggested by the Theory of Psychological Reactance (Brehm and Brehm, 1981). According to Brehm and Brehm (1981), 'any event that increases the perceived difficulty of having or of not having a potential outcome threatens the exercise of a freedom' (3). When an individual perceives that his or her freedom is threatened, the individual is motivated to restore that freedom. This desire to restore the threatened freedom is called psychological reactance. Once psychological reactance is aroused, the individual may experience (1) increased preference for the eliminated option, (2) feelings of annoyance, disturbance and frustration, (3) hostility toward the agent who threatens the freedom or (4) denial of the threat. As for the behavioral outcomes of psychological reactance, the individual may want to directly restore his or her freedom through opposition or non-cooperation. If direct restoration is too costly to pursue, the individual may be motivated to restore the freedom indirectly (i.e., vicariously), by, for example, seeking out similar individuals who are willing to take action to restore the threatened freedom. Worchel and Brehm's (1971) experiment (cited in Brehm and Brehm, 1981) demonstrates this effect of indirect restoration. In their study, each subject was asked to select one of two educational cases in a three-person setting. The subject was exposed to one of the following three conditions: (1) no pressure, (2) pressure from one confederate saying: 'Obviously we have to take case A,' and (3) the same pressure as in condition (2), with another confederate protesting: 'But I have not made up my mind.' Subjects in the control group (1) showed no preference for either case. A total of 83% of the subjects in the pressure group (2) preferred the case *not* advocated by the pressuring confederate. However, 83% of those in indirect restoration group (3) preferred the case advocated by the pressuring confederate. Worchel and Brehm's (1971) interpretation is that the vicarious restoration enacted by the protesting confederate reduced subjects' motive to resist, and the motive to comply guided the decision instead. Therefore, compliance and resistance are equally possible and valid outcomes, depending on whether employees have the opportunity to restore their freedom.

Returning to the model, then, we propose that if no latitude is present, then the individual will grudgingly comply through minimal use (Lapointe and Beaudry, 2014) or will, alternatively, exit the organization. If there is an option, workarounds are likely to ensue. When such an option is embedded in the technological environment (e.g., a parallel system), the individual may construct a technological work around. When this option requires the collaboration of one or more actors, social workarounds may be enacted, through the mechanisms that have been discussed by Ferneley and Sobreperez (2006) and Kane and Labianca (2011).

Proposition 7: An individual's negative or ambivalent opinion of a technology combined with low IVOL with which the individual does not want to comply, and a perceived lack of latitude to work around the intended use policy will likely result in grudging compliance.

Proposition 8: An individual's negative or ambivalent opinion of a technology combined with a perception of low IVOL with which the individual does not want to comply, and a perceived ability to work around the intended use policy by using the technology in unintended ways will likely result in technological workarounds.

Proposition 9: An individual's negative or ambivalent opinion of a technology combined with a perception of low IVOL with which the individual does not want to comply, and a perceived ability to work around the intended use policy by working with others will likely result in social workarounds.

This model is important to our thinking about voluntariness, as it shows how varied reactions to technology may be produced, depending on the individual, the organization and the technology. This is a more complex view of voluntariness than what has been considered in prior literature.

Discussion

Our analysis and synthesis of the literature leads us to two primary contributions: The formal explication of the concept of RVOL and the exploration of theoretical mechanisms through which voluntariness invokes behavioral reactions. These two contributions reconcile equivocal findings in the literature and provide a basis for future research into the complex and multifaceted nature of voluntariness.

Currently, RVOL is underrepresented in theorizing user behavior, because its richness is beyond what the four items of the PVOL scale (see Table 1) can capture. As a result, what PVOL has reflected is mostly the effect of IVOL (e.g., in the form of job description and managers' expectations). As EBVOL is measured by an adaptation of PVOL, we suspect that the latitude in the environment is also underestimated. The control view of voluntariness helps us to understand equivocal findings, which might in fact indicate users' ability to circumvent the technology. That is, the direction of PVOL's influence on user beliefs, intention to use or actual use, when significant, can be positive or negative, each reflecting a different level of RVOL in the context. A positive effect (i.e., the less voluntary the technology is to me, the less I will use it) implies an individual's ability to avoid using the technology even when PVOL is low. The individual must have some level of latitude for that statement to make sense. As for the negative effect, a meaningful interpretation could suggest an individual's resignation (i.e., I'd better use it because there is really no way around this). However, reactance can be reduced, if not completely eliminated, through freedom restoration. Through freedom restoration the individual becomes willing to comply again – though it is certainly possible that restoration increases the motivation to comply for some subjects but not for others, depending on the opportunities available in the environment.

The current literature also does not reflect the range of behavioral responses open to individuals or the varied levels of motivations, which drive the behavior. Our model shows how individuals may react to various forms of EBVOL, as informed by the Theory of Psychological Reactance (Brehm and Brehm, 1981). The underlying mechanism of our model is that an organizational mandate limits employees' freedom in choosing to use (or not to use) a specific technology. Accordingly,

employees would be motivated to restore their freedom either directly (e.g., by openly defying the requirement or using the technology in limited ways; Marakas and Hornik, 1996) or indirectly (e.g., by witnessing other colleagues voicing their rejection). They would also be less likely to engage in innovative IT use, because innovative IT use is beyond the scope of job descriptions and cannot be mandated (Ahuja and Thatcher, 2005; Jasperson *et al.*, 2005). Our model provides a foundation for future research to better dissect the complexity of user behavior. The technology-adoption literature has accumulated a wealth of knowledge on an individual's assessment of a technology (e.g., effort expectancy, performance expectancy) and how the assessment affects usage intention. However, relatively less is known about the motivations and the resources related to individuals refusing to use certain technologies, and how the lack of use in the focal individual is compensated.

We acknowledge, too, the limitations of our research. First, our review of the literature was limited to articles published in refereed journal articles and included in the online databases that we searched. Although we did not include book chapters or dissertations in our data set, our articles are representative of the entire spectrum of research, and we do not believe that expanding the set of articles would vastly change our findings. Moreover, because our search also included an examination of the references of the published articles, the potential number of missed sources is limited. Finally, excluding unpublished works (e.g., dissertations) can be viewed as conservative, as the 'file drawer problem' of unpublished papers would be expected to produce more contradictory or non-significant findings and this would only strengthen our conclusions about the state of the literature.

Another potential limitation of our model (see Figure 2) is a highly linear flow of decision-making and a static process (i.e., once initiated the behavioral response is shown as an end point). We do not intend that the model should be read literally as a flowchart. The linearity is an artifact of our drawing and we acknowledge that the cognitive process is likely to be more simultaneous and ongoing, thus allowing for responses that change and evolve over time. Nonetheless, as a starting point, and a way of demonstrating the possibility of multiple outcomes, we believe the model has value for scholars and practitioners.

Our tripartite view of voluntariness and our reflection on the individual cognitive process leads to multiple directions for future research. Researchers need to explicitly consider the role of RVOL when investigating technology use. For instance, in a post-adoption context, regardless of methodology, researchers could ask respondents whether they are using the technology for other coworkers, and whether others are using it on their behalves. A related step along these lines would be for researchers to theorize and investigate freedom restoration, a process that is indispensable for offsetting aroused psychological reactance.

Understanding users' motivation to comply in order to understand their intention to leverage latitude in the environment, particularly in the face of unfavorable cognitive assessment of and negative or ambivalent affective response to adopting a technology (Lapointe and Beaudry, 2014; Stein *et al.*, 2015) also surfaces as a salient concern. The prevalent form of measuring subjective norm only captures an individual's perceived normative beliefs (i.e., what is expected of me by those who are important to me). This approach omits not only the fact that different referent groups may have different expectations, but also ignores the individual's motivation to comply with various and potentially contradicting expectations, which could further contribute to the formation of attitudinal ambivalence.

From our synthesis of the literature, we also see a multilevel nature to voluntariness. Voluntariness was first conceived as a perception at the individual level, and later expanded to the organizational level. We believe, however, that there are more levels between the micro and the macro (Scheepers *et al* 2006). Through emergence, a lower-level phenomenon can arise at a higher level (Klein and Kozlowski, 2000). Thus, PVOL could also be analyzed at the work group or departmental level. This would be valuable in understanding how users with a work group or department orchestrate their collective use of the technology to meet organizational mandates, while still allowing individuals to control their own actions.

In addition to these opportunities, we believe more varied methodologies are needed. Given the complexities of technology, environment, user and behavior, we see value in qualitative research approaches, where the richness of the phenomenon could be explored more fully. We also see potential for experimental research (e.g., Worchel and Brehm, 1971), where different combinations of IVOL and RVOL could be constructed in order to observe their effects on PVOL and on behavior.

Conclusion

Our comprehensive review and synthesis of the literature extends existing research on voluntariness in technology acceptance. We retain the well-known conceptualization of PVOL, but refine the parallel concept of environment-based voluntariness proposed by Wu and Lederer (2009) to recognize two distinct elements embedded within it: IVOL and RVOL. Our tripartite conceptualization of voluntariness will help researchers better communicate its effects by specifying which aspect of voluntariness they mean in any given discussion. Moreover, our review provides a basis for researchers to comprehend the complexity of choice in this environment, and to account for the paradoxical coexistence of compliance and resistance reflected in the technology adoption literature. In this way, we hope to provide a basis for a richer cumulative tradition for user behavior.

Notes

1 Our study sample differs from that of Wu and Lederer (who identified 71 studies) because we only included those studies that explicitly measured voluntariness. Wu and Lederer's procedure allowed them to include any study where they could construct an assessment of voluntariness, regardless of whether the study authors included it as a formal construct. Thus, for example, Wu and Lederer's sample includes the paper by Agarwal and Karahanna (2000) on cognitive absorption even though voluntariness does not appear in the model. We excluded this study as we were interested in how the original authors conceptualized voluntariness.

2 Moore and Benbasat (1991) is based on the dissertation of Gary Moore in 1989.

3 At the extremes of volitional control are behaviors such as sneezing, where control is almost entirely absent, and voting choice, where control is very high (Ajzen, 2005). But most behaviors, according to Ajzen (*ibid*), fall between these extremes, limited by internal factors such as skills, or external factors, such as resources, opportunity or dependence on others.
4 This motive would not encompass the 3rd of Kelman's mechanisms, internalization (i.e., accepting influence because of the merits of the content of the induced behavior), as this mechanism would then be consistent with the autonomy motive.

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Appendix A

Table A1 Voluntariness as a predictor of use

Author (Date)	*Subjects (Technology)*	*DV (Measure)*	*Hypothesized effect (Result)*	*PVOL mean (STDEV)*[a]
Moore (1989)	540 professionals from 7 companies across industries (personal work station)	Use (hours, months and functions)	Negative ($\beta = -0.37$, supported)	3.7 (N/A)
Agarwal *et al.* (1996)	230 employees (graphical user interface)	Future use (2 items)	Negative ($\beta = -0.148$)	5.15 (1.03)
Iivari (1996)	105 users from 35 organizations (CASE tools)	Use (proportion of projects using the tools, routinization and infusion)	Negative ($\beta = -0.58$, supported)	Not reported
Agarwal and Prasad (1997)	73 part time MBA students (WWW)	Current use (4 items)	Negative ($\beta = -0.27$, supported)	4.65 (1.35)
Lowry (2002)	58 UK professional engineers (building management systems)	Current use (hours per week, 1 item)	Negative ($\beta = -0.43$, supported)	3.40 (1.25)
Green *et al.* (2004)	63 IS professionals (software process innovations)	Current use (2 items)	Negative ($\beta = -0.33$, supported)	4.24 (1.85)
Clay *et al.* (2005)	1013 pharmaceutical sales reps (knowledge management systems)	Loyal use (2 items)	Negative ($\beta = -0.31$, supported)	2.41 (1.46)
Compeau *et al.* (2007)	380 health-care professionals (a comprehensive hospital system)	Use intensity (duration and times, 2 items)	Negative ($\beta = -0.18$, supported)	1.76 (1.13)
Anderson *et al.* (2006)	37 faculty members (tablet PC)	Use (Percentage of time use, 3 items)	Positive ($\beta = 0.478$, supported)	Not reported
Hester (2010)	170 knowledge workers (non-Wiki-based knowledge management systems)	Infusion (duration of adoption, expertise, 2 items)	Positive ($\beta = 0.21$, supported)	Not reported
Chen *et al.* (2015)	195 high-school teachers (blogs)	Use (frequency of usage, daily usage and diversity of usage, 9 items)	Positive ($\beta = 0.40$, supported)	4.63 (1.93)
Hester (2010)	170 knowledge workers (Wiki-based knowledge management systems)	Infusion (duration of adoption, expertise, 2 items)	Positive (n.s.)	Not reported
Hester (2010)	170 knowledge workers (both Wiki and non-Wiki-based systems)	Use (frequency, variety, 4 items)	Positive (n.s.)	Not reported

[a]PVOL is measured using a 7-point scale for all studies.

Appendix B

Table B1 Voluntariness as a Predictor of Intention

Author (Date)	*Subjects (Technology)*	*DV (Measure)*	*Hypothesized effect (Result)*	*PVOL mean (STDEV)*[a]
Agarwal and Prasad (1997)	73 part time MBA students (WWW)	Future intention to use (3 items)	Negative (n.s.)	4.65 (1.35)
Karahanna *et al.* (1999)	77 potential users (MS Windows)	Intention to adopt (2 items)	Negative (n.s.)	5.03 (1.44)
Croteau and Vieru (2002)	41 rural physicians (telemedicine)	Intention to adopt (4 items)	Negative (n.s.)	4.32 (0.80)
Lowry (2002)	58 professional engineers (building management systems)	Future intention to increase use (yes/no)	Negative (n.s.)	3.40 (1.25)
Van Slyke *et al.* (2002)	186 students (groupware)	Future intention to use (4 items)	Negative (n.s.)	Not reported
Hebert and Benbasat (1994)	151 nurses (point-of-care technology)	Intention to use (4 items)	No direction hypothesized (n.s.)	4.12 (1.51)
Hsu *et al.* (2007)	115 potential adopters (multimedia messaging services)	Intention to use (3 items)	No direction hypothesized (n.s.)	Not reported
Karahanna *et al.* (1999)	153 current users (Windows)	Intention to continue using (2 items)	Negative ($\beta = -0.17$, supported)	3.27 (1.69)
Croteau and Vieru (2002)	87 urban physicians (telemedicine)	Intention to use (4 items)	Negative ($\beta = -0.181$, the opposite direction)	3.63 (1.31)
Hardgrave *et al.* (2003)	128 system developers (formalized software development methodologies)	Intention to use (2 items)	Negative ($\beta = -0.18$, supported)	Not reported
Plouffe *et al.* (2001)	172 retail vendors (smart card)	Future intention to adopt (4 items)	No direction hypothesized ($\beta = 0.038$)	6.32 (1.24)
Hsu *et al.* (2007)	92 current users (multimedia messaging services)	Intention to use (3 items)	No direction hypothesized ($\beta = 0.221$)	Not reported
Kijsanayotin *et al.* (2009)	1323 staff in Thailand's community health centers (health IT)	Intention to use (3 items)	No direction hypothesized ($\beta = 0.10$)	4.86 (1.73)
Van Slyke *et al.* (2010)	334 undergrad students (distance learning education)	Intention to register (3 items)	Positive ($\beta = 0.124$)	4.62 (1.57)

[a]PVOL is measured using a 7-point scale for all studies except Hsu *et al.* (2007).

Appendix C

Table C1 Voluntariness as a predictor of beliefs

Author (Date)	*Subjects (Technology)*	*DV (Measure)*	*Hypothesized Effect (Result)*	*PVOL Mean (STDEV)*[a]
Moore (1989)	540 professionals from 7 companies across industries (personal work station)	Attitude toward adopting (composed of PCIs)	Negative ($\beta = -0.15$, supported)	3.7 (N/A)
Benham and Raymond (1996)	612 faculty members (voice mail system)	Perceived behavioral control (3 items)	Positive ($\beta = 0.174$, supported)	Not reported
Speier and Venkatesh (2002)	454 salespeople (sales force automation tools)	Relative advantage (3 items)	Positive ($\beta = 0.15$ & 0.17, supported)	Not reported
Green *et al.* (2004)	63 IS professionals (software process innovations)	Choice (timing) and Choice (process)	Positive ($\beta = 0.56$ & 0.63, supported)	4.24 (1.85)
Templeton and Byrd (2003)	47 software development personnel (system development methodologies)	Trialability (1 item)	Negative (n.s.)	4.77 (1.46)
Compeau *et al.* (2007)	380 health-care professionals (a comprehensive hospital system)	Relative advantage (8 items)	Positive (n.s.)	1.76 (1.13)

[a]PVOL is measured using a 7-point scale for all studies.

Appendix D

Table D1 Voluntariness as a moderator between subjective norm and intention/use

Author (Date)	*Context*	*Operationalization (Binary vs continuous)*	*Results*	*PVOL mean (STDEV)*
Hartwick and Barki (1994)	127 users of business-oriented information systems	'Are you required to use the new system (i.e., is it mandatory that you use the new system)?' (Binary)	SN predicts intention only in the mandatory setting.	Not applicable
Venkatesh and Davis (2000)	38 floor supervisors, 39 members of a personal financial services department, 43 employees of an accounting firm and 35 employees of an investment banking firm	PVOL2, PVOL3 and PVOL4 (7 pt Likert scale) as a site check (Binary)	SN predicts intention only in the mandatory setting.	6.2 (0.4) 6.7 (0.6) 1.2 (0.3) 1.5 (0.6)
Venkatesh *et al.* (2003)	54 users of a web communication tool, 65 users of a data application, 58 analysts' use of a portfolio analyzer and 38 accountants' use of proprietary accounting systems	PVOL2, PVOL3 and PVOL4 (7 pt Likert scale) as site check (Binary)	SN predicts intention only in the mandatory setting.	6.50 (0.22) 6.51 (0.20) 1.50 (0.19) 1.49 (0.18)
Staples and Seddon (2004)	112 librarians' (mandatory) use of a cataloging system and 107 students' (voluntary) use of productivity tools	'My employer (or instructor) requires me to use XYZ' (7 pt Likert scale) as site check (Binary)	SN predicts utilization only in the mandatory group.	6.50 (1.17) 3.70 (2.16)
Lee *et al.* (2006)	245 voluntary and 205 mandatory instructors' use of WebCT	Researchers' judgment (Binary)	SN predicts intention only in the mandatory setting.	Not applicable
Venkatesh and Bala (2008)	38 supervisor and 39 users of a voluntary system and 43 and 36 potential users of a mandatory system	PVOL2, PVOL3 and PVOL4 as site check (Binary)	SN predicts intention only in the mandatory setting.	Not reported
Abbasi *et al.* (2011)	504 Pakistan academics' usage of Internet	PVOL2, PVOL3 and PVOL4 (Continuous)	SN is not a significant moderator between SN and intention	Not reported

Appendix E

Table E1 Voluntariness as a moderator between other concepts

Author (Date)	*Context*	*Operationalization (Binary vs continuous)*	*Result*	*PVOL mean (STDEV)*
Lowry (2002)	58 professional engineers' adoption and use of building management systems	Those whose PVOL score was higher than 3 were in the high PVOL group ($n = 32$). The rest were in the low PVOL group (Binary)	Compatibility is a predictor of future intention in the high PVOL group.	3.40 (1.25)
Lowry (2002)	58 professional engineers' adoption and use of building management systems in United Kingdom	Those whose PVOL score was higher than 3 were in the high PVOL group ($n = 32$). The rest were in the low PVOL group (Binary)	EOU is a predictor of future intention in the low PVOL group.	3.40 (1.25)
Wu and Lederer (2009)	Meta-analysis of the moderating effect of EBVOL in TAM	EBVOL full scale (Continuous)	EBVOL is a significant (positive) moderator between PU and intention.	11.33 (4.98)
Ramayah (2010)	67 university off-campus students' use of distance learning technology	PVOL2, PVOL3 and PVOL4 (Continuous)	PVOL is a significant (negative) moderator between PU and use	3.955 (1.588)
Wu and Lederer (2009)	Meta-analysis of the moderating effect of EBVOL in TAM	EBVOL full scale (Continuous)	EBVOL is a significant (positive) moderator between PEOU and intention.	11.33 (4.98)
Ramayah (2010)	67 university off-campus students' use of distance learning technology	PVOL2, PVOL3 and PVOL4 (Continuous)	PVOL is a significant (positive) moderator between PEOU and use.	3.955 (1.588)

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