BYOD Flexibility: The Effects of Flexibility of Multiple IT Device Use on Users’ Attitudes and Continuance Intention

Research-in-Progress

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Abstract

With the increasing popularity of Bring Your Own Device (BYOD) in companies currently, the flexibility of using more than one personal IT device (PITD) to perform a task requires further attention. This study defines the flexibility of multiple PITD use as a situation in which multiple PITDs are available to users to choose from to complete a specific task. Building on the psychological reactance theory, we extend our investigation into how high and low flexibility of multiple PITD use interacts with task complexity to influence users’ affective and cognitive appraisals and continuance intention of PITD use. The results can contribute to our understanding on the situations that may result in more positive attitudes toward PITD use and in turn higher continuance intention. These results can help companies design their PITD strategy and also extend psychological reactance theory into the context of multiple PITD use, paving the way for this research area.

Keywords

Multiple IT devices, flexibility of IT device use, affective appraisal, cognitive appraisal, continuance intention

Introduction

An increasing number of people own more than one personal IT device (PITD), partly from users’ own purchases and/or partly from company provided. These multiple PITDs build a PITD portfolio through which users can flexibly allocate their PITDs and switch between them to perform a variety of tasks (Carroll 2008). In other words, users have the power of control using and allocating these PITDs to complete a task. For example, imagine an individual on vacation wants to locate an outdoor restaurant at which to have lunch. This task might involve locating a possible lunch venue, reviewing the menu, and checking the weather. In completing this task, the individual can select different combinations of PITDs from his or her PITD portfolio (e.g., the individual can use a tablet to locate a restaurant, a laptop computer to review the menu, and a smartphone to check the weather). In other words, a PITD portfolio provides flexibility in PITD use to suit the different needs of a task. This study defines the flexibility of multiple personal IT device (PITD) use as a situation in which multiple PITDs are available to users to choose from to complete a specific task.

Flexibility of multiple PITD use is critical in practice because a growing number of companies have adapted an initiative called bring-your-own-devices (BYODs), in which their employees are permitted to

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1 In this study, a user refers to any person who owns a range of heterogeneous IT devices, which form his or her own PITD portfolio, and who has total control of these devices in the performance of a task.
bring their PITDs (i.e., laptops, tablets, and smartphones) to their workplace and use those devices to perform a variety of tasks (Bradley 2011; Shim et al. 2013). This phenomenon in which people bring their privately owned IT device to a work environment is called IT consumerization (Niehaves et al. 2012). Moreover, a growing number of companies have provided multiple PITDs (e.g., the company-provided desktop computer and tablet) to their employees to increase their productivity, making multiple PITD use more possible and practical. The question is “Can this policy (i.e., BYOD) really make users/employees have a positive attitude toward having multiple PITDs?”

Importantly, while a continued growth of company adopts BYOD initiative, there are different degrees of freedom of choice of multiple PITDs. Some companies allow their employees to use any PITD to perform a task (i.e., high flexibility), but some other companies may restrict their employees to use certain PITDs for a specific task (i.e., low flexibility) due to the security and privacy issues. For example, Decisive Analytics (2012) investigated the issue of BYOD with IT executives and CEOs of larger companies (500 employees or more) located in the United States, United Kingdom, and Germany. The results show that nearly half of the enterprises that allow employee-owned devices to connect to a company’s network have experienced a data breach. As a result, most of these companies reacted by restricting data access rights (45%) (i.e., some PITDs are not allowed to retrieve sensitive data such as customer data) or installing security software (43%). Consequently, users’ original expectations of choice from the PITD portfolio are restricted, which decreases flexibility of multiple PITD use and may have unintended consequences.

Indeed, according to psychological reactance theory, if people believe that choices A and B are available to them, but they are restricted to only choice A, a reaction called psychological reactance may lead to dissatisfaction and lower expectations of performance outcomes (Brehm 1966). Furthermore, prior studies on BYOD mainly focus on security issues (Harris et al. 2013). Users’ attitudes (both cognitive appraisals and affective appraisals) and continuance intention of multiple PITD use are largely ignored. Thus, to fill this gap, it is critical to take them into account as well.

Additionally, task complexity may play an important moderating role in flexibility of multiple PITD use. Specifically, as task complexity increases, users need to process more information and complete more acts (Campbell 1988; Speier et al. 2003). Under these conditions, if the choice among PITDs has been limited from performing preferred acts, this limitation could further increase the degree of task complexity, resulting in a negative impact on users’ attitudes under the context of multiple PITD use and in turn decreasing their satisfaction and continuance intention of multiple PITD use. Thus, the effects of flexibility of multiple PITD use could be more salient for complex tasks than for simple tasks.

In sum, drawing on psychological reactance theory, this study focuses on flexibility of multiple PITD use at the individual level; explores users’ attitudes with regard to PITD use; and investigates how these factors in turn influence users’ satisfaction with PITD use and intention to continue PITD use. Thus, this study addresses two research questions:

1. How does flexibility of multiple PITD use impact users’ attitudes with regard to multiple PITD use and, in turn, their satisfaction of PITD use and intention to continue PITD use?
2. How does this impact vary with task complexity?

**Theoretical Background**

**Psychological Reactance Theory**

Psychological reactance theory has been a subject of study for many years, both in the laboratory and in the field (Murray et al. 2011; Schwarz 1984). This theory explains how people react to the situation in which their freedom of choice has been threatened. Specifically, people may form an expectation of freedom of choice because they are accustomed to it. For example, individuals become accustomed to having the freedom to choose among menu items at a restaurant. Similarly, they are free to choose among different clothing options at the clothing store. A loss of freedom of choice goes counter to their expectations. Such unexpectedly limited freedom creates a negative force in their motivational state, called reactance, which decreases the perceived attractiveness of the object they were given and increases the attractiveness of the object they cannot have (Clee et al. 1980; Murray et al. 2011). Thus, psychological reactance theory posits that people may react negatively toward a freedom-threatening situation when their expected freedom has been threatened or eliminated (Brehm 1966).
Prior studies have suggested that loss of freedom of choice may result in several reactions. First, when people are constrained to one alternative, that alternative becomes less attractive to them than it would have been had it been freely chosen. As a result, the negative affective attitudes (e.g., anxious or angry) toward the alternative are formed. For example, Murray, and Häubl (2011) discovered that when users are constrained to using a single website interface to complete a task, their preference for it decreases, suggesting that freedom of choice is a critical determinant of interface preference. Second, reactance to constraints on people’s freedom of choice may negatively affect their satisfaction with the decision process. Kalda et al. (2003), for example, found that a free choice of physicians resulted in patients who were more satisfied with their medical care (Kalda et al. 2003). Another study in the same setting indicated that when patients are not able to choose their physicians, they may have lower levels of trust (Kao et al. 1998). Third, freedom of choice can increase people’s confidence levels, which can lead to higher perceived performance. Constrained choice, however, leads to a lack of control and decreased confidence, impairing people’s perceived performance (Tafarodi et al. 1999).

**IT Consumerization**

Prior studies define IT consumerization as privately-owned IT devices or software that are originally used in a non-work environment but are brought and operated in a work environment (Niehaves et al. 2012). On the basis of this definition, IT consumerization has two important implications to a company. First, whereas PITDs are designed for personal use, they can also be used for business purposes. Second, IT consumerization leads to a device use shift from the traditional top-down assignment to bottom-up IT approach (Moore 2011).

Whereas IT consumerization may create some problems such as increasing employees’ workloads (Niehaves et al. 2012), prior studies have reported that using personal IT devices in the work environment has several benefits such as cost reduction, employees’ satisfaction, and increasing productivity (Niehaves et al. 2012). Other studies suggest that IT consumerization increases autonomy (in this study we call this flexibility of device use) for individuals (Murdoch et al. 2010; Niehaves et al. 2012). When a high degree of autonomy occurs, employees may enhance their earning potential (Niehaves et al. 2012). This study believes that the pervasion of privately owned devices further increases the degree of autonomy because people have more different devices available to use, making the topic of the flexibility of multiple PITD use even more important. However, prior studies rarely discussed its impact on attitudes, satisfaction, and continuance intention.

**Literature Review and Hypothesis Development**

Flexibility of multiple PITD use creates a degree of freedom of choice for users to freely allocate their PITDs to completing a task. This freedom may have positively impacts on satisfaction and attitudes (both affective and cognitive appraisals). According to psychological reactance theory, when individuals are aware of their choices yet are forced to accept a certain choice, or when they realize that certain choices are eliminated, reactance is aroused (Brehm et al. 1981). Thus, in the context of this study, we propose that low flexibility of multiple PITD use may cause reactance because users own and are aware of all PITDs but are forced to use a specific one. Prior research has shown that an unwillingness to accept the limited choice threatens free behavior, subsequently generating negative emotions, including frustration and an increasing resistance to current circumstances (Iyengar et al. 2000; Kalda et al. 2003; Murray et al. 2011). Meanwhile, the reverse effect may occur with an increasing level of choice. With more choices available, individuals are able to accept the one they make, which reduces threat and anxiety, increases credibility (Kukde et al. 1994; Rokke et al. 1991) and pleasure (Hui et al. 1991). However, it is important to note that prior studies have suggested that when a user has too many choices, threat and anxiety may increase, resulting in lower satisfaction (Scheibehenne et al. 2010). Nevertheless, in this study, users make a choice among only three distinct PITDs (i.e., a smartphone, tablet, and desktop computer); therefore the effect of too many choices is minimized. Hence, we propose that when users are able to flexibly allocate PITDs to complete a certain task, they may have higher positive affective appraisals than people who were not given a choice.

**H1:** Positive affective appraisal with PITD use will be higher when flexibility of multiple PITD use is high than when flexibility of multiple PITD use is low.
Additionally, freedom of choice has been recognized as a factor influencing cognitive appraisal. Specifically, active thinking and interaction facilitated by freedom of choice makes individuals engage in an activity. For example, when in a restaurant, an individual can choose an available meal listed in a menu by actively thinking about what he or she wants to eat based on the individual’s personal preferences. This engagement process increases the individual’s motivation toward completing the task (Perlmuter et al. 1977) and enhances his or her sense of control over the outcome of the task (e.g., the individual knows what the meal he or she chose should taste like). The positive motivation and enhanced sense of control may lead to higher self-confidence, or even overconfidence, about outcomes (e.g., success of completing the task), resulting in higher cognitive appraisal (i.e., higher perceived performance). Thus, freedom of choice enhances people’s perceived control and their confidence in performing a task, even for tasks in which outcomes are determined by chance, resulting in higher cognitive appraisal.

In the context of this study, when there are multiple PITDs available for users to choose among, the freedom of choice among these PITDs gives users opportunities to select and create the ideal combination of PITDs. Users can work on the task based on the fit between the PITDs they chose and the task, which creates a belief that they can control the task and complete it more efficiently, leading to higher confidence in their ability to carry out tasks and not only increasing their contentedness but also enhancing their cognitive appraisal with PITD use. Conversely, when users know that they own three PITDs but are restricted to using a specific one, their actions are limited, according to psychological reactance theory, resulting in diminishing confidence in accomplishing tasks. We thus posit the following hypotheses:

H2: Positive cognitive appraisal with PITD use will be higher when flexibility of multiple PITD use is high than when flexibility of multiple PITD use is low.

Task complexity

Complex tasks typically contain more informational cues and processes than simple tasks (Campbell 1988; Speier et al. 2003; Wood 1986), with these cues being highly dependent on other cues and processes (Wood, 1986). Hence, when processing simple tasks, people require only a few PITDs and still have extra cognitive resources, whereas when processing complex tasks, people need to use more PITDs to deal with difficult and interrelated issues (Dearman et al. 2008) and require minimizing their expenditures of scarce cognitive resources. We propose that these differences (i.e., different needs with regard to the number of PITDs used and different capacities for cognitive resources) will have a significant impact on affective, cognitive appraisals with regard to multiple PITD use.

According to psychological reactance theory, individuals react positively toward freedom of choice but negatively toward limited choice. This relationship remains the same in different task complexity conditions but its intensity may vary. For simple tasks, freedom of choice may not impact users’ feelings as strongly as it would for complex tasks. In the context of this study, under simple task conditions, the need to freely use PITDs is not strong because one PITD seems sufficient to perform the task. As a result, limited choice may only slightly influence users’ attitudes (both affective and cognitive appraisals) toward PITD use. Conversely, under complex task conditions, freedom of choice among PITDs matters because, in performing the complex task, freedom of choice can give users the capability to freely allocate the appropriate devices based on TTF and habit. Thus, as freedom of choice increases users’ sense of control and confidence in dealing with complex tasks, leading to higher affective and cognitive appraisals towards PITD use. However, if freedom of choice is threatened under complex task conditions, reactance is likely to occur, resulting in lower affective appraisal and decreased cognitive appraisal with regard to PITD use. Indeed, when the freedom of choice becomes very important to people but they are forced to choose specific alternatives, the high levels of reactance would be generated (Clee et al. 1980). Therefore, the higher the task complexity, the higher the relationship between the flexibility of multiple PITD use and attitudes (both affective and cognitive appraisals) toward PITD use. We thus posit the following:

H3: Task complexity positively moderates the positive relationship between the flexibility of multiple PITD use and positive affective appraisal with PITD use.

H4: Task complexity positively moderates the positive relationship between the flexibility of multiple PITD use and positive cognitive appraisal with PITD use.
**The Relationship between Affective Appraisals, Cognitive Appraisals, and Continuance Intention of PITD Use**

Both affective and cognitive appraisals toward an object have been recognized by prior studies as the antecedents in forming continuance intentions for using IT devices (Bhattacherjee et al. 2004; Lee et al. 2009). Prior studies have suggested that perceived usefulness and perceived enjoyment are two of the key determinants of IT continuance intention (for perceived usefulness, see Bhattacherjee (2001) and for perceived enjoyment, see Kim (2010)). In other words, when users believe that using a specific IT device can enhance their productivity (i.e., positive cognitive appraisal) and/or makes them more enjoyable (i.e., positive affective appraisal), they may want to continue to use it (Bhattacherjee 2001; Bhattacherjee et al. 2004; DeLone et al. 1992). In the context of this study, we define continuance intention of PITD use as the intention that users plan to use the same PITD(s) to perform the similar tasks in the future given that the consistency of the portfolio available to them. If users have a positive attitude that using PITD(s) can lead to better performance and/or make the task completion more interesting and fun, such positive attitude may encourage them to continue using the same PITD(s) in the future. Thus, we posit the following hypotheses:

**H5:** The more favorable the affective appraisal, the higher the continuance intention of PITD use.

**H6:** The more favorable the cognitive appraisal, the higher the continuance intention of PITD use.

The overall research model is shown in Figure 1.

![Figure 1. Research Model](image)

**Method**

For our experiment, we employ a $2 \times 2$ full factorial design with the following factors: high vs. low flexibility of multiple PITD use, high vs. low task complexity. Subjects are randomly assigned to each condition. The subjects are full-time employees in the United States.

This study uses three PITDs in the experiment: a desktop computer, Kindle Fire (Tablet) and iPod Touch (Smartphone). Note that we use Apple’s iPod touch as a smartphone because most of its functions are almost identical to that of the iPhone, except for the ability to function as a phone. Moreover, participants are not allowed to make calls to complete the task, making the iPod touch a more appropriate device for this study.

**Task Design**

The participants are instructed to perform a trip-planning task that involves a series of searches and calculations so as to include both simple and complex tasks (see Appendix A). It is important that the simple and complex tasks be equivalent across cross-PITD use and single PITD use conditions (Campbell 1988). This is accomplished by asking the same task questions for each condition. It is also important that degree of complexity in simple and complex tasks is significantly different so that the effect of complexity becomes salient. Following prior studies, the complex task is manipulated by increasing the number of criteria and by adding five more options than is given for the simple task (Campbell 1988; Wood 1986).
This allowed us to use the same data set across cross-PITD use and single PITD use conditions, yet subjects could perceive a different level of task complexity in each.

**Flexibility Manipulation**

Hammock and Brehm (1966) suggested that to create reactance, subjects should first be shown a number of alternatives and then have their freedom of choice constrained as a result of some of these alternatives becoming unavailable. Following their suggestion, the subjects in this study are first shown all PITDs (i.e., a smartphone, a tablet, and a desktop computer) on a table. In the high flexibility of multiple PITD use condition, they are told that they can freely access these PITDs. In the low flexibility of multiple PITD use condition, however, they can see these PITDs on the table but cannot use whatever one they want; they are forced instead to use the devices we have chosen for the task based on the pilot study results.

**Experimental Procedure**

In all conditions, a smartphone, tablet and desktop computer are placed on a table where subjects can easily access them. In the high flexibility of multiple PITD use condition (i.e., condition 1 and 2), subjects are free to use these devices. In the low flexibility of multiple PITD use condition (i.e., condition 3 and 4), subjects are forced to use the device that I told them to use in the training session.

In this study, we have loaded the same apps including Google Maps, The Weather Channel, calendar, calculator and a browser in both the Kindle Fire and iPod Touch. Upon commencement of the experiment, a 15-minute training session is held to orient the participants on how to use these applications across three devices in all conditions. After the training session, the subjects in condition 3 and 4 are instructed to use a specific device to complete a particular task. For example, they need to know that the smartphone is used to check the weather and perform simple calculations, and the desktop to search destinations using Google Maps. After subjects know that there are free to use PITDs (condition 1 and 2) or know that which PITD they should use to perform a specific task (condition 3 and 4), they can use any device they want (condition 1 and 2) or they are asked to use the desktop (condition 3 and 4 and control group) to visit a website on which they are asked to work on a trip-planning task. The subjects will be assigned to either the simple or complex task. A post-task questionnaire is provided immediately after the task.

**Measurement**

The questionnaire is designed to measure a wide range of demographic factors, individual differences, affective appraisals, cognitive appraisals, and continuance intention of PITD use. The scales for affective and cognitive appraisals are adapted from by Van der Heijden (2004). The scale for multiple PITD continuance intention is adapted from Bhattacherjee’s (2001).

**Analysis**

Descriptive statistics showing the frequencies for gender and age in each condition is presented. To test the significance of experimental manipulations, we will be conducting partial least squares (PLS) analysis using smartPLS with the boot- strapping resampling procedure (Chin 2000).

**Expected Contributions**

With the increasing popularity of BYOD in companies currently, the flexibility of multiple PITD use to perform a task requires further attention. Building on the psychological reactance theory, we extend our investigation into how high and low flexibility of multiple PITD use interact with task complexity to influence users’ affective and cognitive appraisals and continuance intention of PITD use. The results may have both practical and theoretical contributes. For practical contribution, the findings can improve our understanding on the situations that may result in more positive attitudes toward PITD use and in turn higher continuance intention. These results can help companies design their PITD strategy. For theoretical contribution, the findings can extend psychological reactance theory into the context of multiple PITD use, paving the way for this important research area.
Appendix A

**Simple Task**

Suppose that your 10-day vacation begins tomorrow. You will be asked to select one out of the next 10 days to take a leisure trip. There is one destination that you wish to go to: **The Yale Art Gallery**. The questions below are designed to help you plan your trip. You must choose either a sunny or a cloudy day for your trip. You may not choose a rainy day unless the next 10 days are all rainy days. You will use a device that we ask you to use.

Please use at least two IT devices in front of you to answer these questions below.

1. Date: choose the date on which you wish to take your vacation within the next 10 days.
   Answer: ____________
2. Weather: check the weather on that day. Please note that you cannot choose a rainy day.
   Answer: ____________
3. Driving Time: Driving time from here to your destination and back.
   Answer: ____________
4. Total miles: Total miles driven from here to your destination and back
   Answer: ____________
5. Fuel charges: $25 worth of fuel can sustain 85 miles of driving. How much you should pay for the trip.
   Answer: ____________
6. Toll fees: average toll fees are $3 for every 45 miles. How much you should pay for the trip.
   ____________
7. Attraction admission fees: this fee is day-specific. Please visit the website to check the admission fee.
   ____________
8. Opening hours: the open hours are day-dependent. Please visit the website to check the opening hours for destination.
   ____________
   ____________
10. Total time: the time taken for your trip including driving hours and open hours.
    ____________
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