ABSTRACT

The demand for software has increased rapidly in the global industrial environment. Open source software (OSS) has exerted significant impact on the software industry. Large amounts of resources and effort have been devoted to the development of OSS such as Linux. Based on the technology adoption model (TAM), the development of Linux as the most well-known OSS with a graphical user interface designed for ease of use and a wide range of functionalities is expected to result in high levels of Linux adoption by individual users. Linux, however, currently controls about 1% of the operating system market for personal computers. The resistance of users to switch to a new operating system remains one of the major obstacles to widespread adoption of Linux among individual users. Based on the integration of the equity implementation model and the TAM, this study examines the formation of user resistance, as well as the effects of user resistance, on the migration to Linux for personal computers. This study discusses the role and effect of user resistance based on the equity implementation model in comparison with the two main determinants in the TAM. This study contributes to the advancement of theoretical understanding of Linux migration and user resistance. The findings also offer suggestions for software communities and practitioners, of OSS in particular, to promote the use of new software by individual users.

Keywords: Equity Implementation Model, Linux Migration, Open Source Software, Technology Adoption Model, User Resistance

INTRODUCTION

The demand for software has rapidly increased in today’s global industrial environment. As technology environments change at an unprecedented rate, the agility of software development has become increasingly critical for software development performance (Lee & Xia, 2010; Batra, VanderMeer & Dutta, 2011). In contrast with hardware, the term software in this study refers to application software that processes the work and tasks of users. Once an individual starts to use a particular software brand, the user is often reluctant to replace it with another kind of software. Over the last 20 years, OSS products have made successful inroads into many information systems segments (Von Krogh et al., 2012). OSS has achieved great success
and exerted significant impact on the software industry (Xu, Lin & Xu, 2011).

The emergence of OSS in successful projects such as Linux operating systems, Mozilla web browsers, and Apache web servers, together with the most prominent advantages of OSS, such as cost savings, freedom of modification, and availability of source codes, have created a vast interest in OSS among academics and practitioners (Ebert, 2008; Ven, Verelst & Mannnaert, 2008; Li, Yan, Xu & Teo, 2011). The development and implementation of OSS has become one of the most important topics of current interest in academic, business, and political environments (Fitzgerald, 2006; Hauge, Ayala & Conradi, 2010; Singh & Tan, 2011). The OSS community and developers have been exerting significant efforts to produce software that is competitive with proprietary programs. More developers are motivated to participate in OSS software development because OSS projects are a good opportunity to improve skills and gain experience (Ke & Zhang, 2010; Roberts, Hann & Slughter, 2006). As of August 2012, SourceForge (http://sourceforge.net/), the world’s largest open source development and distribution portal, was hosting over 308,000 registered projects and more than 2.7 million users.

Linux is arguably the most well known OSS project, to which large amounts of resources and effort have been devoted. Wheeler (2001) estimated that Red Hat Linux 7.1 has over 30 million physical source lines of code. Similarly, a study of Debian GNU/Linux found 300 million lines of code as of 2007 (Gonzalez-Barahona, Robles, Michlmayr, Amor & German, 2009). In comparison, Windows 98 contained an approximate 18 million source lines of code in the same time period. Using the constructive cost model (COCOMO), Red Hat Linux 7.1 is estimated to have required about 8,000 person-years of development time (Wheeler, 2001). Accordingly, if all this software had been developed through conventional proprietary means, it would have cost more than one billion U.S. dollars for development in the United States (Wheeler, 2001).

As development of OSS such as Linux has increased in general, its adoption by companies and corporate users has also increased (Ebert, 2008). The features and functionality offered by the two operating systems (i.e., Linux and Microsoft Windows) are comparable, and some users have even declared Linux better in areas such as customizability, reliability, and security (Ebert, 2008). Linux adoption and usage by individual users for personal computers, however, remains very limited. According to Market Share by Net Applications, the market share for operating systems in September 2011 indicated that Linux represented 1% of the market, while Microsoft Windows had a total of 87% of the market. This creates an area of interest for study – why does Linux have a low level of individual usage despite having successfully achieved favorable comparisons to Microsoft Windows in terms of performance, usability, reliability, and functionality?

The usual determinants of the technology adoption model (TAM) (Davis, 1989) – perceived usefulness and perceived ease of use – may be able to partially explain why some people adopt the Linux software. The inclusion of a graphical user interface has enhanced Linux’s ease of use (e.g., KDE, GNOME, and Xfce). However, people remain hesitant to use the software onto desktops (Express Computer, 2006). This very low rate of adoption cannot be explained by the TAM alone, and there must be additional factors that make it difficult for users to adopt and use Linux on their personal computers. In this study, we investigate adoption for moving to other alterative system of users using the existing other system, and explain TAM model showing adoption for moving other alterative system and EIM model indicating switching together.

There has been little research to explain the low level of Linux adoption by individual users. Prior research on OSS has mainly addressed issues of motivation in OSS development (Ke & Zhang, 2010; Roberts, Hann & Slughter, 2006; Singh & Tan, 2011), OSS user communities (Chua & Yeow, 2010; Roberts, Hann & Slughter, 2006), OSS design and development (Bach & Carroll, 2010; Setia, Rajagopalan, Sambamurthy & Calantone, 2012; Sojer & Henkel, 2010), OSS adoption (Gallego, Luna
According to market statistics, the Microsoft Windows family counts for nearly 87% of operating system usage used for all kinds of users, because Windows is bundled with the personal computer (Net Market Share, 2011). Consequently, Linux adoption often involves switching from a current operating system to a new operating system. Adoption of a specific technology can be accompanied by the discontinuance of an existing technology (Desouza, Jha, Papagari & Ye, 2006). In this case, adoption requires users to discontinue the use of a current system. Moreover, system providers make efforts to retain their customers by preventing existing consumers from abandoning current products and services for the products and services of competitors. As a result, a major obstacle to OSS migration is user resistance to change. It is therefore imperative to consider the effects of user resistance when studying the adoption of Linux for personal use. Regardless, previous research on OSS adoption (Gallego, Luna & Bueno, 2008; Hauge, Ayala & Conradi, 2010; Macredie & Mijinyawa K., 2011) has not considered the issue of user resistance.

To examine the effects of user resistance, this study adopts the equity implementation model (EIM) (Joshi, 1991), which was proposed to explain user resistance in the implementation of information systems (IS). The present study selects EIM as its theoretical foundation because EIM explains that individuals describe their level of resistance based on net equity, which is determined based on comparisons between benefits and costs. By integrating the TAM and the EIM, this study examines (1) how perceived value affects the resistance of users to migration to Linux for personal computers and (2) how users decide on the adoption of Linux based on their levels of resistance and the two determinants of the TAM. The theoretical model in this study is validated through a survey of personal computer users. Contributions of this study include the advancement of our theoretical understanding of user migration, particularly by adding the new perspective of user resistance and offering strategies for managing user resistance to Linux.

CONCEPTUAL BACKGROUND

User Resistance

Although resistance manifests in numerous ways, resistance to change is frequent when individuals are introduced to new innovations (Kavanagh, 2004). The concept of user resistance has slightly different meanings in different disciplines (Oreg, 1978). In management studies, resistance has commonly been conceptualized as conduct that seeks to maintain the status quo (Pardo del Val & Fuentes, 2003). Piderit (2000) suggested an attitudinal conceptualization of resistance in terms of cognitive, emotional, and intentional dimensions. In marketing studies, resistance is viewed as an attitude of customer commitment (Crosby & Taylor, 1983). With regard to information systems (IS) and information technology (IT), user resistance has been conceptualized from both behavioral and attitudinal perspectives. The concept of resistance in most IS and IT research is adapted from psychology, management, and marketing studies. Resistance is behaviorally defined as an adverse reaction (Hirschheim & Newman, 1988) or the opposition of users to proposed changes resulting from IS implementation or use of a new system (Kim & Kankanhalli, 2009; Markus, 1983). By conceptualizing resistance as manifesting in behavior, Fereneley and Sobrerez (2006) further classified resistance into opposition (e.g., challenge or disruption to initiatives), negative resistance (e.g., sabotage),
and positive resistance (e.g., support or suggestions for improvement).

In addition to the behavioral perspective, user resistance has also been conceptualized from an attitudinal perspective. Newman and Noble (1990) interpreted the attitudes of users due to entrenched habits or the dislike of learning new habits as attitudes of resistance toward any form of change in terms of IS implementation. Similarly, resistance has been conceptualized as a cognitive force that precludes potential behavior (Bhattacherjee & Hikman, 2007). Hartmann and Fischer (2009) suggested consideration of user resistance as a natural and essential function of any process of change. The present study conceptualizes user resistance as an individual's attitude toward change, specifically, when the user is resistant to switch from his current situation (e.g., use of a current operating system) to a new situation (e.g., use of Linux). Thus, this study defines user resistance as an oppositional attitude toward change (i.e., Linux migration).

It is important to distinguish the phenomenon of user resistance from user adoption to justify the need to study each phenomenon separately. That is, user resistance and user adoption are not simply the reverse of one another. User adoption has been defined as an individual's initial decision to use a system (Agarwal, 2000), including his or her intention to use, or actual system usage (Davis, 1989), with alternative conceptualizations that include the sustained use and even emergent use (Rogers, 1995) of new systems. In contrast, user resistance refers to the opposition of individuals to changes associated with the adoption of a new system (Bhattacherjee & Hikman, 2007; Kim & Kankanhalli, 2009). These definitions highlight the first difference, which is that user resistance not only targets a system, but more importantly, occurs in response to the multifarious changes associated with the system. From the perspective of this study, when people who are accustomed to using Microsoft Windows begin to use Linux, they find that they cannot use exclusive programs created by Microsoft Windows and consequently have difficulty replacing the old programs with other programs. On the other hand, user adoption tends to occur more in response to the specific characteristics (Davis, 1989; Rogers, 1995) and job outcomes of a system (Davis, 1989). As a result, negative change factors (e.g., switching costs) may lead to user resistance, but the absence of negative change factors (e.g., no switching costs) may not necessarily lead to user adoption.

Secondly, user resistance can come into play prior to the deployment of a system, whereas the issue of user adoption only arises after an IS is poised to be or has already been deployed. Accordingly, most research on user adoption models the concept and collects data after IS implementation (Davis, 1989; Nah, Tan & The, 2004; Venkatesh, Morris, Davis & Davis, 2003; Wixom & Todd, 2005). User resistance can occur either before or after the system is ready. In the first case, user resistance can result in project delays and overspending (Verton, 2002). In the second situation, the consequences of user resistance include low usage (Barker & Frolick, 2003) or refusal to use the system (Kim & Pan, 2006).

Accordingly, it is important to study user resistance in the context of software migration. As previous research (Bhattacherjee & Hikman, 2007) has mentioned, “IT usage and resistance must be examined jointly within a common theoretical model because user resistance is clearly a barrier to IT usage in organizations” (p. 726). User resistance is thus not the mirror opposite of user adoption but rather is a possible antecedent to it (Bhattacherjee & Hikman, 2007).

**Equity Implementation Model**

Because Linux migration incurs benefits and costs, this study uses the EIM (Joshi, 1991) to provide a theoretical understanding of IS user resistance to change. This study examines the attitudinal perspective of user resistance when users consider switching from a system they are currently using to a new system. Users tend to evaluate the inputs and outcomes based on system changes, and they may resist the changes or resist switching from their current systems.
if the inputs are greater than the outcomes. The EIM evaluates net equity by comparing the changes in outcomes and inputs, and a positive or negative net equity influences user resistance accordingly (See Figure 1). The EIM describes a process of comparison, which is absent in the TAM. Therefore, we believe that the EIM helps us understand user resistance in Linux migration, which tends to occur as a result of system changes (i.e., switch from current to new operating system).

According to the EIM, users evaluate changes related to a new system based on net equity. The net change in equity status is estimated based on a comparison between changes in benefits (i.e., outcomes) and changes in costs (i.e., inputs). Joshi (1991) operationally defined net equity as follows: Net equity = ΔOutcomes - ΔInputs = (Increase in outcomes – Decrease in outcomes) – (Increase in inputs – Decrease in inputs) = (Increase in outcomes + Decrease in inputs) – (Increase in inputs + Decrease in outcomes). The combination of increase in outcomes and decrease in inputs means that there are benefits to switching to a new system (i.e., switching benefits). The combination of increase in inputs and decrease in outcomes means that there are costs in switching (i.e., switching costs). Similar to the concept of benefits and costs in switching, Ven et al. (2008) identified advantages and disadvantages for organizations to consider before adopting OSS.

The advantages include free software, lower costs of hardware, course code availability, and maturity of OSS, while the disadvantages include an unclear total cost of ownership, lack of knowledge, unreliability, and lack of support.

Because this study focuses on the individual level, personal computer users must switch from their current systems in order to adopt the new system. As a result, there may be user resistance due to switching. As per the EIM, there is no fundamental or irrational resistance to a switch. In fact, users evaluate the switch to the new system based on the perceived net equity. Net equity is perceived or assessed by comparing additional benefits relative to the new system to the additional costs incurred from switching. There are different types of costs related to switching, including procedural costs (i.e., the expenditure of time, effort, and economic resources incurred by switching operating systems), psychological costs (i.e., psychological or emotional discomfort of users due to the switching of operating systems), and loss costs (i.e., losses due to investments already made in current operating systems) (Burnham, Frels & Mahajan, 2003; Jones, Mothersbaugh & Beatty, 2002; Whitten & Wakefield, 2006).

As a corresponding factor to net equity, we select value, which has been conceptualized as the net benefit based on a comparison of benefits and costs (Kim & Kankanahalli, 2009; Zeithaml, 1988). Thus, based on the

![Figure 1. Equity implementation model](image-url)
EIM, this study explains that user resistance is influenced by value, which is perceived based on the comparison between switching benefits and switching costs.

**RESEARCH MODEL AND HYPOTHESES**

We develop the research model based on the integration of the EIM and the TAM (See Figure 2). The EIM explains how users become resistant to system migration, which in turn reduces the intentions of users for system adoption. The TAM explains that people adopt technology based on perceptions of usefulness and ease of use. When it comes to software migration, an individual should consider both the adoption of alternative software and the switch from existing software to alternative software. Thus the TAM and the EIM complement each other in explaining OSS migration. Because the TAM and its two determinants (usefulness and ease of use) are well tested, this study treats usefulness and ease of use as control variables without stating hypotheses.

User resistance to software migration refers to the opposition of an individual to the use of a new system (Hirschheim & Newman, 1988; Kim & Kankanahalli, 2009; Markus, 1983). In our study, a switch refers to migration from any current operating system to a new operating system (e.g., Linux), and we conceptualize the negative attitudes of individuals regarding such switching in terms of user resistance. Most previous research on technology adoption (Taylor & Todd, 1995; Wixom & Todd, 2005) has examined the effects of positive attitudes on adoption. Venkatesh et al. (2003), however, argued against the role of positive attitudes in explaining and predicting the adoption intentions of users. In contrast, user resistance is conceptualized as the negative attitudes of users, which will affect their adoption intentions according to the theory of planned behavior (TPB) (Ajzen, 1991). Thus, user resistance to...
software migration will decrease the intentions of users to adopt alternative software when it comes to Linux migration from current operating systems.

**H1:** User resistance to software migration has a negative effect on the intention of users to adopt alternative software.

As a corresponding factor to net equity in EIM, the perceived value of software migration is conceptualized as the *perceived net benefits* (perceived benefits relative to perceived costs) of *switching to a new system* (Kim & Kankanhalli, 2009). According to the EIM, the judgments of users about switching affect their attitudes of resistance. Further, perceived value indicates whether the benefits derived from switching are worth the costs incurred by switching to a new situation. If the net change in the equity status proves to be positive, then the switch will be welcomed. However, if the net change in the equity status is negative, then switching to a new system will be resisted (Joshi, 1991). Therefore, if the perceived value of switching is high, users are likely to experience lower resistance to migration. Conversely, if the perceived value is low, users are likely to have greater resistance to software migration. Moreover, people have a strong tendency to maximize value in their decision making and consequently are less likely to resist changes that deliver a higher perceived value (Joshi, 1991).

**H2:** Perceived value of software migration has a negative effect on user resistance to software migration.

The benefits of software migration have been conceptualized as the benefits or advantages perceived as resulting from the switch from a current system to a new system (Moore & Benbasat, 1991). In our study, the switching benefits of software migration refer to perceived additional utility that a user experiences in switching from a current system to a new system (Kim & Kankanhalli, 2009). Perceived value is assessed as the overall evaluation of the net benefits of a switch (Kahneman & Tversky, 1979). According to the EIM, the change in equity status is positively affected by changes in benefits (Joshi, 1991). As per rational decision-making principles, higher switching benefits would increase the net benefits or perceived value of any user change, because value is assessed based on benefits relative to costs (Joshi, 1991; Zeithaml, 1988). Therefore, the perceived value of software migration is increased when the switching benefits of software migration are high.

**H3:** Switching benefits of software migration have a positive effect on the perceived value of software migration.

According to previous research, switching costs include psychological costs such as uncertainty costs and emotional costs (Whitten & Wakefield, 2006), one-time switching costs such as set-up costs and learning costs (i.e., procedural costs) (Burnham, Frels & Mahajan, 2003), and loss costs such as lost benefit costs and sunk costs (Jones, Mothersbaugh & Beatty, 2002). In our study, the switching costs of software migration are defined as the perceived *disutility a user incurs in switching from the current system to a new system* (Chen & Hitt, 2002). As stated earlier, perceived value is assessed as the overall evaluation of the net benefits of a switch based on a comparison between switching benefits and costs (Kahneman & Tversky, 1979). According to the EIM, the change in equity status is negatively affected by changes in costs (Joshi, 1991). As per rational decision-making principles, higher switching costs in any form would lower the net benefit or perceived value of the switch (Joshi, 1991; Zeithaml, 1988). Accordingly, the perceived value of software migration decreases when the switching costs of software migration are high.

**H4:** Switching costs of software migration have a negative effect on the perceived value of software migration.
In addition to the indirect effects of switching benefits and costs of software migration on user resistance to software migration through the perceived value of software migration, we also expect direct effects of switching benefits and costs on user resistance to software migration. According to the TPB, switching benefits and costs are conceptualized as beliefs. Based on the TPB, a person’s attitude toward a target behavior is determined by his or her salient beliefs. Therefore, user beliefs about the benefits achieved from switching to a new system will affect his or her attitude toward the switch. In other words, switching benefits (i.e., user beliefs) influence user resistance (i.e., user attitude toward the switch). The potential advantages of switching from any current system to a new system provide users with the motivation to switch. In contrast, if a new system offers few switching benefits, then users are more likely to resist a switch from their current systems (Martinko, Henry & Zmud, 1996). High switching benefits of software migration may thus reduce user resistance to software migration.

**H5:** Switching benefits of software migration have a negative effect on user resistance to software migration.

Similarly, switching costs may directly influence user resistance. Switching costs refer to any perceived disutility (Chen & Hitt, 2002) that a user would experience from switching to an alternative system. Based on the TPB, a person’s attitude toward a target behavior is determined by his or her salient beliefs (Davis, Bagozzi & Warshaw, 1989). That is, the beliefs of users about incurring costs from a switch affect their attitudes toward the switch. Therefore, high switching costs of software migration increase user resistance to software migration.

**H6:** Switching costs of software migration have a positive effect on user resistance to software migration.

Perceived usefulness is defined as the prospective user’s subjective probability that using a specific application system will increase his or her job performance (Davis et al., 1989). In this study, the perceived usefulness of alternative software is believed to increase the level of work productivity related to the use of alternative software when migrating from an existing software system to alternative software. Perceived usefulness is known as the best predictor of user satisfaction (Calisir & Calisir, 2004). The rate of use of technologies that are convenient to use is higher than the rate of use of technologies that are not convenient to use (Davis, 1989). When a new product provides higher value in terms of performance and function than existing products, the new product will be rapidly accepted in the market (Rogers, 2003). This has positive effects on the benefits obtained by users that are willing to migrate to alternative software due to recognition that the new software is more convenient to use than the current software.

**H7:** The perceived usefulness of alternative software has a positive effect on the switching benefits of software migration.

Perceived ease of use refers to the degree to which a prospective user expects the target system to be free of effort (Davis et al., 1989). In this study, the perceived ease of use of software migration refers to the degree of ease with which a prospective user may use the alternative software when migrating from existing to alternative software. The effect of perceived ease of use on the attitudes of users toward software if the new software is easier to understand and use than the existing software. If users of existing software recognize that alternative software is easier to use, then they will replace the current software regardless of the costs – including costs of time and effort – required for migration.
H8: The perceived ease of use of alternative software has a negative effect on the switching costs of software migration.

RESEARCH METHODOLOGY

Instrument Development

A field survey was conducted to understand the software migration from Windows to Linux based on the research model in Figure 2. The survey instrument for the research model was developed by adapting existing validated scales as much as possible. To measure adoption intention, we followed the scale guidelines of the theory of reasoned action and ensured that the questions were specific and consistent with respect to our action (adoption), target (Linux), context (individual purpose) and timeframe (within the following six months). The three items of intention to adopt alternative software were then adapted from Karahanna et al. (1999). The measurement items for user resistance to software migration were modified from Pritchard et al. (Pritchard, Havitz & Howard, 1999) to fit the context of switching to a new software system. We developed the measurement items for the switching benefits of software migration based on the definition of switching benefits and by referring to the items of relative advantage (Moore & Benbasat, 1991). The switching costs of software migration were conceptualized as a single-dimensional construct, with scales adapted from Jones et al. (2002), to reflect procedural costs (SWC1 and SWC2), psychological costs (SWC3), and loss costs (SWC4). Scales for the perceived value of software migration were modified from the value construct of Sirdeshmukh et al. (2009) to the context of Linux migration. The items represent the procedural aspect (PVL1), loss aspect (PVL2), and psychological aspects (PVL3 and PVL4) in the net benefit assessment. Scales for the perceived usefulness of alternative software and perceived ease of use of alternative software were adapted from Davis et al. (1989). Three IS researchers reviewed the instrument for validity. The measurement items were anchored on seven-point Likert scales (from 1 = strongly disagree to 7 = strongly agree). The final version of the measurement items is presented in the Appendix.

Data Collection

We determined the population of interest to be composed of personal computer owners (and users) who were in a position to decide and act on Linux migration for individual purposes. Survey participants should not have been using Linux as the current operating system in their computers, but they should have some awareness of Linux. A database from a market research firm was used to draw a sample of panel members who were at least 19 years of age. The market research firm randomly selected members from the panel pool, each of whom was sent an invitation to participate in the survey via an email that included a link to a web-based survey questionnaire. The online survey was available for one week, in which time a total of 216 responses were collected. Among the 216 responses, we excluded 18 invalid responses because eight of the respondents did not have the authority to change their operating system, and ten of them were unfamiliar with Linux.

Table 1 presents descriptive statistics of the 198 valid respondents. The respondents were mostly male (75%). Their average age was 34 years (S.D. = 8.6) and the average time of usage of their current operating systems was 3.4 years (S.D. = 2.2). The average level of familiarity with Linux was 3.6 (on a 7-point scale of completely unfamiliar (1) to completely familiar (7)). We evaluated the non-response bias by comparing the responses of early and late respondents, i.e., those who replied during the first three days compared to those who responded in the last three days of the week-long data collection period. T-tests demonstrated that early and late respondents did not differ significantly in terms of age or usage experience with the operating systems. The results of Mann-Whitney tests also showed no significant differences in gender ratios of the two respondent groups.
DATA ANALYSIS AND RESULTS

Instrument Validation

To validate the survey instrument, we assessed its convergent and discriminant validities. We first performed confirmatory factor analysis (CFA) using statistical software LISREL. Convergent validity can be established using three criteria. First, the standardized path loading must be statistically significant and greater than 0.7 (Gefen, Straub & Boudreau, 2000). Second, the composite reliability (CR) and Cronbach’s α for each construct must be greater than 0.7 (Nunnally, 1994). Third, the average variance extracted (AVE) for each construct must exceed 0.5 (Fornell & Larcker, 1981). The standardized path loadings were all significant and greater than 0.7, with the exception of three items (RST1 = 0.66, SWB1 = 0.66, and SWC1 = 0.41). Because the path loadings of RST1 and SWB1 were close to the criteria (0.7), we retained them for further testing. The path loading of SWC1, however, was too low compared to the criterion. The AVE for the switching costs of software migration with the four items was 0.43, which is lower than the criterion of 0.5. For this reason, we excluded switching costs of software migration (SWC1) from the model for further testing. The CR and Cronbach’s α for all the constructs then exceeded 0.7, and the AVE for each construct was greater than 0.5. The convergent validity was thus supported (See Table 2).

The discriminant validity of the measurement model was assessed by comparing the square root of AVE for each construct with the correlations between the given construct and other constructs. Discriminant validity is established if the square root of AVE for a given construct is greater than the correlations between that construct and other constructs (Fornell & Larcker, 1981). In our model, the square root of AVE for each construct (diagonal term) exceeded the correlations between the given construct and other constructs (off-diagonal terms) (See Table 3).

Because one of the correlation terms in the table was greater than the prescribed threshold of 0.6 (Carlson, Kacmar & Williams, 2000), we conducted a second test of discriminant validity using a process of constrained CFA, as suggested by Anderson and Gerbing (1988). From the results of this test, all \(\chi^2\) statistics (the range of \(\Delta\chi^2\) was from 394.25 to 554.74) were significant, indicating that the measurement model was significantly better than other alternative models (obtained by combining pairs of latent constructs). Hence, the discriminant validity of the instrument was established.

We further tested our data for common method variance using Harman’s single-factor test following guidance from previous research (Podsakoff, MacKenzie, Lee & Podsakoff, 2002). The results of this test indicated that no single factor explained a majority of the variance, suggesting that common method variance was not a significant concern.

Table 1. Descriptive statistics of survey respondents

<table>
<thead>
<tr>
<th>Demographic variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>148</td>
<td>74.7</td>
</tr>
<tr>
<td>Female</td>
<td>50</td>
<td>25.3</td>
</tr>
<tr>
<td>Age range (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[Mean = 34.2, S.D. = 8.6]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-29</td>
<td>73</td>
<td>36.9</td>
</tr>
<tr>
<td>30-39</td>
<td>102</td>
<td>51.5</td>
</tr>
<tr>
<td>40 – above</td>
<td>23</td>
<td>11.6</td>
</tr>
<tr>
<td>Profession</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>52</td>
<td>26.3</td>
</tr>
<tr>
<td>Professional</td>
<td>141</td>
<td>71.2</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Total</td>
<td>198</td>
<td>100.0</td>
</tr>
</tbody>
</table>

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Table 2. Convergent validity testing

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Std. Loading</th>
<th>AVE</th>
<th>CR</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to adopt alternative software (INT)</td>
<td>INT1</td>
<td>0.85</td>
<td>0.74</td>
<td>0.90</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>INT2</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INT3</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User resistance to software migration (RST)</td>
<td>RST1</td>
<td>0.66</td>
<td>0.57</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>RST2</td>
<td>0.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RST3</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived value of software migration (PVL)</td>
<td>PVL1</td>
<td>0.74</td>
<td>0.72</td>
<td>0.91</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>PVL2</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVL3</td>
<td>0.90</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>PVL4</td>
<td>0.92</td>
<td></td>
<td></td>
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<tr>
<td>Switching benefits of software migration (SWB)</td>
<td>SWB1</td>
<td>0.66</td>
<td>0.70</td>
<td>0.90</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>SWB2</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>SWB3</td>
<td>0.88</td>
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<tr>
<td></td>
<td>SWB4</td>
<td>0.91</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Switching costs of software migration (SWC)</td>
<td>SWC1</td>
<td>0.71</td>
<td>0.52</td>
<td>0.76</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>SWC2</td>
<td>0.69</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Perceived ease of use of alternative software (EOU)</td>
<td>EOU1</td>
<td>0.76</td>
<td>0.67</td>
<td>0.89</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>EOU2</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>EOU3</td>
<td>0.92</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>EOU4</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Perceived usefulness of alternative software (USF)</td>
<td>USF1</td>
<td>0.80</td>
<td>0.69</td>
<td>0.87</td>
<td>0.87</td>
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<tr>
<td></td>
<td>USF2</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>USF3</td>
<td>0.87</td>
<td></td>
<td></td>
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</table>

Table 3. Correlations between constructs

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>INT</th>
<th>RST</th>
<th>PVL</th>
<th>SWC</th>
<th>SWB</th>
<th>EOU</th>
<th>USF</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>3.31</td>
<td>1.66</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>RST</td>
<td>4.49</td>
<td>1.21</td>
<td>-0.50</td>
<td>0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVL</td>
<td>3.62</td>
<td>1.15</td>
<td>0.63</td>
<td>-0.59</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWC</td>
<td>4.65</td>
<td>1.12</td>
<td>-0.24</td>
<td>0.29</td>
<td>-0.32</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWB</td>
<td>3.49</td>
<td>1.14</td>
<td>0.51</td>
<td>-0.47</td>
<td>0.60</td>
<td>-0.22</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOU</td>
<td>3.99</td>
<td>1.11</td>
<td>0.43</td>
<td>-0.38</td>
<td>0.42</td>
<td>-0.28</td>
<td>0.33</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>USF</td>
<td>3.96</td>
<td>1.10</td>
<td>0.46</td>
<td>-0.36</td>
<td>0.50</td>
<td>-0.27</td>
<td>0.61</td>
<td>0.61</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Note: Leading diagonal shows the square root of AVE of each construct
Harman’s single-factor test involves an exploratory factor analysis (EFA) of all items to determine whether the majority of variance is accounted for by one general factor. The test showed that the first factor accounted for 39.83% of the total variance. We further carried out principal component analysis using varimax rotation, which revealed that each of the seven principal components explained almost an equal amount of the 75.96% total variance, ranging from 8.65% to 13.14%. These results indicate that our data does not suffer from common method variance.

**Hypothesis Testing**

We examined the structural model using LISREL. We applied indices and standards to assess the model fit based on work by Gefen, Straub and Boudreau (2000) as follows, normed $\chi^2$ ($\chi^2$ to degree of freedom) less than 3; root mean square of approximation (RMSEA) less than 0.08; goodness-of-fit index (GFI), comparative fit index (CFI), and normed fit index (NFI) greater than 0.9; and adjusted goodness-of-fit index (AGFI) greater than 0.8. The results of structural model testing are shown in Figure 3. The structural model satisfied the threshold for all indices except GFI (with a value of 0.87, which is close to the threshold). Other values were normed $\chi^2 = 1.53$, RMSEA = 0.051, GFI = 0.87, AGFI = 0.83, CFI = 0.98, and NFI = 0.95. The structural model thus appeared to adequately fit the data.

The results indicate that user resistance to software migration (H1) together with perceived usefulness of alternative software had significant effects on the intention of users to adopt alternative software, explaining 52% of its variance. The perceived value of software migration (H2), switching benefits of software migration (H5), and switching costs of software migration (H6) had significant effects on user resistance to software migration, explaining 56% of its variance. The switching benefits of software migration (H3) and switching costs of software migration (H4) had significant effects on the perceived value of software migration, explaining 53% of its variance. However, there was no significant relationship between the perceived ease of use of alternative software and user resistance to software migration.

![Figure 3. Test results](image-url)
and the intentions of users to adopt alternative software. The results also show that the perceived usefulness of alternative software had positive effects on the switching benefits of software migration (H7), explaining 48% of its variance. The perceived ease of use of alternative software had negative effects on the switching costs of software migration (H8), explaining 15% of its variance. We additionally tested three control variables (gender, age, profession) as predictors of the intention of users to adopt alternative software, with no significant results.

We further tested the Linux intention exclusively, based on the TAM, and compared the R-square values between the two competing models (i.e., the TAM and the proposed model). The testing of the TAM showed that only perceived usefulness of alternative software (path coefficient = 0.44, p < 0.001) had a significant effect on the intention of users to adopt alternative software, explaining 32% of its variance. The comparison between the two competing models showed a significant increase in the R-square value in the proposed model compared to the TAM ($\Delta R^2 = 0.20$ and $F = 58.2$ (p < 0.001)).

**DISCUSSION AND IMPLICATIONS**

**Key Findings**

There are several salient findings from this study. The first finding is that user resistance to software migration has a significant negative impact on user intention to adopt alternative software in the context of Linux. This is consistent with the TPB, in which an individual’s intention is determined by his or her attitude toward the target behavior (Ajzen, 1991). Our study extends this idea by conceptualizing user resistance as a negative attitude toward the migration to Linux from a current operating system. This study also supports the idea of pursuing dual aspects of migration, such as adopting a new system and discarding the current system. Most users have already adopted and use a proprietary system (e.g., Microsoft Windows) on their personal computers. In order to adopt Linux as an alternative system, users often have to discontinue the use of existing systems. Therefore, users may demonstrate resistance to Linux migration and to discarding their current systems, which subsequently impact their intention to adopt alternative software.

The second finding is that perceived value of software migration has a significant negative impact on user resistance to software migration. In addition, the switching benefits of software migration increase the perceived value of software migration, while the switching costs of software migration reduce the perceived value of software migration. This finding is consistent with the EIM (Joshi, 1991) and previous research (Kim & Kankanhalli, 2009). If users perceive an overall loss in net equity (i.e., greater switching costs than switching benefits), which indicates a low perceived value of software migration, then they develop an oppositional attitude and become averse to switching. This also supports previous research (Joshi, 1991; Joshi & Lauer, 1999) that argues that changes delivering greater perceived value are less likely to be resisted than changes with a low perceived value.

The third finding is that switching costs and switching benefits of software migration have direct impacts on user resistance to software migration. The observed direct effect of switching costs of software migration parallels the observed effects in previous research (Kim & Kankanhalli, 2009), which argues that switching costs create user resistance. Moreover, the direct influence of switching benefits of software migration on user resistance to software migration is consistent with previous research (Martinko, Henry & Zmud, 1996) explaining that the beliefs of individuals regarding positive outcomes or switching benefits regarding new systems will reduce user resistance.

The fourth finding is that the perceived usefulness of alternative software has a significant impact on the intention of users to adopt alternative software, while the perceived ease of use of alternative software does not. This
is inconsistent to the findings in TAM studies (Davis, 1989). One possible reason for this discrepancy is that users may more highly prioritize the usefulness of a system than its ease of use when deciding whether to adopt the system. In this study in particular, users may find that the usefulness of Linux is more important than its ease of use in deciding on adoption. Another possible reason is that most respondents to this study have used computers for several years and therefore have a high level of skill with computers. There are no special features that make Linux difficult to use compared to other operating systems. Hence, ease of use will have a smaller impact on the decision to adopt Linux.

The fifth finding is that the perceived usefulness of alternative software has a positive effect on the switching benefits of software migration, and the perceived ease of use of alternative software has a negative effect on the switching costs of software migration. First of all, the perceived usefulness of alternative software having a positive effect on the switching benefits of software migration is due to the recognition of users that Linux as an alternative software is more convenient and increases productivity. Accordingly, users are willing to switch to Linux in order to obtain these benefits. Second, the reason for the perceived ease of use of alternative software having a negative effect on the switching costs of software migration is that when users recognize that the use of Linux as alternative software is easier, the time and efforts required to migrate to Linux from the current software are diminished.

**Implications for Research**

This study offers several implications for research. First, this study examined the relationship between user adoption and user resistance, as well as the differences and similarities between these concepts. The TAM explains that users decide on the adoption of technology based on their perceptions of the target technology (i.e., OSS). In contrast, user resistance to software migration is based on the EIM, which explains that users determine resistance based on an overall evaluation of benefits and costs related to switching (i.e., migration from a current system to a new system). This study also conceptualized user resistance as negative user attitude and explained the relationship between user resistance and adoption based on the attitude-behavior link of the TPB.

Another theoretical implication is the development of the EIM-based user resistance model to understand the benefit and cost reasons for resistance. Few theoretical foundations with empirical validation exist in current literature to explain user resistance (exceptions include Joshi (1991) and Kim and Kankanhalli (2009)). The EIM (Joshi, 1991) provides an explanation about the role of net equity in causing user resistance, as well as providing some examples of inputs and outcomes. However, the EIM does not examine net equity based on increases and decreases in outcomes and inputs, nor has it been tested in the context of Linux or other software. This study developed and tested a theoretical model to explain the evaluation of switching to new systems using a survey methodology.

The present study adds to previous research on user resistance, especially works by Bhattachjee and Hikmet (2007) and Kim and Kankanhalli (2009). Bhattachjee and Hitmet (2007) examined the relationship between resistance to change and intention to use healthcare information technology. They conceptualized resistance to change as a generalized opposition to change engendered by the expectation of adverse consequences. Their main contribution was identification of the negative relationship between resistance to change and intention to use. However, their study was limited in explaining the antecedents of resistance to change. They examined perceived threat as the main antecedent of resistance to change, based on arguments from previous conceptual research (Lapointe & Rivard, 2005; Markus, 1983). In contrast, the present study derived and empirically tested a theoretically grounded model to understand how software migration is evaluated in order for user resistance to occur. In particular, our study showed that user resistance is determined not only by the perceived threats or known costs of change, but also by the benefits.
Kim and Kankanhalli (2009) examined causes of user resistance based on an integrative framework centered on the theory of planned behavior. They explained the key role of switching costs in causing user resistance. However, they considered user resistance as a type of behavior in the context of IS implementation, as opposed to technology adoption or migration. For this reason, they did not analyze the relationship between user resistance and user adoption. In contrast, the present study examined the relationship between user resistance and software migration by conceptualizing user resistance as an attitude.

This study also adds to OSS literature. There has been little research on the adoption of OSS (Gallego, Luna & Bueno, 2008; Hauge, Ayala & Conradi, 2010; Macredie & Mijinyawa, 2011; Li, Yan, Xu & Teo, 2011). Based on previous research, Hauge et al. (2010) classified methods of OSS adoption and discussed two main areas (i.e., deploying OSS products and using OSS in software development) in which organizations can benefit from OSS. Similarly, Macredie and Kabiru (2011) examined the adoption of OSS by small- to medium-sized enterprises based on the theoretical foundation of TPB but neglected to consider user resistance or the benefits and costs of switching. Gallego et al. (2008) and Li et al. (2011) examined the adoption of OSS by individual users based on the TAM and its extension. However, there has been no consideration of the two different types of OSS in user adoption. One type of OSS requires switching from a current system to a new system, and the other type of OSS does not require switching. If the target OSS does not require users to switch from existing systems to the new OSS, then the central concept of user resistance is not relevant. Gallego et al. (2008) considered adoption of the type of OSS that does not require users to switch. The second type of OSS, such as Linux, is that which requires users to switch from existing systems to the new OSS. In this type of OSS, individual users are more likely to consider not only the characteristics of the new OSS, but also all the issues related to migration. By identifying the role and effects of user resistance on OSS migration, the present study adds to the knowledge of OSS and technology adoption. In particular, the comparative testing between the proposed model with user resistance ($R^2 = 0.52$) and the TAM ($R^2 = 0.32$) in the post-hoc analysis showed the effectiveness of the proposed model in terms of the change in R-square value.

**Implications for Practice**

This study also has several practical implications. The results of this study suggest that the development of useful and easy to use software – Linux in particular – is not sufficient to facilitate widespread migration from existing proprietary systems. Proprietors need to pay attention to alleviating user resistance in order to increase software migration. The oppositional attitudes of users based on their assessment of the value of migration may hinder migration to new systems. Accordingly, software developers and advocates should be aware of the critical effects of user resistance on the adoption intentions of users and aim to reduce user resistance by increasing the perceived value of switching.

In determining perceived value, users weigh the perceived costs and benefits associated with a proposed switch (Joshi, 1991; Zeithaml, 1988). In order to increase the perceived value of a software switch, the advantages of the software should be emphasized from the viewpoint of users. Therefore, the benefits of switching need to be clearly stated together with the release of the developed software. Developers can further increase perceived value and reduce user resistance by minimizing switching costs. Users perceive switching costs in different forms, including psychological costs (Whitten & Wakefield, 2006), procedural costs (Burnham, Frels & Mahajan, 2003), and loss costs (Jones, Mothersbaugh & Beatty, 2002). Therefore, developers should mitigate these switching costs for users. Developers should allay the psychological costs of switching perceived by users by clearly informing them about further changes in technology and feasible solutions for various issues. In addition, developers should alleviate procedural costs by providing a comprehensive and effective user guide for
software, increasing the ease of set up and use. Again, developers should reduce or eliminate loss costs by emphasizing the benefits of the new software for users over existing systems.

User resistance is a critical concern for the type of software requiring migration from current systems to a new system. Software advocates and companies must develop their marketing strategies according to the characteristics of their software, the existence of substitutes (i.e., requirements for migration), and competitors.

Limitations and Future Research

The results of this study should be interpreted in the context of its limitations. This study identifies Linux as a representative type of OSS and tests the research model based on data collected from personal computer users. It should be noted that many corporate users have used Linux as an operating system in products such as server systems and mobile devices. In contrast, Linux has only about 1% of the operating system market among individual users. This study focuses on a summative assessment of perceived benefits, costs, and value of software migration. Specific features of Linux versus other operating systems are not considered because of the very large number of features, and furthermore, different features may be relevant only for different groups of users. Future research needs to evaluate other types of software at different levels (i.e., the individual level or the organizational level). While Linux migration requires switching from current operating systems to Linux, other types of software may not require this type of switch. Accordingly, the theoretical research model should be redeveloped depending on the type of software.

This research also suggests and presents a number of future research opportunities. First, user resistance to software migration may be influenced by factors other than those proposed in the EIM. Future research could extend the model to study factors that influence user resistance as well as the direct effects of those factors on software migration. In addition, future research can examine it considering specific factors only Linux or open source software has. Second, future research could include an in-depth study of the classification of switching costs and switching benefits of software migration. Because the subtypes of switching costs and switching benefits that impact the attitudes or behaviors of users can differ depending on the context, the study of diverse switching costs and switching benefits in software migration has the potential to create rich research on this topic. Third, future research could test the effects of user resistance in the application of the unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Morris, Davis & Davis, 2002). Furthermore, future research could consider issues relevant to hardware, specifically in examining software migration. In this study, aspects of hardware during the process of software replacement were not taken into account. Because aspects of hardware may be explained on the basis of switching costs and switching benefits, hardware-specific issues are relevant for consideration in future studies.

CONCLUSION

Going beyond previous research, this study identifies user resistance as one of the most critical constructs in the migration to Linux from current operating systems. We develop a model for user resistance based on the EIM (Joshi, 1991) and examine the effects of user resistance in software migration. This study also highlights the significances of perceived value, switching costs, and switching benefits as key determinants of user resistance based on the EIM and shows that user resistance has a negative effect on the intention of users to adopt alternative software in software migration. As such, this research provides a theoretical understanding of user evaluation of software migration and of the formation of user resistance.

User resistance is applicable to other OSS systems. Although OSS communities and developers have developed a number of useful and easy to use types of OSS, the number of individual users of OSS, especially Linux, for
personal computers is quite low. This is because most personal computer users have already adopted proprietary software systems, which they may need to discontinue using in order to adopt the new OSS. When users must discontinue and switch from a current system to a new system, there tends to be user resistance to the migration. Therefore, OSS developers should not only focus on the development of useful and easy to use OSS, they should also pay a great deal of attention to alleviating user resistance in the promotion of OSS migration. This study also provides practitioners with methods to reduce resistance when it comes to software migration switching and offers a number of suggestions for further research in the investigation of OSS adoption, the characteristics of user resistance, and its causes and effects.

REFERENCES


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ENDNOTES


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## APPENDIX

### Table 4. Measurement instrument

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Wording</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to adopt alternative software (INT)</td>
<td>INT1</td>
<td>I intend to adopt Linux within the next 6 months.</td>
<td>Karahanna, Straub &amp; Chervany (1999)</td>
</tr>
<tr>
<td></td>
<td>INT2</td>
<td>During the next 6 months, I plan to experiment with or regularly use Linux.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INT3</td>
<td>I predict I will use Linux within the next 6 months.</td>
<td></td>
</tr>
<tr>
<td>User resistance to software migration (RST)</td>
<td>RST1</td>
<td>My preference to use my current operating system would not willingly change.</td>
<td>Pritchard, Havitz &amp; Howard (1999)</td>
</tr>
<tr>
<td></td>
<td>RST2</td>
<td>Even if close friends recommended Linux, I would not change my preference for my current operating system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RST3</td>
<td>To change my preference from my current operating system would require major rethinking.</td>
<td></td>
</tr>
<tr>
<td>Perceived value of software migration (PVL)</td>
<td>PVL1</td>
<td>Considering the time and effort that I have to spend, switching to Linux is worthwhile.</td>
<td>Sirdeshmukh, Singh &amp; Sabol (2009)</td>
</tr>
<tr>
<td></td>
<td>PVL2</td>
<td>Considering the loss that I have to incur, switching to Linux is of good value.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVL3</td>
<td>Considering the hassle that I have to experience, switching to Linux is beneficial to me.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVL4</td>
<td>Considering everything, switching to Linux would be of good value.</td>
<td></td>
</tr>
<tr>
<td>Switching benefits of software migration (SWB)</td>
<td>SWB1</td>
<td>Switching to Linux would give me greater control over my work than using the current operating system.</td>
<td>Moore &amp; Benbasat (1991)</td>
</tr>
<tr>
<td></td>
<td>SWB2</td>
<td>Switching to Linux would make it easier to do my work than using the current operating system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SWB3</td>
<td>Switching to Linux would enhance my effectiveness at work compared to the use of the current operating system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SWB4</td>
<td>Overall, I would find switching to Linux to be more advantageous in my work than using the current operating system.</td>
<td></td>
</tr>
<tr>
<td>Switching costs of software migration (SWC)</td>
<td>SWC2</td>
<td>It would take a lot of time and effort to switch to Linux.</td>
<td>Jones, Mothersbaugh &amp; Beatty (2002)</td>
</tr>
<tr>
<td></td>
<td>SWC3</td>
<td>Switching to Linux could result in unexpected hassles.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SWC4</td>
<td>I would lose a lot if I were to switch to Linux.</td>
<td></td>
</tr>
<tr>
<td>Perceived ease of use of alternative software (EOU)</td>
<td>EOU1</td>
<td>I would find it easy to get Linux to do what I want it to do.</td>
<td>Davis, Bagozzi &amp; Warshaw (1989)</td>
</tr>
<tr>
<td></td>
<td>EOU2</td>
<td>It would be easy for me to become skillful at using Linux.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EOU3</td>
<td>I would find Linux easy to use.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EOU4</td>
<td>Linux would be easy to operate.</td>
<td></td>
</tr>
<tr>
<td>Perceived usefulness of alternative software (USF)</td>
<td>USF1</td>
<td>I would find Linux useful in performing my work.</td>
<td>Davis, Bagozzi &amp; Warshaw (1989)</td>
</tr>
<tr>
<td></td>
<td>USF2</td>
<td>Using Linux would help me perform many things conveniently.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>USF3</td>
<td>Using Linux would help me accomplish my work effectively.</td>
<td></td>
</tr>
</tbody>
</table>