INFORMATION SYSTEM INFUSION: THE ROLE OF CONTROL AND EMPOWERMENT

Abstract

Organizations have made significant investments in ERP systems with the expectation that employees will utilize the technology to enhance organizational performance. However, research indicates that many systems are under-utilized. In order to entangle the challenge of under-utilization, this paper addresses the impact of control and empowerment on infusion – the deep and comprehensive usage of an information system. Moreover, it also tests whether infusion will lead to higher levels of ERP success. A survey was conducted in a large public organization which has been using an ERP system for several years. Results indicate that empowerment is positively related with infusion, while an inverted u-relationship has been found for control. The critical link between infusion and ERP system success was found as well, meaning that the more users utilize the system to its fullest extent, the more likely the organization can attain its promised benefits. Finally, traditional predictors of the acceptance and routinization phases were found to be inappropriate when examining infusion.

Keywords: Control, Empowerment, Enterprise Systems, Infusion, IT Adoption and Use
Introduction

Many organizations have implemented an Enterprise Resource Planning (ERP) system over the past decades. ERP systems are commercial software packages that integrate the information flowing through a company – financial and accounting information and customer information (Karimi et al. 2007). These systems are widely used in most industries today because of the benefits they offer: improved integration of business processes, improved cost control, improved decision making, improved customer service, and improved profitability (Bandyopadhyay and Barnes 2012). Estimates indicate that ERP implementation is as high as 75 percent among medium to large organizations. Up to 60 percent for service companies and firms in the Fortune 500 show an implementation rate of 80 percent (Morris and Venkatesh 2010).

Despite the high implementation rates of ERP systems, the percentage of ERP failures is over 60 percent with losses ranging from $6 million to well over $100 million (Devadoss and Pan 2007). While the stories about the large number of ERP failures continue to exist, (Yu et al. 2009) argue that even if a system is implemented successfully, this does not automatically mean that the organizational will perform better. When the users of the technology do not use it to full extent, the benefits of ERP systems are unlikely to be obtained and subsequent increases in performance will stay out. Under-utilization of ERP systems is a serious challenge for many organizations: it means that these systems do not increase the productivity or performance of the organization (Hsieh and Wang 2007). A high level of system usage is necessary for enhancing organizational performance. Hence, this paper focuses on infusion, which is regarded as ‘the highest’ level of system usage, i.e. using the ERP system to full extent (Tennant et al. 2011).

In order to understand how system usage can be improved, more should be known about factors influencing system usage. Such insight in specific effects could help organizations manage these factors and subsequently improve and optimize system usage. Compared to the implementation of simpler technologies often studied in prior individual-level research, e.g. technology acceptance (Davis 1989), implementation of ERP systems causes change with broader organizational impacts on employees. ERP fundamentally changes the nature of tasks, workflows and, by extension, jobs themselves (Morris and Venkatesh 2010). One of these organizational changes is an increase in the amount of control and empowerment employees may perceive when using an ERP system (Elmes et al. 2005). Since the increase in both control and empowerment can be seen as a paradox, it is important to entangle mechanisms underlying these concepts (Robey and Boudreau 1999).

First, ERP systems are structured to support control in many ways. For example, information systems promote organizational discipline through constraining users to follow prescribed processes and by limiting access to transactions to specific organizational roles. According to Elmes et al. (2005) this mirrors bureaucratic features such as the application of consistent rules to operations and a clear-cut division of labor with specialized experts in each position. In this way, ERP systems can be used to support organizational control because of their ability to standardize and integrate processes and provide more transparency across the organization. Second, next to the ability of ERP systems to increase control, research also recognized the empowering aspect of ERP systems (Sehgal & Stewart 2004). Due to increased visibility of data, employees can become more responsive to others within the organization. Shang and Seddon (2000) identified empowerment as one of the organizational benefits of having an ERP system. These authors show that ERP systems can be empowering because they increase both user accountability and autonomy: users receive ownership of the system. Sia et al. (2002) argue that the ‘best practices’ that are hard-wired into the software incorporate features such as enhanced functional flexibility, process-oriented task integration and the removal of reconciliation checks.

Although previous literature has provided us with a lot of knowledge about control, empowerment and deep system usage, the concepts have been studied as separate concepts (Sehgal 2007; Tennant et al. 2011). The few researchers, who explored the effects of control and empowerment, did not assess the consequences of these two concepts for infusion in detail yet (Teoh and Teoh 2010). Therefore we contribute to the literature by bridging this gap in the literature. Moreover, according to Benders et al. (2009), little research has been conducted aimed at exploring and understanding impacts at the individual level during the implementation of ERP systems, let alone in which way these impacts are translated to the organizational level. This study explores whether changes in infusion at the individual level, induced by control and empowerment, can account for changes in ERP success and performance at
the organizational level (Motowildo 1997). By providing more insight about how the system usage or infusion of an ERP system is influenced by control and empowerment, organizations can gain more knowledge about how they can leverage technology usage to increase performance among their employees (Tennant et al. 2011).

The design of this study is as following. First, it builds on theories of control, empowerment and infusion, in order to construct a theoretical model. The model is tested empirically using several statistical techniques. In the remaining part, the results and implications for research and practice are discussed. The study contributes to the current IS literature since it not only examines whether deep system usage, or infusion, leads to higher performance of an organization. It also assesses the impact of control and empowerment on infusion. Therefore it offers practical insights for organizations in order to achieve higher levels of system usage by identifying factors that lead to infusion.

**Theoretical Framework**

**Deep System Usage: Infusion**

Burton-Jones and Straub (2006: 6) defined individual-level system usage as an individual user’s employment of one or more features of a system to perform a task. Although system usage is one of the most frequently reported measures of system implementation success (Shang and Seddon 2000), the construct remains theoretically vague and has yielded many contradictory results in past studies of system usage (Tennant et al. 2011). However, the work of Burton-Jones and Straub (2006) and Burton-Jones and Gallivan (2007) has provided more clarity in the field of IS usage. They differentiated between lean and rich measures for system usage. System usage can entail three different elements, namely the system (the object being used), the user (the subject using the IS) and the task (functions being performed). The more elements of system usage are captured in the measurement, the richer the measurement of system usage will become and the better the entire activity of usage can be comprehended. Figure 1 illustrates the three elements of Burton-Jones and Straub (2006).

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<th>Lean Measures</th>
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Yet, the majority of the IS research on system usage has measured ‘use of an information system’ with rather lean instead of rich measures (Schwarz and Chin 2007). As a consequence, these lean measures cannot assess whether the usage behavior implies shallow and superficial use or whether it implies deep and sophisticated use of the ERP system (Gallivan 2001). Igbaria et al. (1997) show this is an important distinction. When users obtain knowledge of, and interact with the ‘deep structures’ of an information system, they can become more productive. As Gallivan (2001) states, it is not technology use (frequency or duration) per se that matters as outcome of interest, but rather how extensively the system is used by the user to carry out tasks. Despite its importance, deep system use continues to be an understudied area in the IS domain (Yu et al. 2009).
In order to measure system usage with rich measures, the concept of infusion will be applied. Infusion can be seen as deep system usage and is part of the six-stage model of the IS implementation process by Cooper and Zmud (1990). The last three stages of this six-stage model refer to different levels of information system use. Acceptance is reflected by the users’ commitment to use the system. Routinization can be seen as the state where the use of the information system is no longer perceived as out-of-the-ordinary while infusion relates to the process of embedding an information system deeply and comprehensively within an individual’s or organizations work system (Saga and Zmud 1994). Wang (2005: 4) acknowledges this and extends the idea of deep usage by defining it as: ‘the extent to which an individual fully uses a technology to enhance productivity and the degree to which they find ways to extend its productivity contribution to tasks not originally envisioned by the managerial adopters’. In this study, infusion is seen as a multi-dimensional concept and consists of three subtypes: extended use, integrative use and emergent use. 

Extended use is defined as using most, if not all, of the system features (Wang and Hsieh 2006). Integrative use can be seen as using the system to establish, enhance or reinforce linkages among tasks (Ng and Kim 2009) while emergent use is defined as using the system in an innovative manner to support tasks (Saga and Zmud 1994).

Most of the current research on ERP system usage can be placed in the acceptance and routinization stages. Especially the Technology Acceptance Model (TAM) originally developed by Davis (1989) has been well researched in the last decades (Legris et al. 2003). TAM posits Perceived Ease of Use (PEOU) and Perceived Usefulness as the key factors influencing individual acceptance. TAM has been developed to explain the initial IT acceptance of users but other researchers have acknowledged that routinization can also be measured with this model. Hsieh and Wang (2007) included parts of the TAM as predictors for extended use and found mixed results. Only PEOU showed a significant relationship with extended use while the other traditional predictors did not relate to this dimension of Infusion. Therefore they conclude that caution should be taken when applying these to infusion. This is in line with Ng and Kim, (2009), who state that the rational-oriented predictors used to measure the acceptance and routinization-stages are less appropriate to research infusion because this is an extra-role behavior. Therefore this study applies control and empowerment in order to research their impact as predictors of infusion.

**Control**

Flamholtz, Das and Tsui (1985) define organizational control as: ‘attempts by the organization to increase the probability that individuals will behave in ways that will lead to the attainment of organizational objectives’. Assuming that organizations have objectives and that individuals working in organizations are purposeful and goal seeking, their goals may differ from the ideal state. Therefore controls are necessary to engage workers in instrumental rational action that is aligned with the firm’s objectives. There have been a number of studies investigating the impact of IT on organizational control and empowerment (e.g. Tang et al. 2000, Elmes et al. 2005), little is known about the effects of these phenomena on users of ERP systems. Implementation of an ERP system in an organization can in fact have a profound impact on organizational processes (Schneiderjans & Kim 2003) and information flows and transparency (Gattiker and Goodhue, 2004). Therefore, ERP systems and their impact on organizational control and empowerment deserve greater attention.

Within an organization, the controlling of employee actions can be conceptually linked to the notion of Bentham’s panopticon (Foucault 1977). This panopticon is a circular building with an observation tower in the center, surrounded by cells for the incarceration of convicts. Due to this specific design the tower provides the ability to ‘gaze’: continuous surveillance that is hierarchical (the observers can observe prisoners and can themselves be observed by their superiors) and one-way (the prisoners cannot observe the observer, cannot observe each other and cannot know whether they are being observed). An important effect of this panoptic structure is that there is no continuous need for the ‘gaze’ since prisoners start to behave as if they are under constant surveillance since they are unable to tell whether they are being observed or not. By programming individuals with the knowledge of visibility a form of control is created (Foucault 1977: 141). An effect of the ‘gaze’ is that disciplinary power will increase. Individuals become used to the ‘gaze’, since they are continuously observed by supervisors. Subsequently individuals learn to self-discipline and control themselves.

In line with Foucault’s work, Zuboff (1988) was the first author to consider IT as a form of an information panopticon which exerts the ‘gaze’. Although this ‘gaze’ is formed through IT-based representations.
(Cooper 1992), it is argued that a panopticon exists. Since all user actions can be observed and information can be stored real-time within an integrated common database, ERP systems are able to provide a 'gaze' on a continuous basis. In this way, disciplinary power may increase: employees know that their actions are more visible to others and therefore will engage in greater self-discipline (Foucault, 1977). ERP systems provide real-time availability of data due to an integrated database. This enables monitoring and managing at different levels in an organization. Furthermore, data access increases information transparency across different parts of the organization or hierarchical layers; the so-called 'drill down tracking capability' of ERP (Davenport 1998; Ignitiadis et al. 2009). Moreover, transparency is linked to visibility. This is the ability to have multiple views of business processes: the board can explore performance information extracted from ERP systems and view it from any perspective and at any level of detail, for example at global, local, product and customer levels. The presence of a more widespread vertical and horizontal dispersal of information throughout the organization indicates increased visibility. Simons (1991: 6) postulates that the easy and widespread availability of information ensures that managers remain in touch with the activities on the ground, and are able to 'involve themselves in the decisions of subordinates'.

Sia et al. (2002) categorizes the panoptic power of ERP systems in three dimensions: 1) comprehensive system tracking capability, 2) enhanced visibility to management and 3) enhanced visibility to peers. ERP as an IT infrastructure has various features that facilitate the gathering, tracking, reporting and analysis of workplace behaviors. 'Best practice' management tools are in place to capture and track performance data (e.g. activity-based costing and profitability analysis). These enhanced functionalities enable managers to track and view the performance of workers since they can analyze data in real-time with fine granularity. Visibility between workers and their peers is also increased. For instance, the common database used by the ERP system will also imply data interdependency between peers. In this regard data errors, inconsistencies or lack of certain data can be seen and reported by others (Sehgal and Stewart 2004). Moreover, ERP systems impact workflow dependency because of the tighter interdependency between tasks. ERP-induced visibility of workplace behavior will enhance the experienced level of control and a 'gaze'. All with all, enhanced control enable managers and peers to observe work processes (Elmes et al. 2005).

**Empowerment**

Next to increasing control, ERP systems are also found to empower employees (Esteves, 2009; Shang and Seddon 2000). Empowerment can be seen as 'any increase in worker power that enables workers to achieve institutional objectives with greater efficiency and effectiveness' (Elmes et al. 2005: 5). It rationalizes the system by removing or minimizing organizational barriers and giving employees means (information, power or authority) by which they can achieve institutional objectives more efficiently and effectively. Sehgal (2007) provided evidence for empowerment motivating employees to higher worker effectiveness and higher work satisfaction.

According to Sia et al. (2002) empowerment can be enabled by job discretion and procedural formality. First, higher job discretion can emerge due to process-oriented job expansion. The process-orientation of the ERP system promotes greater cross-functional integration, i.e. expanding a worker's job scope. Job discretion also increases because users have extended access to information that provides them greater flexibility in their job. It also allows them to make decisions that previously had to be formally referred upwards in the hierarchy or to another department due to a lack of information input. Moreover, an ERP system can also provide access to data in real-time (Elmes et al. 2005). In this way, increases in information and knowledge will increase the power of users to get their work done.

The second empowering aspect is the reduction in procedural formality. Enhanced user flexibility is embedded within the modular design and process-orientation of ERP. Sia et al. (2002: 29) describe this as, 'whereas the old system could mandate a specific screen flow, the ERP system now has many drop down menus and icons and it is all up to the user to call up the screen which he wants to see.' Procedural formality can also be related to changes in authority and roles. Changes in these roles and reduction in validation checks (Ng and Kim 2009) in the ERP systems can provide employees with a 'value added role'. Within this role users can exercise more discretion and responsibility since their amount of authority increases. At the same time, the role of validation checks and changes in authority are different for each organization, depending on managers' preferred level of risk tolerance (Benders et al. 2009).
Next to the conceptualization of empowerment from Sia et al. (2002) also the concept of user empowerment exists. Ng and Kim (2009: 4) define user empowerment as ‘a construct that enables the users to enhance their operational and decisional activities, improve their individual performance metrics and contribute to the overall organizational performance by the usage of adequate information system(s)’.

User empowerment is derived from psychological empowerment (Spreitzer 1995). Its main premise is that an empowered employee will exhibit extra-role and innovative behavior. In line with this, user empowerment will lead to extra-role behavior such as extended and integrative use of an ERP system. Moreover, an individual who feels empowered is authentically motivated and will engage in the desired activities volitionally (Gagne and Deci 2005). User empowerment includes four different dimensions; user competence, usage impact, usage meaning and user self-determination. The two different conceptualizations of empowerment, user and system empowerment, are incorporated in this study in order to observe both the user’s immediate work environment characteristics (user empowerment), as well as the particular IS characteristics that can facilitate in evoking system empowerment (Liden et al. 2000).

**Paradox of Control and Empowerment**

On one hand, an ERP system is capable of offering new methods of work surveillance, yet on the other hand, it is also possible that the embedded business model within the ERP system can enhance the empowerment of the users of the system. Previous research shows that this control and empowerment ‘paradox’ is not unknown to the IS literature (Robey and Boudreau 1999). Yet, in most cases both control and empowerment have been studied as separate concepts; hence the relation between these two concepts remains unclear (Sehgal 2007).

Willmott (1994) questions the boundary between control and empowerment. Following Coombs et al. (1992), these managerial concepts seem incompatible because the exercise of empowerment implies the exclusion of control over employees. This would require that employees have to be trusted to perform in ways that serve managers’ interests. However, Das & Teng (1998) indicate that empowerment and control may not be related in a strictly inverse manner. Instead, each of the concepts contributes to the common purpose of aligning individual behavior to the achievement of organizational objectives in an independent manner. Sia et al. (2002) stated that, in theory, increased empowerment does not dictate a lowering of control, meaning that these concepts can function in parallel. However, their findings were inconclusive and only showed an increase in control. Similarly, Hofstede 1991) argued that both elements of control and empowerment can coexist. Managers’ primary task is to optimize control and autonomy, rather than attempt to maximize both. Similarly, Elmes et al. (2005) highlighted that personal control may be associated with being controlled. As users are enabled to monitor others’ work, this results in increased peer pressure. Moreover, users knowing that they are being monitored tend to be more self-disciplined.

In summary, existing studies indicate that information technology can induce a paradoxal increase in control and empowerment; still these findings remain inconclusive. More research on this topic is necessary in order to entangle whether control and empowerment can work in a synergistic or mutually exclusive manner.

**Hypotheses**

**H1: Control**

The enhanced visibility to management and the enhanced visibility to peers are two functions that can increase ERP system users’ feeling of panoptic control (Ignitiadis et al. 2009). The visibility of their performance is greatly enhanced as management can analyze in real-time and in multiple dimensions. Therefore it can be argued that due to the integrated nature of the ERP system (Davenport 1998) and the panoptic information gaze (Sia et al. 2002) the disciplinary power will increase. Since all user actions can be observed and stored real-time within an integrated common database, ERP systems are able to provide a ‘gaze’ on a continuous base. In this way disciplinary power will increase: employees know that their actions become more visible to others and therefore they are expected to engage in greater self-discipline
Foucault, 1980). This would subsequently result in higher levels of infusion of the ERP users, since they know that their actions are more visible to management and peers.

On the other hand, Elmes et al. (2005) indicated that employees resisted to these ‘new ways’ of control. This resulted in complaining about, or even avoiding interaction with the system because the ERP system would distract them from their work tasks. The system tracking capability of ERP systems provides real-time information about who processed which transaction or who made specific errors. When employees perceive high enhanced visibility to either the management or peers they will use the system less extensively (Sia et al. 2002). Also, when ERP users feel controlled extensively due to the system tracking capability, they also perceive to be less trusted and relied on by the organization (Teo and Teoh 2010). This will lead to less motivation for users to appropriate all the functions of an ERP system or experiment with it in innovative ways. Hsieh and Wang (2007) indicate that although usage may be compulsory, employees still have the discretion about the level of use, or how to use the system to support their tasks. In this way users who perceive a high level of panoptic control will exert less infusion, than users who experience lower levels of panoptic control.

It can be argued that higher levels of perceived control could induce decreased motivation to use the system in a comprehensive and integrated way due to a lack of trust and a feeling of suspicion emanating from the organization. Still, a lower level of perceived control could be detrimental to the level of system infusion because of a ‘shortage’ of discipline: users experience no feeling of being under control whatsoever. Therefore it is argued that a curvilinear or ‘inverted U’ relationship exists between the perceived control and the infusion of an ERP user. This means that neither low nor high amounts of perceived control will cause a high level of infusion but that a certain optimal level of perceived control will induce an optimal level of infusion. Before and after this ‘sweet spot’ of control, diminishing returns will result in a suboptimal amount of infusion. Therefore it is hypothesized:

**H1:** A curvilinear relationship between the perceived control of an ERP user and the IS infusion of an ERP user exists.

**H2: System Empowerment**

*Job discretion* can be subdivided in two dimensions: job scope and access to information and knowledge. First, when process-oriented job expansion finds place this will result in greater task concentration, i.e., expanding one’s job scope. This expanded job scope can make jobs of employees more significant or powerful because they have to fulfill more tasks than beforehand and have more responsibilities (Sia et al. 2002). Still, to perform all these tasks and responsibilities the ERP systems has to be used more substantially and more of the systems functions have to be appropriated. Second, job discretion can provide expanded access to information and knowledge (Sehgal 2007). More information and knowledge about the work tasks and work processes lead to empowerment, according to Foucault (1980). Knowledge and power are intertwined: as knowledge produces power and power produces knowledge. Knowledge as a source of power is important for understanding how employees are empowered through their use of an ERP system. When users acknowledge that the ERP system provides more information and knowledge to perform their tasks or to make decisions they are inclined to use more of the system features.

*Procedural formality* refers to the amount of flexibility a user can experience when using the ERP system (Sia et al. 2002). The more drop down menus, icons and different screens the user can appropriate, the more freedom the user will experience when working with the ERP system. When a user has the ability to choose their own way of working with the ERP system, a larger amount of functionalities will be appropriated in detail and the system will be used more widely to support tasks. Moreover, procedural formality refers to the amount of validation checks and the different roles in the ERP system the user is authorized to use (Ignitiadis et al. 2009). When procedural formality is high, users are restricted with respect to how they use the system and which functionalities they have access to. If procedural formality is low, then ERP system users have more freedom in how they work with the system. Furthermore, it shows that managers trust their employees. When users feel that they are ‘relied’ on and receive more power and authority they will feel empowered (Thomas and Velthouse 1990). This is in line with Ball and Wilson (2000) who associate empowerment with self-management, proactivity, choice and freedom. Hence it is hypothesized:
**H2:** The higher the **system empowerment (job discretion, procedural formality)** a user of an ERP system experiences, the higher the IS infusion of an ERP system user will be.

**H3: User Empowerment**

We distinguish four forms of user empowerment; user competence, usage impact, usage meaning and user self-determination. User competence can be seen as an individual’s belief in his/her potential to perform activities with skill. Thus, when users consider themselves competent to use the ERP system, they would be able to maximize ERP usage (Bandura 1997). With more skills and knowledge, competent users are able to see the potential of the system and will be able to grasp many of the functionalities of the ERP system. In this way the user is able to use more of the system to accommodate tasks. Users who are competent with the target system are arguably more proactive in using it and would propose ways to fully utilize the IS beyond customary usage (Basselier, Reich and Benbasat 2001).

Usage impact is the degree to which an individual believes that they can influence how a job is done or the outcomes of a job. With the expectation of significant impact resulting from a particular usage level, the user will be more engaged. This leads to investments of work efforts in order to proactively exploit the ERP system to its full potential (Bandura 1986). Users will fully use the ERP system in order to enrich and broaden their task performance and add innovative elements to the customary way of system usage to improve the processes by which the task is performed (Sehgal 2007). Ng and Kim (2009) found usage impact to significantly impact extended use and integrative use. When routinization is high, users will be more concerned about the direct usage impact on their task outcomes. Such concern grows over time: the more fully users will use the system, the greater the usage influence (breadth and depth) on their task outcomes.

Usage meaning is the value of a work goal as judged against the values and ideals an individual holds (Sehgal and Stewart 2004). When a user perceives the value of system usage to be in accordance with their personal needs and desires, the user will perceive such use as being important and personally relevant (Sehgal 2007). When a user perceives system usage to be meaningful, than this individual would engage and commit in using more of the system functionalities to perform tasks, reinforce linkages among tasks and also try to use the ERP system creatively to accomplish tasks (Hunton and Price 1997). This is in line with Bandura (1986: 348) who postulates that ‘people do not care much how they do in activities that have little or no significance for them, and they expend little effort on devalued activities’.

User self-determination is the individual’s sense of having choice in initiating and regulating actions (Doll et al. 2003). Gagne and Deci (2005) postulate that when a user perceives the usage environment as being conducive and providing opportunities, this user will take initiative to fully use the ERP system. Specifically, users who perceive that they have discretion over the manners of system usage and who do not have to wait for instructions before proceeding, exploit more of the available system functionalities to support tasks, enhance coordination of related-tasks and explore new ways to better use the ERP system in accomplishing tasks (Scott and Bruce 1994).

**H3:** The higher a user of an ERP system experiences **empowerment (usage-competence, usage-impact, usage-meaning, usage-self-determination)**, the higher the IS infusion of an ERP system user will be.

**H4: ERP System Success**

The ultimate goal of the implementation of an ERP system is to receive the benefits such a system can deliver, like the improvement of productivity, IT cost reduction and increased flexibility (Shang and Seddon, 2000). System use is typically assessed in the IS literature as a proxy for success. However, it does not necessarily follow that a used system is successful or would benefit an organization (Szajna 1993). Doll & Torkzadeh (1998) argue that utilization alone is not sufficient to predict performance accurately; hence, utilization should be examined as an independent or intervening variable in the link between information technology and performance. According to Tennant et al. (2011) the critical link between infusion and performance is lacking in current IS literature. Therefore this study will assess whether the argument that using an ERP system deeply and comprehensively will impact ERP system success in a positive way holds. Hsieh and Wang (2007) argue that an ERP system which is fully utilized
will lead to a higher ERP system success, and subsequently brings the organization the promised benefits involved with the implementation of such a system. This leads to the final hypothesis, which is illustrated next to the other hypotheses in Figure 2.

**H4:** *The higher the IS infusion of a user of an ERP system, the higher the ERP system success will be.*

![Figure 2. Research Model including all hypotheses](image)

**Methods**

**Sample and Procedures**

Data has been collected within a public-sector organization in The Netherlands which employs around 70,000 people. During the study this organization has been implementing an organization-wide ERP system in order to integrate financial and logistics material management. At the time of the data collection not all units of the organization were migrated to the ERP system. Still, all the units that have been included in the study have been 'live' with the ERP system for at least twelve months. This means that users have been working quite some time with the system and had time to experience any controlling or empowering effects of the system and its context. For the purpose of this research, a user is defined as someone working in a functional, operational or management unit of an organization. Users included in this study use at least one ERP system application to complete their daily job activities. During the data collection 330 users out of the migrated units of the organization were randomly selected across functions and departments. The links to the online surveys were distributed to the users by email. All respondents were assured of anonymity and had 20 days to fill out the questionnaire. A total of 161 complete responses were returned. The response rate of the sample was 48.8%. From the respondents' units, all leaders filled in a survey to rate the degree of infusion and performance of their employees. In order to reduce common method biases, this study incorporated different measures for the predictor and criterion variables. According to Podsakoff et al. (2003) one of the major causes of common method variance is obtaining measures of both the predictor and criterion variable from the same rater or source. No individual scores were shared with the leaders with regard to the anonymity of the respondents.
Measurement

In the first part of the questionnaire personal and control variables have been assessed. These are gender, age, tenure, job level and former IT experience. These variables have been included in the research model to control for their effects on infusion. Especially former IT experience is an important control variable. Ifinedo (2011) found that employees with computer/IT literacy or knowledge can work better with the new ERP system and are better at understanding the technical and semantic qualities of such systems. The second part of the questionnaire included the ‘panoptic control’ scale of Sia et al. (2002). This is a previously used and validated scale of fifteen items and originates from different studies (Zuboff 1988). The third part of the questionnaire included two scales on empowerment, namely ‘system empowerment’ from Sia et al. (2002) and Sehgal (2007) and ‘user empowerment’ from Spreitzer (1995) and Ng & Kim (2009). The first scale was comprised of two dimensions with six items in total; the latter scale has a total of sixteen items divided over four dimensions. These scales were also adjusted to fit the studied organization (Sia et al. 2002; Ng and Kim 2009). Also these scales have been found reliable and are validated by previous studies. In the fourth part of the survey, infusion has been incorporated. The items for this scale originate from Saga and Zmud (1994). Still, the slightly adapted scales of Hsieh and Wang (2007) have been used since these scales have been found to be valid more recently. This scale consists of three dimensions: extended, integrative and emergent use. The last part of the questionnaire consists of the ERP system success scale of Delone and McClean (2002). This is a widely used and validated model for ERP success (Gable et al. 2003). This scale includes four dimensions: individual impact, organizational impact, information quality and system quality. All measures are included in the Appendix.

The questionnaire had an extra section for infusion and ERP success. This part of the survey had to be filled in by the supervisor. The supervisors rated how ‘infused’ their subordinates are with the ERP system. The validity of this rating stems from supervisors’ cooperation with their subordinates. Moreover, supervisors submitted reports about the system usage behavior of their subordinates. In this way the 54 supervisors rated all the subordinates of this study, resulting in 161 matched pairs. The pairs could be matched by comparing the personnel numbers filled in by the respondents. Subsequently, the matched pairs also assessed ERP system success. By including data from leaders and employees, single-source or common method variance has been avoided, which may inflate relationships (Podsakoff et al. 2003). All items made use of a five-point Likert scale, with anchors ranging from Strongly Disagree (1) to Strongly Agree (5). After entering all questionnaires, the reliability of the scales has been tested by examining the Cronbach’s alpha of the scales. All were higher than the recommended 0.707 (Nunnally 1994).

Sample Demographics

The demographic characteristics of the 161 respondent were as following. Out of the 161 respondents 80.1% was male and 19.9% female. The mean age was 41.2 years (SD=8.4), ranging from 19 till 60 years old. Average tenure was 17.3 years with an SD of 8.5. The job level was distributed in the following way, workfloor = 74.5%, middle management = 20.3% and management = 5.8%. The average user worked 2.42 years with the ERP system and they worked around 7.14 years with the legacy system. Former IT experience had a mean of 2.67 (SD=0.51) on a scale of 1 to 5, meaning that the average IT experience of the user is on an average level. Non response bias has also been tested. Late and early respondents were compared, but no significant differences in terms of gender, age, tenure, job level and former IT experience were found. Finally, the demographics of the sample were verified by a panel of managers with demographics similar to the studied organization.

Results

In order to explore the results of this research, several statistical techniques have been used to grasp the meaning of the outcomes. Therefore, correlations, multiple regression and structural equation modeling techniques have been used to get a comprehensive insight in the analyzed data.

First of all, the different relationships between all the variables have been investigated using the Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. There are several strong correlations between the variables. Both system as user empowerment are positively related to infusion with $r=0.532$
and \( r = .539 \). System and user empowerment also share a strong correlation \( (r = .665) \) with each other. Looking at Table 1, it can also be stated that system and user empowerment are positively related with ERP System Success. More important, there is a strong positive relationship between infusion and ERP system success \( (r = .537) \). Finally, the traditional predictors of acceptance of use are all strongly related to each other \( (r = .728, r = .723, r = .626) \), yet they don’t seem to relate strongly to the other variables. Moreover, control does only share a very small relationship with infusion \( (r = .118) \) and individual impact \( (r = .124) \). In order to test whether the variables are truly unrelated, the discriminant validity of all variables has been tested. These were smaller than 0.85 for all the variables, meaning that the different variables are not measuring the same aspect in different ways.

<table>
<thead>
<tr>
<th>Table 1. Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>p &lt; 0.05</strong></td>
</tr>
<tr>
<td>1 System empowerment</td>
</tr>
<tr>
<td>2 User empowerment</td>
</tr>
<tr>
<td>3 Control</td>
</tr>
<tr>
<td>4 Infusion</td>
</tr>
<tr>
<td>5 ERP system success</td>
</tr>
<tr>
<td>6 Satisfaction</td>
</tr>
<tr>
<td>7 Perceived ease of use</td>
</tr>
<tr>
<td>8 Perceived usefulness</td>
</tr>
</tbody>
</table>

Secondly, hierarchical multiple regression (Table 2) was used to assess the ability of control and empowerment to predict the levels of infusion, after controlling for the influence of control variables (age, gender, tenure, duration of legacy, current system use and former IT experience). Four models were assessed, with the control variables included in model 1. The model explains 3.5% of the variance of Infusion and is the regression equation is not significant for \( p < 0.05 \) with an F-value of 0.920. Clearly none of the control variables are making a statistically significant contribution.

The second model included both the control variables as the traditional variables used in acceptance and routinization stages of system usage (Saga and Zmud 1994). Perceived usefulness, perceived ease of use and satisfaction were assessed in this model. These traditional variables explained an extra 8.9% in variance resulting in a total variance of 12.4% and F-value of 3.115. This means that model 2 is also not significant for \( p < 0.05 \). None of the variables are contributing in a significant way. In the third model all the previous variables plus control, system empowerment and user empowerment have been entered. Model 3 is significant as a whole with an F-value of 17.78 for \( p < 0.05 \). The explained variance in Infusion of the model is 39.5% meaning an \( R^2 \) change of 27.1%. Also in this model, none of the control or traditional variables made a significant statistical contribution. System and user empowerment do make a statistically significant contribution to infusion. However, control is not found to be significant.

After the variables were explored, a fourth model was applied to test the variable control more deeply. In this model the same variables as in model 3 were included plus a squared variant of ‘perceived control’. Model 4 is also significant as a whole \( (F=22.19) \) for \( p < 0.05 \) and explains 49.1% of the variance in infusion. With respect to Model 3 this is a \( R^2 \) change of 9.6%. In this model, system and user empowerment are contributing in a significant way again, while control is still not statistically significant. However, the quadratic term of control is found to be significantly contributing to infusion, meaning that control is not linear but quadratic (inverted U) as depicted in Figure 3. In final, no multicollinearity has been found in any of the models. VIF-values ranged from 1.110 to 3.632 and tolerance values were all above 0.10 (Pallant 2007).
Table 2. Multiple Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \beta )</td>
<td>SD</td>
<td>( \beta )</td>
<td>SD</td>
</tr>
<tr>
<td>Gender</td>
<td>( .032 )</td>
<td>( .154 )</td>
<td>( .044 )</td>
<td>( .152 )</td>
</tr>
<tr>
<td>Age</td>
<td>( -.076 )</td>
<td>( .020 )</td>
<td>( -.213 )</td>
<td>( .020 )</td>
</tr>
<tr>
<td>Tenure</td>
<td>( .121 )</td>
<td>( .020 )</td>
<td>( .242 )</td>
<td>( .020 )</td>
</tr>
<tr>
<td>Job level</td>
<td>( .063 )</td>
<td>( .002 )</td>
<td>( .104 )</td>
<td>( .002 )</td>
</tr>
<tr>
<td>ERP system use</td>
<td>( -.140 )</td>
<td>( .023 )</td>
<td>( -.151 )</td>
<td>( .023 )</td>
</tr>
<tr>
<td>Former IT experience</td>
<td>( .138 )</td>
<td>( .182 )</td>
<td>( .026 )</td>
<td>( .190 )</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>( .210 )</td>
<td>( .152 )</td>
<td>( .002 )</td>
<td>( .133 )</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>( .171 )</td>
<td>( .162 )</td>
<td>( .066 )</td>
<td>( .141 )</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>( -.014 )</td>
<td>( .165 )</td>
<td>( -.086 )</td>
<td>( .141 )</td>
</tr>
<tr>
<td>Control</td>
<td>( .111 )</td>
<td>( .107 )</td>
<td>( .112 )</td>
<td>( .106 )</td>
</tr>
<tr>
<td>System empowerment</td>
<td>( .383^* )</td>
<td>( .128 )</td>
<td>( .329^* )</td>
<td>( .119 )</td>
</tr>
<tr>
<td>User empowerment</td>
<td>( .171 )</td>
<td>( .162 )</td>
<td>( .066 )</td>
<td>( .141 )</td>
</tr>
<tr>
<td>Control (Quadratic)</td>
<td>( .092 )</td>
<td>( 3.115 )</td>
<td>( 17.78^* )</td>
<td>( 22.19^* )</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>( .035 )</td>
<td>( .089 )</td>
<td>( .271 )</td>
<td>( .096 )</td>
</tr>
<tr>
<td>( R^2 ) Change</td>
<td>( .035 )</td>
<td>( .124 )</td>
<td>( .395 )</td>
<td>( .491 )</td>
</tr>
<tr>
<td>( N )</td>
<td>161</td>
<td>161</td>
<td>161</td>
<td>161</td>
</tr>
</tbody>
</table>

Dependent variable: Infusion - \(^*p < 0.05\)

Figure 3. Control: Inverted U-relationship with Infusion
In order to get a clear overview of the research model as a whole, structural equation modeling (SEM) has been applied. The measurement model is illustrated in Figure 3. The resulting fit indices suggest an acceptable fit. The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) are above their criterion levels (Byrne 1994). Also the RMSEA is lower than 0.08 (Browne and Cudeck 1993) and the relative chi-square is less than 3 (Ullman 2001).

The relationships in the model are all significant and support the proposed model, except for control. The complete model is depicted in Figure 4. System empowerment (.378) and user empowerment (.456) affected infusion significantly; both variables also significantly influence each other (.403). Like the previous results in the other statistical analyses, control did not contribute to infusion in a significant way (.142). Infusion has a strong significant influence on ERP success (.428). In order to control for user empowerment and system empowerment directly affecting ERP success, we examined whether infusion is partly or fully mediating the effect. Since the direct effects of system empowerment (.166) and user empowerment (.001) are not significant it can be stated that infusion fully mediates the effect of system and user empowerment on ERP success ($p < 0.05$).

### Table 3. SEM: Goodness of fit for the measurement model

<table>
<thead>
<tr>
<th>Fit Indices</th>
<th>Model</th>
<th>Desired levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$/df</td>
<td>1.337</td>
<td>$&lt; 3.00$</td>
</tr>
<tr>
<td>CFI</td>
<td>0.994</td>
<td>$&gt; 0.90$</td>
</tr>
<tr>
<td>TLI</td>
<td>0.981</td>
<td>$&gt; 0.90$</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.051</td>
<td>$&lt; 0.08$</td>
</tr>
<tr>
<td>Standardized RMR</td>
<td>0.023</td>
<td>$&lt; 0.08$</td>
</tr>
<tr>
<td>GFI</td>
<td>0.988</td>
<td>$&gt; 0.90$</td>
</tr>
<tr>
<td>AGFI</td>
<td>0.940</td>
<td>$&gt; 0.80$</td>
</tr>
</tbody>
</table>

### Figure 4. Results of the measurement model ($^{*}p < 0.05$)

**Hypothesis Testing**

Looking back at the hypotheses, the results show that H1, H2, H3 and H4 can all be accepted. In hypothesis 1, a low or high level of control perceived by an ERP system user does not result in a higher
level of infusion. This result is confirmed by both the multiple regression analysis and the SEM-analysis. Instead, the evidence shows that a curvilinear or ‘inverted U’ relationship exists between the perceived control and the infusion of an ERP user. This means that neither low nor high amounts of perceived control will cause a high level of infusion but that a certain optimal level of perceived control will induce an optimal level of infusion. Before and after this optimal level, diminishing returns will cause for a suboptimal amount of deep system usage (infusion). Hypothesis 2 can also be confirmed, meaning that system empowerment is positively related to infusion. The same applies for hypothesis 3. Higher levels of user empowerment also induce higher levels of infusion. Hypothesis 4 is also confirmed by the SEM-analysis. Infusion has a significant and positive influence on ERP success. Further examination also showed that infusion is fully mediating the effect between system and user empowerment on ERP success.

Discussion

Discussion of Results

The objective of this study was to research how the infusion of an ERP system user is influenced by control and empowerment and subsequently how infusion can lead to ERP success. The first important finding is the curvilinear influence of control on infusion. Neither low nor high levels but an intermediate level of control will induce the highest amount of infusion for ERP system users. Evidence for this finding can be traced back in the IS literature on infusion, control and empowerment. Elmes et al. (2005) showed that employees showed resistance to the amount of control they experienced when using the ERP system, meaning that high amounts of control are detrimental to infusion. Moreover, the system tracking capability of ERP systems provides real-time information about who processed which transaction or who made specific errors. Sia et al. (2002) indicated that the control exerted by the ERP system resulted in shallow use of the ERP system by the employees because they felt distrusted by the organization. The feeling of a lack of trust gave the employees a feeling of suspicion by the organization, leading to less or even no system usage at all (Teo and Teoh 2010). This would mean that the level of control should be low, in order for ERP system users to feel trusted and relied on by the organization, giving the users incentive to use the ERP system to full extent.

On the other hand, the lack of panoptic control and self-discipline induced by the ERP system will decrease the amount of infusion because of a ‘shortage’ of discipline. When ERP users perceive no control or ‘gaze’ from the management or peers, their level of infusion will decrease since they have no reason anymore to engage in ‘self-discipline’ (Foucault 1977). This indicates that low levels of control are also not beneficial for maximizing infusion. The ‘inverted U’-relation that has been found in this study implies that a certain trade-off exists between self-discipline and the lack of trust, and reliance of the organization in the ERP user. Therefore neither low nor high perceived amounts of control will lead to ERP system users using the information system in an infused manner.

This control and infusion trade-off contributes to the IS literature by making clear that control should not be rigorously minimized or maximized by organizations in order to stimulate infusion. Instead, an intermediate amount will lead to an optimal level of infusion among the ERP users. This would mean that management should actively regulate the amount of control perceived by their ERP system users. Moreover, it can be argued that this ‘sweet spot’ of control is subject to differentiations in the personality of users and the kind of work they perform (Burton-Jones and Straub 2006). The optimal point of control and infusion could shift to the left or right (figure 2) according to variations in user, task or system (figure 1). An example could be the work ethic of users. Employees who work hard will be less bothered by higher amounts of control than their less achieving counterparts (Van Maanen 2010). After all, less achieving employees will be more concerned by the fact that the management ‘questions’ their work than employees with a solid performance. These differences between personalities would also mean different optimal points of control and infusion for these employees.

The findings of this study confirm that user and system empowerment lead to higher levels of infusion. These results are adding to earlier research on this topic. With regard to user empowerment, Marcolin et al. (2000) have provided evidence that when users perceive themselves being competent in using the
system; this will lead to higher levels of use. Jones et al. (2002) found that a supporting work environment becomes very important after the adoption of an information system. Work environments which are free of barriers are essential: a supportive usage environment stimulates attaining higher levels of infusion. Moreover, Ahuja and Thatcher (2005) indicated that autonomy, an important aspect of empowerment, increases the intention of the ERP system user to use the system in a more innovative way. Ng and Kim (2009) also studied the effect of user empowerment on the highest level of system use and found that this form of empowerment leads to infusion. They indicated that especially user meaning and user competence are strongly predicting infusion. However, this study found that next to the importance of user empowerment also system empowerment plays a significant role in predicting the highest level of system usage. Where user empowerment can be seen as an authentic aspect of user’s immediate work environment characteristics, system empowerment is directly dependent on the interaction with the characteristic features of an ERP system (Sia et al. 2002). The findings also indicate that user and system empowerment are positively related to each other, so both forms seem to be dependent on each other in predicting infusion.

Although results indicate that both control and empowerment influence infusion, the concepts do not relate to each other. Higher levels of control do not lead to lower empowerment and vice versa. Sia et al. (2002) state that increased empowerment does not dictate a lowering of control and vice versa, meaning that these two phenomena can coexist in an organization. Therefore the results of our study provide evidence for the existence of the paradox of control and empowerment. This is in line with Hofstede (1968) and Simons (1991), who similarly argue that control systems which are used in organizations must balance and reconcile empowerment and control, to avoid the influence of one element over the other. In this way management could optimize control and empowerment rather than to maximize both. The statement is especially true when looking back at the ‘inverted-u’ relation of control and infusion. Instead of maximizing, control could be optimized to a certain point in order to optimize infusion.

Tennant et al. (2011) state that system use is typically assessed in IS research as a dependent variable and as a proxy for success. However, a system that is used does not automatically imply that it is successful or that the benefits of such a system are attained. Critics argue that utilization alone is not sufficient to predict performance accurately. Hence, utilization should be examined as a broad and rich variable, including to what extent and in what way (integrative and emergent) a user applies the system. By using the numerous features of ERP system to a fuller extent, the benefits of ERP systems will become enabled. For example, improved decision making can only be reached when all users use the system correctly and thoroughly, so users are able to make well-informed decisions in line with the goals of the organization. Moreover, our findings indicate that infusion mediates between control and empowerment. In addition, it can be linked with increased ERP success. So, infusion is not only important as a dependent variable; our study shows that it can also act as an important independent variable since it can predict ERP success (Roberts et al., 2010). Finally, infusion is fully mediating the influence of user and system empowerment on ERP success, showing that it is a very important link between the information technology and performance (Doll and Torkzadeh 1998).

**Implications for Practice**

Several implications for practice can also be indicated. The findings show that both empowerment and control matter when organizations want their users to induce in higher levels of system use. Since control and empowerment turn out to be unrelated, organizations can aim to optimize both. Several initiatives could be initiated to increase empowerment. Adequate user training can enhance the users understanding of the ERP system and the underlying processes. By showing the flexibility and expanded job scope of the system, users could be stimulated to become ‘empowered’. Showing support by pointing out key users, online help and user instructions could contribute to higher levels of user and system empowerment.

In order to optimize control, managers should try to balance the amount of control users perceive. A decent amount of autonomy should be tolerated so users feel relied upon and trusted by the organization, while a weekly check or report from the ERP system could induce enough control for users to engage in self-discipline. Managers should take into account that empowerment and control play an important role in infusion and the impact that this behavior has on the ERP system performance of an organization. Moreover, the users should bear in mind that although they can experience increased control when using the ERP system, they can also benefit by using the system. By embracing the ERP system, empowerment
can take place, for example more visibility of the organization and improved decision making. In this case, the task of the management is to encourage their users in such a way that they encompass the feeling of increased control and experience the empowerment. Management within the organization studied by Sia et al. (2002) failed to achieve this, which resulted in users complaining and resisting the new system. Some employees even avoided the panoptic gaze partially by arguing that system interaction would distract them from serving clients.

**Limitations and Future Research**

Although this study verifies that empowerment and control lead to higher levels of usage behavior and that in turn infusion influences the success of an ERP system, still some limitations should be taken into account. First, the focus of this study is just on a single organization and that is certainly diminishing the generalizability of the results we found. Additional research on control, empowerment and infusion should include several organizations from different industries in order to single out specific organization or industry characteristics. By replicating this study, the robustness of the findings would also be established. The second limitation relates to the cross-sectional nature of this study. By extending future research to longitudinal designs more can be stated about the directions of causal influence. Also differences in infusion and the performance of the ERP system it influences can be stated over time. Perhaps also patterns in the amount of control and empowerment perceived by ERP system users can be discovered by including different points of measurement over time.

Third, to further unwind the relationship between control and infusion, the sweet spot of control needs more research on factors influencing this relationship. Examples are specific personal characteristics, like work ethic or work contingencies (task uncertainty, task interdependence). Finally, researchers have made calls for further work to advance our understanding on the factors that lead to more infusion (Ng and Kim 2009). Next to control and empowerment a lot of other individual characteristics have been coined or even found to influence infusion. Examples of such factors are symbolic adoption (Hsieh and Wang 2007) and motivation (Peijan and Lihua 2007). Since this paper only included control and empowerment nothing can be stated about relationships with any of these other predictors of infusion. To receive a clear overview, future research should include a wide array of predictors of infusion to establish which factors predict infusion, and whether these factors are mutually related. This is in line with the notion of Tennant et al. (2011), who propose that a comprehensive and unified theory is necessary to disentangle the concept of infusion.
References


### Appendix: Measures

<table>
<thead>
<tr>
<th>Variables</th>
<th>Items</th>
</tr>
</thead>
</table>
| **Control: system tracking capability**       | 1) The ER system provides very complete information about how well or badly I have done my work.  
2) The ER system provides very accurate information about how well and badly I have done my work.  
3) The ER system provides very immediate information about how well and badly I have done my work.  
4) The ER system provides very reliable information about how well or badly I have done my work.  |
| Sia et al. (2002)                              |                                                                                                                                          |
| **Control: enhanced visibility to management**| 1) If there is an error in the ERP, it is very easy for my supervisor to trace when, where, and by whom it was committed.  
2) The ER system provides the supervisor with very detailed information on the source of error.  
3) My supervisor is constantly updated on the status of my work performance.  
4) My supervisor is highly aware of any mistakes I have committed in my work.  |
| Sia et al. (2002)                              |                                                                                                                                          |
| **Control: enhanced visibility to peers**     | 1) There is great necessity to work with others on tasks.  
2) Working with others as part of a team is a pressing requirement of my job.  
3) It is very easy for coworkers from other departments to access the information system to see the status of my work performance.  
4) It is very easy for my peers to detect mistakes in my work because errors in my work will have a great impact on their performance.  |
| Sia et al. (2002)                              |                                                                                                                                          |
| **Empowerment: job discretion** (Sia et al., 2002) | 1) Management relies a great deal on me to ensure proper operation or processing when I use the system.  
2) Much is left to my discretion to ensure proper operation or processing when I use the system.  
3) I have considerable autonomy in deciding how to carry out my work.  |
| **Empowerment: procedural formality** (Sia et al., 2002) | 1) Job descriptions in my organization are highly specific and very detailed.  
2) The procedures to carry out a task are spelled out very clearly.  
3) Employees are very closely supervised to ensure that they are conforming to the standard procedures established.  |
| **Empowerment: user competence** (Ng & Kim, 2009) | 1) I have complete knowledge in using the ERP system  
2) I have mastered the skills necessary for using the ERP system  
3) I am self-assured about my capabilities to use the ERP system  
4) I am confident about my ability to use the ERP system  |
| **Empowerment: usage impact** (Ng & Kim, 2009) | 1) The ER system usage highly affects task outcomes  
2) The impact of my ERP system usage on task outcomes is large  
3) My ERP system usage has significant influence over task outcomes  
4) My ERP system usage has a great deal of control over task outcomes  |
| **Empowerment: usage meaning** (Ng & Kim, 2009) | 1) Using the ERP system is very important to me.  
2) Using the ERP system is meaningful to me.  
3) I feel that using the ERP system is valuable.  
4) ERP system usage activities are personally meaningful to me.  |
| **Empowerment: user self-determination** (Ng & Kim, 2009) | 1) I have significant autonomy in determining how I use the ERP system  
2) I can decide on my own how to go about using the ERP system  
3) I have a lot of freedom to decide how I use the ERP system  
4) I have considerable opportunity for independence in how I use the ERP system  |
| **Infusion: extended use.** (Schwarz, 2003; Hsieh & Wang, 2007) | 1) I often use most of the features of the ERP system installed in my organization to support my work.  
2) I often use more features than the average user of the ERP system installed in my organization to support my work.  
3) I fully use the available ERP system features to complete my tasks  
4) I make use of the available ERP system features thoroughly to accommodate my tasks  
5) I use all available ERP system features to help me in my tasks  |
| **Infusion: Integrative use** (Hsieh & Wang, 2007) | 1) I use the ERP system for better connections among tasks  
2) I use the ERP system to organize various tasks in an integrative manner  
3) I use the ERP system to coordinate multiple tasks  
4) I use the ERP system to handle related-tasks  |
| **Infusion: emergent use** (Hsieh & Wang, 2007) | 1) I explore new uses of the ERP system to support my tasks  
2) I often experiment with new ways of using the ERP system to accomplish my tasks  
3) I often find new uses of the ERP system in performing my tasks  
4) I use the ERP system in novel ways to complete my tasks  |
| **Success: system quality** (Gable et al, 2008; Ifinedo, 2011) | 1) Our ERP has accurate data  
2) Our ERP is flexible  
3) Our ERP is easy to use  
4) Our ERP is easy to learn  
5) Our ERP is reliable  
6) Our ERP allows data integration  
7) Our ERP is efficient  
8) Our ERP meets users’ requirements  |
| **Success: information quality** (Delone & McClean (2002; Ifinedo, 2011) | 1) Our ERP provides timely information  
2) The information on our ERP is understandable  
3) The information on our ERP is important  
4) The information on our ERP is concise  
5) The information on our ERP is relevant  
6) The information on our ERP is usable  
7) The information on our ERP is available  
8) The information on our ERP is accurate  |
| **Success: individual impact** (Delone & McClean (2002; Ifinedo, 2011) | 1) Our ERP enhances individual creativity.  
2) Our ERP enhances organizational learning  
3) Our ERP is beneficial for individual’s tasks  
4) Our ERP enhances higher-quality of decision making  
5) Our ERP saves time for individual tasks/duties  |
| **Success: organizational impact** (Delone & McClean (2002; Ifinedo, 2011) | 1) Our ERP provides timely information  
2) The information on our ERP is understandable  
3) The information on our ERP is important  
4) The information on our ERP is concise  
5) The information on our ERP is relevant  
6) The information on our ERP is usable  
7) The information on our ERP is available  
8) The information on our ERP is accurate  |