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A Conceptual Model for Measuring the Effectiveness of Employee Portals

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ABSTRACT

Employee portals are utilized by many companies to improve information exchange and communication between their employees as well as to better support business processes. Assessing the benefits of employee portals has become important, owing to limited IT budgets and the need to justify investments in portals. In this paper, we propose a conceptual model for measuring the effectiveness of employee portals on the basis of the DeLone and McLean IS Success Model as well as an extensive review of employee portal success measurement literature. The resulting model is presented as the basis for future empirical work in this area. The development of the survey instrument is described and further validation steps are proposed.

Keywords

Employee Portals, Information Systems Success, Information Systems Effectiveness.

INTRODUCTION

With the emergence of web-based technologies and the subsequent emergence of employee portals, the ways employees handle information, communicate, as well as execute business processes have significantly changed. Over the past decade, company intranets have been transformed from collections of static web pages into highly integrated and interactive information systems (IS). Whereas the first-generation intranets only provided a single interface to information, today's employee portals enable integrated support of information, communication, applications, and business processes.

An employee portal offers a browser-based user interface which provides access to personalized information, resources, and applications. In many cases, an employee portal is the primary tool through which employees do their work. Ideally, employee portals yield different benefits to both organizations and employees, such as reducing information overload, reducing organizational costs, improving corporate communication, and enhancing employee productivity (Tajib, Sugianto and Sendjaya 2006).

Today, many companies, especially large ones, offer their employees portals (Forrester 2006). The use of employee portals has been growing steadily and, despite many companies' restricted IT budgets, investments in portal solutions are still growing. However, portal projects are usually complex, time and cost-consuming, with a high failure risk (Remus 2006). And although IT departments and decision-makers have to justify portal investments, a significant number of companies do not assess the actual benefits of their portal implementations (Brown, Mines, Moore and Barnett 2007).

Companies that do assess their portal benefits have often used monetary indicators, such as return on investment (ROI) or total cost of ownership (TCO) and other cost-benefit analysis methods (White 2003). These success-measurement approaches do not take into account intangible impacts and intervening environmental variables. A portal's success cannot, however, be measured by just its reach, and practitioners should not purely rely on "hit counts" as measures of success (Damsgaard and Scheepers 1999). Clearly, a comprehensive measurement of success would need to consider both the tangible and intangible effects of a portal to detect potential improvements, and to justify present and future investments in portal solutions.

In this paper, we report on our development of a conceptual model, based on the DeLone and McLean IS Success Model (D&M IS Success Model) (DeLone and McLean 1992, 2003), which considers employee portals' specific requirements. The second section describes the theoretical foundations of employee portals and offers a literature review of measuring IS and portal success. In the third section, we explain how we developed our employee portal success model and discuss the characteristics of its success dimensions. The fourth section outlines our methodological approach to validating our

conceptual model. We cannot as yet present empirical results as the research is still in progress. To conclude, we summarize the paper's contribution, refer to the limitations, and present suggestions for future research.

FOUNDATIONS

Employee Portals

Employee portals can be regarded a specific type of the broader concept of *enterprise portals*. The latter will therefore be discussed first. In this context, we use the terms *corporate portal*, *enterprise information portal*, *business portal*, and *enterprise portal* interchangeably (Dias 2001).

An early definition of a portal in the corporate context appeared in a Merrill Lynch report (Shilakes and Tylman 1998). In this report, an enterprise (information) portal is considered an application that primarily integrates the company's information and provides users with a single interface to this corporate information. Subsequent definitions tend to include the integration of collaborative applications such as e-mail and calendars (Eckerson 1999). Current enterprise portals do not only integrate information and simple tools, but also business applications and processes (Chan and Liu 2007; Daniel and Ward 2005). Table 1 lists the different definitions of enterprise portals over time.

Year	Definition
1998	"Enterprise information portals are applications that enable companies to unlock internally and externally stored information, and provide users a single gateway to personalized information needed to make informed business decisions." (Shilakes and Tylman 1998)
2000	"Enterprise portals are single-point web browser interfaces used within organizations to promote the gathering, sharing and dissemination of information throughout the enterprise. As such, these tools offer corporations a means by which to manage and access information from disparate sources across the firm." (Detlor 2000)
2002	"An enterprise portal is any system that allows users to use the web browser to get all corporate information he needs. A portal is a flexible information technology platform that allows dispersed sources of information to be linked together while providing users the opportunity to customize what they need from the information source." (Chan and Chung 2002)
2005	"Enterprise portals are secure web locations, that can be customized or personalized, that allow staff and business partners access to, and interaction with, a range of internal and external applications and information sources . Uses of the portal may include: improved access to information , increased collaboration , greater use of existing applications, and effective integration between applications ." (Daniel and Ward 2005)
2007	"A corporate portal is a web-based platform to access with security a broad range of information, services, applications, and expertise ." (Chan and Liu 2007)

Table 1. Definitions of Portals

In summary, enterprise portals have evolved from low-end intranets into highly integrated IS. Today, such portals enable the integrated support of information, communication, applications, and business processes.

In terms of their target user groups, enterprise portals can be classified as supplier, customer, and employee portals. Ideally, these three types have the same technical infrastructure. Thus, organizations effectively have one portal with different "windows," that give each user group access to specific functions that are relevant to it (Riempp 2002).

Before portal technology was available, the web-based intranet was a popular tool for building work force commitment (Azzone and Bianchi 2000). Although it yielded benefits for organizations in this regard, these intranets lacked personalization, offered poor navigation, and did not provide centralized access to information, which often led to losses in productive employee time. To overcome these problems, organizations began to implement employee portals (Tojib et al. 2006). An *employee portal* is a web-based interface to access personalized information, resources, applications, and e-commerce options. Employees can access a range of internal and external information through a network connection. They are provided with relevant proprietary information displayed in a password-protected setting (Sugianto and Tojib 2006). In addition, business applications are increasingly integrated into employee portals. Thus, in many organizations, the role of the

employee portal has become crucial, especially when an entire business process can be completed by means of the portal. In some organizations, an employee portal is the primary tool through which employees do their work (Tojib et al. 2006).

Research on Measuring IS Success

The IS literature provides several definitions and measures of IS success. As DeLone and McLean state, there are nearly as many measures as there are studies (1992). Obviously, there is no ultimate definition of IS success. Since there are different stakeholders who assess IS success in an organization (Grover, Jeong and Segars 1996), each group has a different definition. From a software developer perspective, a successful IS is completed on time and under budget, has a set of features that is consistent with the specifications, and functions correctly. Users may find an IS successful if it improves their work satisfaction or work performance. From an organizational perspective, a successful IS may contribute to the company's profits or create a competitive advantage. Consequently, success is always assessed from a certain stakeholder's point of view. Furthermore, IS success also depends on the type of system being evaluated (Seddon, Staples, Patnayakuni and Bowtell 1999).

In order to provide a more general and comprehensive definition of IS success, one that covers these different perspectives, DeLone and McLean (1992) reviewed the existing definitions of IS success and their corresponding measures, and classified them into six major categories. They then created a multidimensional measuring model with interdependencies between the different success categories, which became very popular.

Motivated by DeLone and McLean's call for further development and validation of their model, many researchers have attempted to extend or respecify the original model. They either suggest that further dimensions should be included in the model, or they present alternative success models (Seddon 1997; Seddon and Kiew 1994). Other researchers have focused on the model's application and validation (Rai, Lang and Welker 2002). Although some weaknesses have been revealed, the D&M IS Success Model has become the dominant model for measuring IS success (Hu 2003).

Ten years after the publication of their first model, and based on the evaluation of the many contributions to it, DeLone and McLean proposed an updated IS success model (DeLone and McLean 2003). The updated model consists of six interrelated dimensions of IS success: information, system and service quality, (intention to) use, user satisfaction, and net benefits. It can be interpreted as follows: A system can be evaluated in terms of the information, system, and service quality; these characteristics affect subsequent use or intention to use, and user satisfaction. As a result of using the system, certain benefits will be achieved. The net benefits will (positively or negatively) influence user satisfaction and further information system use.

Research on Portal Success

Existing measurement approaches to assess portal success in practice usually utilize monetary indicators. Typical examples are return on investment (ROI), total cost of ownership (TCO), or other cost-benefit analysis methods (White 2003). Building business cases on the basis of such indicators is questionable because non-monetary impacts and intervening variables are not taken into account.

There is little documented empirical research on employee portal success measurement. Some studies investigate single aspects of employee portal success, but none of the studies we reviewed took a comprehensive, integrated approach.

In order to measure user satisfaction with employee portals, Sugianto et al. (2007) and Tojib et al. (2008) proposed using the B2E Portal User Satisfaction (B2EPUS) model, which is based on the End-User Computing Satisfaction measure (EUCS) developed by Doll and Torkzadeh (1988). Bin Masrek (2007) has proposed another approach to assessing user satisfaction with campus portals, which is based on an extract of the updated D&M IS Success Model (DeLone and McLean 2003). A similar framework for investigating corporate intranet effectiveness has been proposed by Masrek et al. (2007) and Hussein et al. (2008). Focusing on the user-perceived service quality of web portals, Yang et al. developed and validated an instrument based on different conceptual models in the areas of IS and technology adoption (Yang, Cai, Zhou and Zhou 2005).

Finally, based on the Technology Acceptance Model (TAM) (Davis 1989), de Carvalho et al. (2008) analyze the effects of technological and organizational features on intranet and portal usage.

In our review of the IS success literature, we found no study specifically aimed at comprehensively examining the success of employee portals. Consequently, we built our measurement model for employee portal success on the above-mentioned studies. Secondly, we extended our literature review by analyzing studies focusing on the evaluation of web-based systems (WBS), which are similar to employee portals (e.g., Bharati and Chaudhury 2004; Cheung and Lee 2005; Garrity, Glassberg,

Kim, Sanders and Shin 2005; Huang, Chyan Yangb, Jinb and Chiua 2004; McKinney, Kanghyun and Zahedi 2002; Molla and Licker 2001). We took the measures used in these studies into consideration when developing our conceptual model. Furthermore, since employee portals have many commonalities with web-based knowledge management (KM) systems, we reviewed the basic concepts of integrated KM systems (Riempp 2005) as well as empirical studies focusing on KM system success (e.g., Clay, Dennis and Ko 2005; Kulkarni, Ravindran and Freeze 2006; Wu and Wang 2006) to derive relevant success dimensions and adapt these measures to our conceptual model.

CONCEPTUAL MODELING

Since employee portals are widespread but there is no known comprehensive, integrated theoretical framework for measuring their success, we propose a conceptual model of employee portal effectiveness that is based on the D&M IS Success Model (DeLone and McLean 2003).

Success Dimensions

We modified the dimension definitions of the D&M IS Success Model for application in the employee portal context and added additional success dimensions where the characteristics of employee portals have not been fully covered by the original model. To this end, we examined the definitions of the original success dimensions, contrasted them with the specific properties of employee portals, and merged the different points of view into a revised classification scheme. Consequently, we propose a conceptual model for measuring employee portal success consisting of the following success dimensions:

- *System quality*, which consists of measures of the employee portal as a system in itself. It considers performance characteristics, functionality, and portal usability, among others.
- *Information quality*, which focuses on the quality of the employee portal's output (i.e., the quality of the information that the portal provides) and its usefulness for the user. Information quality has been shown to be a prominent success factor when investigating overall IS success, especially in the context of web-based systems (Schaupp, Fan and Belanger 2006).
- *Process quality*, which summarizes measures capturing the quality of the employee portal's supporting processes such as approvals, applications for leave, meeting room reservations, procurement request, time registration, travel expense reports, and invoice releases. The quality of process support should be measured in terms of efficiency, reliability, accuracy, completeness, and other criteria.
- *Collaboration quality*, which covers the quality of the employee portal's enabling of collaboration among the users. It evaluates the extent to which the utilization of employee portals, for example, enhances communication and improves the effectiveness and efficiency of information sharing as well as social networking.
- *Service quality*, which includes measures of the overall support delivered by the service provider. In the context of employee portals, this success dimension covers aspects such as responsiveness, reliability, empathy, competence, and the overall quality of the portal owner.
- *Use*, which measures the perceived actual use of the employee portal by a company's staff. To assess use in this context, we propose measuring the perceived time of use of the different functionalities such as e-mail, searching for information, as well as the overall portal usage time.
- *User satisfaction*, which is the affective attitude to the portal of the employee who interacts directly with the portal (Doll and Torkzadeh 1988; Tojib et al. 2006). User satisfaction is considered one of the most important measures when investigating overall IS success. The proposed construct evaluates adequacy, efficiency, effectiveness, and overall satisfaction with the portal.
- *Individual benefits*, which subsume measures of the perceived individual benefits gained by the employee through the use of the portal. These benefits cover aspects like task performance, job efficiency, and overall usefulness.

With this model, we focus on individual performance impacts as the final dependent variable of interest instead of organizational performance. The difficulty with measuring the organizational impact of individual IS initiatives has been discussed and demonstrated by many researchers (e.g., Gelderman 1998; Goodhue and Thompson 1995). Thus, we do not consider the organizational impact in our model, although this impact is very likely greater than the individual impact.

Conceptual Model and Hypotheses

The proposed conceptual model assumes that system, information, process, collaboration and service quality are linked to user satisfaction and usage of an employee portal, and that these, in turn, influence the portal's benefits. Our research model for measuring employee portal success on the basis of the updated D&M IS Success Model is shown in figure 1. Each of the arrows represents a hypothesized positive relationship between two success dimensions that should be tested within this study.

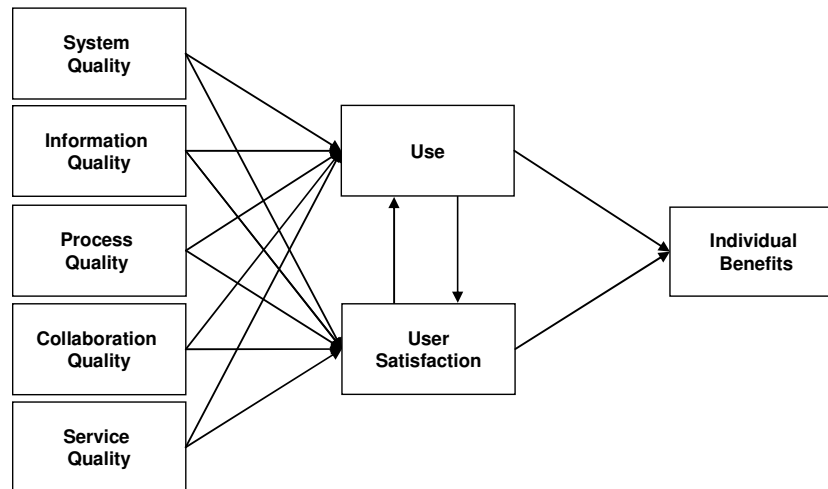


Figure 1. The Model to be Tested

In addition, knowledge intensity of tasks, process standardization, and organizational culture with respect to using the employee portal will be used as control variables.

Measures

In order to operationalize the constructs of the conceptual model, we have followed the recommendation by various authors (e.g., Bharati and Chaudhury 2004; DeLone and McLean 2003; Kankanhalli, Tan and Wei 2005; Sugianto and Tojib 2006) to use tested and proven measures in order to enhance validity. Thus, we have adapted items identified in previous studies and modified them for use in the employee portal context. Where there were no items and they needed to be created, we have paid particular attention to pilot testing and will pay attention to the verification of the constructs' *discriminant validity* to avoid biases resulting from common method variance (Majchrzak, Malhotra and John 2005).

After surveying the literature for existing constructs, initial item pools were created for each of these. We added additional items where important aspects of a construct's content domain have not been covered. In order to ensure the *content validity* of the item pool, we discussed the choice of items with a group of four IS experts. Based on the experts' feedback, both the choice of items as well as the wording was refined. This initial item pool was revised and further developed in the validation phase of the research project. We subsequently started with a larger item pool than we will use in the final questionnaire and successively reduced the number of items.

RESEARCH METHODOLOGY

Our development of the conceptual model on the basis of theoretical considerations is the first step of a long-term research project that seeks to present a reliable and valid instrument for measuring the effectiveness of employee portals. Before it can be applied in practice, it needs further development and validation. We have applied classic test theory methods to validate the survey instrument and assess the measurement model (Churchill Jr 1979). The corresponding steps already taken and that will be taken, are presented in the following sections.

Instrument Validation

First, we conducted an in-depth validation of the survey instrument prior to the field studies. The step after the expert discussions targeted the refinement of the items into scales with a high level of *construct validity*. We used a card-sorting and

item-ranking approach similar to the one adopted by Davis (1989), Moore & Benbasat (1991), and Kankanhalli et al. (2005). Instead of cardboard cards, we used a computer-based spreadsheet solution to support the sorting procedure. Eight experts participating as judges were independently asked to assign each item to one of the constructs or to an “Ambiguous/Unclear” category. Additional space was provided, allowing comments and suggestions regarding the items. The results of this approach were basically satisfying. However, we dropped several items and modified the wording of the items to comply with the judges’ feedback.

Finally, as presented in table 2, we selected a set of six to eleven items for each of the constructs for the field test. All of the six constructs used within this study will be measured using a seven-point Likert-type scale (1 = strongly disagree, 7 = strongly agree).

Construct	Items	References
System quality	Navigation, design, usability, functionality, responsiveness, availability, reliability	Adapted from Ahn et al. (2004), McKinney et al. (2002)
Information quality	Understandability, usefulness, interestingness, reliability, completeness, timeliness	Adapted from Lin and Lee (2006), McKinney et al. (2002), Yang et al. (2005)
Process quality	Efficiency, reliability, accuracy, ease of initiation, understandability, traceability, comprehensiveness	New items
Collaboration quality	Communication support, information sharing, document storing and sharing, coordination, locating contacts, competence profiles, expert directory, networking effectiveness, collaboration effectiveness	New items
Service quality	Responsiveness, reliability, empathy, assurance, training	Adapted from Chang and King (2005), Pitt et al. (1995)
Use	Daily use, extent of feature use	Adapted from Iivari (2005), new items
User satisfaction	Adequacy, efficiency, effectiveness, overall satisfaction	Adapted from Seddon and Kiew (1994)
Individual benefits	Task performance, job performance, productivity, job effectiveness, job simplification, usefulness	Adapted from Davis (2005)

Table 2. Selected Measures

The remaining items were combined into a draft survey instrument for pre-testing. In order to ensure the quality of the questionnaire design and presentation, we discussed the draft within our research team and modified it according to the group’s feedback. As a final pre-test prior to using the survey in the field, the draft questionnaire was trialed with a group of 20 IS PhD students and faculty members serving as test users. Based on their feedback, the questionnaire’s appearance and instructions have been finalized. The development and validation of the survey instrument within this research project has been presented in detail by Urbach et al. (2009).

Data Collection

Several field surveys will be conducted to collect data for the empirical assessment of our conceptual model. Since survey-based research is the dominant empirical method in IS success research at present (Urbach, Smolnik and Riempp 2008), a survey is deemed most suited to test the hypothesized relationships.

In order to gain support from companies for our study, we have tried to create a win-win situation with potential participants by initiating a benchmarking study. Generally, benchmarking can be considered as evaluating and improving an organization's performance, technology, process, competence, and/or strategy by learning from other organizations (Kyro 2003). The philosophy beyond benchmarking is to recognize one's shortcomings and acknowledge that someone is doing a

better job (Bhutta and Huq 1999). In this particular case, we offer a gratis analysis of the participants' employee portal effectiveness and anonymized comparative data. In return, we can use the result data to validate our research model. To date, 18 companies that will distribute our questionnaire to a total of about 35,000 employees have registered for participation, and we expect more to follow.

Data Analysis

Using the empirical data of the surveys, the psychometric properties of the model will be explored by applying second-generation modeling techniques. Owing to the exploratory nature of this research stage and possible sample size limitations, we will use a partial least squares (PLS) approach to validate and refine the instrument (Chin 1998). The software package SmartPLS (Ringle, Wende and Will 2005) will be employed for the related statistical calculations.

Following the validation guidelines of Straub et al. (2004) and Lewis et al. (2005), we will test the measurement model for reliability, convergent validity, discriminant validity, and predictive validity. We will apply commonly employed decision rules. Given an adequate measurement model, the structural model will be analyzed to test the associations hypothesized in our research model.

SUMMARY AND CONCLUSIONS

In our review of the IS success literature, we found no study that comprehensively evaluates employee portals. Based upon the D&M IS Success Model, we propose a conceptual model for measuring employee portal effectiveness. Furthermore, we present the research methodology for further developing and validating the model.

Our research presented here is limited in that the proposed model is merely based on an extensive literature review and on our experiences. The results are the foundation for future empirical work in this area. However, the model needs further development and validation before it can be applied in practice. In the first phase, the survey instrument has been validated. Future research within this long-term research study will focus on empirically validating the conceptual model and on applying it in practice, as described in this paper.

Furthermore, the proposed model focuses on the individual benefits of portal use, whereas benefits from the organizational perspective have not yet been taken into account. Future research should also consider the organizational benefits achieved by offering employee portals.

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