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Industry-Specificity of Employee Portal Success: A Multi-Group Comparison

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ABSTRACT

The purpose of this study is to gain a better understanding of employee portal success and to investigate the industry differences with regard to the success factors. We introduce a theoretical model for this that is based on the DeLone and McLean IS Success Model, which considers the specific requirements of employee portals. We tested the associations between our model's different success dimensions by using more than 6,000 employees' responses that were collected in a survey of 22 companies across different industries participating in an international benchmarking study. Furthermore, we analyzed potential industry differences by means of a multi-group comparison. We applied structural equation modeling to carry out the data analysis. The study's results indicate that, besides the factors contributing to the success of IS in general, other success dimensions – like the quality of the collaboration and process support – have to be considered when aiming for a successful employee portal. The results of the multi-group comparison further indicate that the impacts of the success factors differ in intensity and significance between the industries in our sample. The study's findings make it possible for practitioners to understand the industry-specific levers with which to improve their employee portals and to prioritize their investments accordingly. By empirically validating a comprehensive success model for employee portals, the study's results advance the theoretical development in this area and present a basis for further research in this field.

Keywords

Employee portals, IS success measurement, structural equation modeling, multi-group comparison.

INTRODUCTION

In the last few years, company intranets have developed from collections of static web pages into highly integrated and interactive information systems (IS). Whereas first-generation intranets only provided a comfortable interface to static information, today's employee portals build a "single point of access" by enabling the front-end integration of information, communication, knowledge sharing, applications, and business processes within organizations. In many cases, an employee portal is the primary tool through which employees do their work. Ideally, employee portals yield various benefits for organizations and employees, such as reducing information overload, decreasing organizational costs, improving corporate communication and knowledge management (KM), as well as enhancing employee productivity (Tojib, Sugianto and Sendjaya 2006).

Many companies, especially large ones, offer their employees a portal. The use of employee portals has been growing steadily and – despite many companies' restricted information technology (IT) budgets – investments in portal solutions are on the rise (Forrester 2006). However, portal projects are usually complex, time and cost-consuming, and entail a high failure risk (Remus 2006). Moreover, although IT departments and decision-makers have to justify portal investments, a significant number of companies do not assess their portal implementations' actual benefits (Brown, Mines, Moore and Barnett 2007). The assessment of portal benefits is, however, often problematic, since common cost-benefit analysis methods do not take intangible impacts and intervening environmental variables into account.

Companies in various industries utilize employee portals, including – for example – consulting firms, financial institutions, and manufacturers, which usually significantly differ according to their structure and business processes, among others. As a result, the information demands and the ways in which these demands are satisfied differ between industries. Thus,

companies in different industries may have different requirements for employee portals that should support corporate information and knowledge management.

The purpose of this study is to gain a better understanding of employee portal success. Existing research on employee portals investigates single aspects of employee portal success; however, none of the studies we reviewed make use of a comprehensive, integrated approach. Consequently, we developed a success model that considers employee portals' specific requirements. We collected data for the empirical assessment through a survey of the employees of 22 companies across different industries. As a first step, we validated the theoretically derived causal model in order to understand the interrelations of the suggested success dimensions using the full data sample. As a second step, by means of a multi-group comparison, we investigated the differences between the distinct industries of the companies within our sample.

Next, we describe the theoretical foundations of employee portals, IS success measurement, and portal evaluation. Thereafter, we explain how we developed our theoretical model. The research process section outlines our approach to operationalizing the constructs and collecting empirical data. In the analysis and results section, we assess the measurement models and structural model by means of structural equation modeling. Furthermore, we present the results of the multi-group comparison aiming to identify industry differences. To conclude this study, we summarize the results and outline the implications, limitations, and contribution of this research.

FOUNDATIONS

We started our research by examining the existing research in the field. Consequently, we reviewed relevant literature on employee portals, information systems success measurement, and existing approaches for evaluating portals.

Employee Portals

An employee portal can be regarded as a specific type of enterprise portal. One of the first definitions of a portal in the corporate context appeared in a Merill Lynch report (Shilakes and Tylman 1998). In this report, a portal was considered an application that primarily integrated the company's information and provided users with a single interface. The perception of portals has changed over time, as is reflected in various publications in the field (e.g., Chan and Liu 2007; Chan and Chung 2002; Detlor 2000; Shilakes and Tylman 1998). Over the past few years, employee portals have developed from low-end intranets into highly integrated IS. Today, such portals enable the front-end integration of information, communication, applications, and business processes (Benbya, Passiante and Belbaly 2004). Before portal technology was available, the web-based intranet was a popular tool for building workforce commitment (Azzone and Bianchi 2000). Although it yielded benefits for organizations in this regard, these intranets usually 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 for accessing personalized information, resources, applications, and e-commerce options with which employees can reach a range of internal and external sources through a network connection in a password-protected setting (Sugianto and Tojib 2006). In addition, business applications are increasingly integrated into employee portals (Schelp and Winter 2002). Thus, the role of the employee portal has become crucial in many organizations, especially when an entire business process can be completed by means of the portal (Chan and Chung 2002). Moreover, in some organizations, an employee portal is the primary tool through which employees do their work (Tojib et al. 2006).

IS Success Measurement

The measurement of IS success has been widely investigated by the IS research community. A recent literature review by Urbach et al. (2009b) indicates that the D&M IS Success Model (DeLone and McLean 1992, 2003) is the dominant theoretical basis of IS success measurement. The first version of this IS Success Model (DeLone and McLean 1992) is the result of an attempt to provide a general and comprehensive definition of IS success that covers its various, previously published definitions and measures. Ten years after the publication of their first model, and based on the evaluation of the many contributions to it (e.g., Rai, Lang and Welker 2002; Seddon 1997; Seddon and Kiew 1994), DeLone and McLean (2003) proposed an updated IS success model that can cope with the growing e-commerce world's measurement challenges. Several success models for evaluating specific types of IS have been developed on the basis of the D&M IS Success Model. Petter et al. (2008) provide a review of recent literature on measuring IS success. They summarize the measures applied and examine the relationships that comprise the D&M IS Success Model in an individual and organizational context.

Portal Evaluation

Little empirical research has been published on portal evaluation. Although some of the studies we reviewed investigated single aspects of portal success, none of them 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 B2EPUS model, which revisits the work of 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. Hussein et al. (2008) have suggested a similar framework for investigating corporate intranet effectiveness. 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) analyzed the effects of technological and organizational features on intranet and portal use. In our review of the IS success literature, we found no study specifically aimed at comprehensively examining the success of employee portals. However, we considered the existing approaches when we developed our model.

THEORETICAL MODEL

Since employee portals are widespread but there is no known comprehensive, integrated theoretical framework for measuring their success, we developed a new theoretical model to do so. Our model's core principle is based on the D&M IS Success Model (DeLone and McLean 2003). We studied the definitions of the D&M IS Success Model's success dimensions, contrasted them with employee portals' specific properties, and merged the different points of view into a revised classification scheme. Consequently, we included the following success dimensions in our theoretical model: *System quality*, *information quality*, *service quality*, *use*, *user satisfaction*, and *individual impact*. Furthermore, we extended the original model, which did not fully cover employee portals' characteristics. Employee portals are not only utilized to exchange information, but also to electronically support work processes (Martini, Corsob and Pellegrini 2009). In addition, they are used to support collaboration and knowledge sharing between users (Benbya et al. 2004). Consequently, we expected the quality of these features to influence our model's effectiveness level (*use*, *user satisfaction*, *individual impact*) as a further success dimension. We therefore added the following two success dimensions, which – contrary to other types of information systems – are specific to employee portals (e.g., Benbya et al. 2004; Puschmann and Alt 2005):

- *Process quality* summarizes measures capturing the quality of an employee portal's supporting processes such as approvals, applications for leave, meeting room reservations, procurement requests, time registration, travel expense reports, and invoice releases. The quality of process support should be measured in terms of efficiency, reliability, and accuracy, among others (Martini et al. 2009; Puschmann and Alt 2005).
- *Collaboration quality* covers the quality of an employee portal's enabling of collaboration between users. It evaluates the extent to which the utilization of employee portals, for example, enhances communication, and improves information sharing as well as social networking's effectiveness and efficiency (Benbya et al. 2004; Detlor 2000; Raghavan 2002).

In order to control for the influence of distinctive characteristics within the sample, we identified a set of control variables that we thought could impact our model's effectiveness level: *knowledge-intensity of tasks* (Eppler, Seifried and Röpnack 1999), *process standardization* (Wüllenweber, Beimborn, Weitzel and König 2008), and *management support* (Sharma and Yetton 2003).

Based on the previous findings of DeLone and McLean (2003) and related studies, as well as on our additional success dimensions, we propose a theoretical model which assumes that *system*, *information*, *process*, *collaboration* and s*ervice quality* are linked to an employee portal's *use* and *user satisfaction*. Furthermore, we propose that both of these are intercorrelated and, in turn, influence the *individual impac*t of an employee portal. Our theoretical model for assessing employee portal success is shown in Figure 1. Each of the arrows represents one of the hypotheses to be tested.

Many researchers have discussed and demonstrated the difficulty of measuring the organizational impact of individual IS initiatives (e.g., Goodhue and Thompson 1995). Consequently, we do not consider organizational impact, although there is likely an overall impact of employee portals' utilization in addition to the impacts perceived by individual users. A detailed theoretical derivation of our causal model for investigating employee portal success has already been published (Urbach, Smolnik and Riempp 2009a).

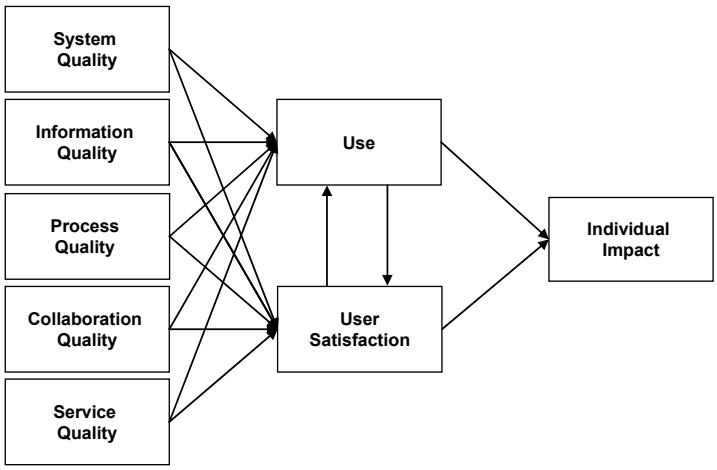


Figure 1. Employee Portal Success Model

RESEARCH PROCESS

We initiated an international benchmarking study to gather data for the empirical assessment of our theoretical model. We used an end-user survey to collect data from 22 organizations across different industries. In order to operationalize the constructs of our conceptual model, we followed various authors' recommendation (e.g., Kankanhalli, Tan and Wei 2005) to use tested and proven measures, if available, in order to enhance validity. Thus, we adapted items identified in previous studies and modified them for use in the employee portal context if required. Where there were no items, and they had to be created, we paid particular attention to testing the constructs' measurement models. After several validation steps, such as a card-sorting and item-ranking approach similar to the one adopted by Moore and Benbasat (1991), we finally selected the items presented in Table 1 for data collection. Furthermore, we added additional questions to capture the respondents' demographic characteristics (Table 2).

Construct	Items (No. of Items)	References
System quality (SYSQ)	Navigation, design, searchability, structure, usability, functionality, accessibility, responsiveness (8)	Items adapted from Ahn et al. (2004), McKinney et al. (2002)
Information quality (INFQ)	Usefulness, understandability, interestingness, reliability, completeness, timeliness (6)	Items adapted from Lin and Lee (2006), McKinney et al. (2002), Yang et al. (2005)
Process quality (PROQ)	Efficiency, reliability, accuracy, ease of initiation, understandability, traceability, completeness (7)	New items derived from Puschmann and Alt (2005), Martini et al. (2009)
Collaboration quality (COLQ)	Ease of use, comfort, effectiveness, efficiency of different collaborative features (7)	New items derived from Benbya et al. (2004), Detlor (2000), Raghavan (2002)
Service quality (SERQ)	Responsiveness, empathy, reliability, assurance (4)	Items adapted from Chang and King (2005), Pitt et al. (1995)
Use (USE)	Extent of using different features (8)	New items derived from Almutairi and Subramanian (2005)
User satisfaction (USS)	Adequacy, efficiency, effectiveness, overall satisfaction (4)	Items adapted from Seddon and Kiew (1994)
Individual impact (INDI)	Task performance, job performance, productivity, job effectiveness, job simplification, usefulness (6)	Items adapted from Davis (1989)
Knowledge-intensity (KNI)	Level of complex knowledge and understanding, amount of information required, overall knowledge-intensity (3)	New items derived from Eppler et al. (1999)

Process standardization (PROS)	Repetitiveness, transparency, overall process standardization (3)	New items derived from Wüllenweber et al. (2008)
Management support (MANS)	Encouragement, leadership support (2)	New items derived from Sharma and Yetton (2003)

Table 1. Constructs and Items

We acquired 22 internationally acting companies' participation by inviting them and other companies to participate in a benchmarking study. Participation was encouraged by offering the companies both their individual results and the other participants' anonymized comparative data. We provided each of the 22 companies with a hyperlink to an online survey, asking them to distribute it to all or a subset of their employee portal's users via e-mail. In order to minimize bias caused by differences in addressing the survey participants, we also provided the companies' coordinating persons with invitation templates. The invitations to the employee portal users were sent out at the beginning of the survey period. Two weeks later, we asked the companies' contact persons to send their employees a reminder. After the survey period of about five weeks, we closed the online survey. In total, 10,926 employee portal users completed the online survey fully. This provided an average response rate of 36.7%. Since the sample sizes of the different companies varied greatly, we further limited the number of responses to 1,000 per company in order to avoid an overemphasis of single companies in our results (random sample). Finally, we used a sample of 6,210 responses for the subsequent analysis.

	Age (Years)	**Gender**	**Computer Use (Hours per Week)**	**Experience with Portal (Months)**
Average / STD	38.3 / 12.2	32.5% female	34.3 / 28.8	35.9 / 38.4

Table 2. Respondents' Demographic Characteristics

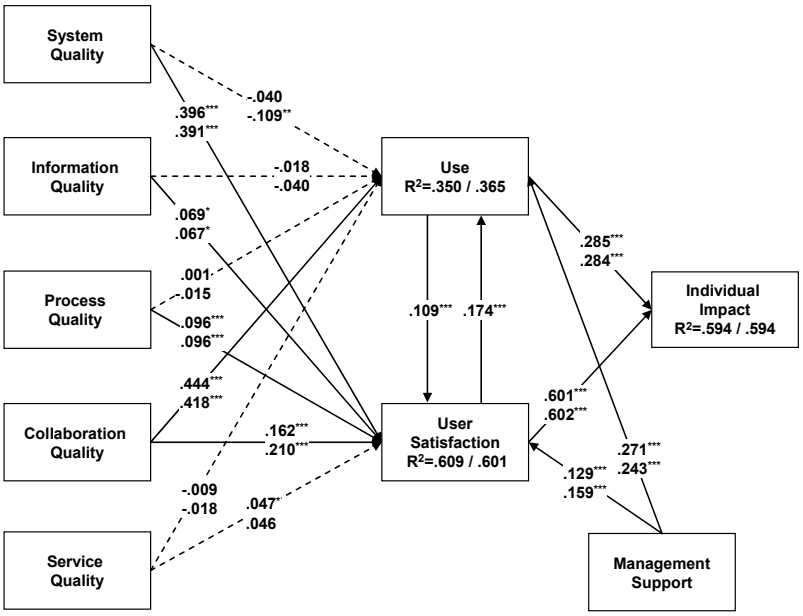
ANALYSIS AND RESULTS

Using the full sample of empirical data from the survey, we analyzed the theoretically derived model. Furthermore, we conducted a multi-group comparison using different sub-samples. We chose the partial least squares (PLS) approach (Chin 1998) for data analysis as it is advantageous compared to covariance-based approaches when the research model is relatively complex and relationships between indicators and latent variables should be modeled in different modes (Chin and Newsted 1999). We made use of the software package SmartPLS (Ringle, Wende and Will 2005) for the statistical calculations.

Causal Analysis

As a first step in the causal analysis, we assessed the measurement properties and tested our research model's hypothesized associations. We used both reflective and formative indicators for the operationalization of the model's constructs. Following the validation guidelines of Straub et al. (2004), we tested the reflective measurement models for unidimensionality, internal consistency reliability, indicator reliability, convergent validity, and discriminant validity by applying standard decision rules. Furthermore, we checked the formative measurement models for multicollinearity with the variance inflation factor (VIF). After the validation of the measurement models, the structural model was analyzed and the hypothesized relationships between the constructs were tested. Since our theoretical model includes a mutual influence between *use* and *user satisfaction* that cannot be simultaneously tested, we tested two different models. Model 1 assumes the influence to be from *use* to *user satisfaction*, whereas Model 2 works from *user satisfaction* to *use*. The results of the tests performed on the two structural models are depicted in Figure 2. The upper path coefficients reflect Model 1's results and the lower ones, those of Model 2.

The quality of the structural models was evaluated by means of squared multiple correlations (R^2). Overall, both models explain a considerable portion of the latent variables' variance. More than half of the variance of the endogenous dependent variables, *individual impact* (R^2=.594 in both models) and *user satisfaction* (R^2=.609 in Model 1 and R^2=.601 in Model 2), is explained, which is substantial. The variance of the remaining endogenous variable, *use* (R^2=.350 in Model 1 and R^2=.365 in Model 2), is explained to a lesser extent, but is nevertheless moderate (Chin 1998).



*significant at p<.050; **significant at p<.010; ***significant at p<.001

Figure 2. Results of the Causal Analysis

Unexpectedly, the results support only half of the relations derived from the D&M IS Success Model (see Table 4). The paths from *system quality* to *user satisfaction*, between *use* and *user satisfaction*, from *use* to *individual impact*, as well as from *user satisfaction* to *individual impact* emerged as hypothesized by the original model. However, the paths from *system* and *information quality* to *use*, from *information quality* to *user satisfaction*, as well as from *service quality* to *use* and *user satisfaction* were not significant. Instead, our results support most of the hypothesized relationships of the two newly added success dimensions. The paths from *collaboration quality* to *use* and *user satisfaction* as well as from *process quality* to *user satisfaction* are supported. Only the path from *process quality* to *use* is not significant. Furthermore, the control variable *management support* has a significant impact on *use* and *user satisfaction*. The two control variables, *knowledge-intensity of tasks* and *process standardization*, had no significant influence on our results.

Multi-Group Comparison

The data sample that we used for the causal analysis is quite heterogeneous with respect to the companies' industries. To account for this heterogeneity, we analyzed potential industry differences by means of a multi-group comparison. Therefore, we clustered the companies we collected data from into different industry groups (Table 3). Most of the companies could be assigned to one of four groups, namely *consulting*, *financial services*, *automotive and manufacturing*, as well as *software and IT*. We grouped the remaining companies to *other*.

Industry	No. of Companies	No. of Responses
Consulting	4	522
Financial Services	4	1.284
Automotive & Manufacturing	4	1.810
Software & IT	5	923
Other	5	1.617
Sum	***22***	***6.210***

Table 3. Industries Within Sample

We divided the sample according to the five groups and validated the proposed theoretical model again using each of these sub-samples. The empirical results of the structural paths' analysis for each group are presented and contrasted with the results of the full sample in Table 4.

Influence	Consulting	Financial Services	Automotive & Manufacturing	Software & IT	Other	Full Sample
SYSQ → USE	.085 / .004	-.064 / -.133	-.023 / -.101	.013 / -.053	-.076 / -.127	-.040 / -.109**
SYSQ→ USS	.448*** / .462***	.414*** / .407***	.396*** / .393***	.372*** / .373***	.314*** / .305***	.396*** / .391***
INFQ → USE	-.067 / -.044	.058 / .015	-.083 / -.099	-.043 / -.054	.000 / -.017	-.018 / -.040
INFQ → USS	-.075 / -.135	.172* / .178*	.028 / .019	.031 / .027	.082 / .082	.069* / .067*
PROQ → USE	.-003 / -.065	.045 / .036	-.030 / -.063	.101 / .078	.008 / -.019	.001 / .015
PROQ → USS	.006 / -.010	.044 / .048	.181** / .178**	.153* / .162**	.153* / .154*	.096*** / .096***
COLQ → USE	.375*** / .323***	.397*** / .389***	.509*** / .478***	.440*** / .401***	.474*** / .438***	.444*** / .418***
COLQ → USS	.197** / .262***	.149** / .185***	.152* / .209***	.215** / .255***	.205** / .253***	.162*** / .210***
SERQ → USE	-.045 / -.038	.018 / .004	-.030 / -.040	-.023 / -.026	.001 / -.003	-.009 / -.018
SERQ → USS	.-070 / -.076	.074 / .076	.052 / .048	.028 / .025	.026 / .026	.047* / .046
MANS → USE	.306*** / .287***	.247*** / .221**	.265*** / .240***	.228*** / .201**	.280*** / .250***	.271*** / .243***
MANS → USS	.106 / .158**	.115** / .138**	.099* / .130**	.134** / .155**	.150** / .178***	.129*** / .159***
USE → USS	.173*** / ---	.092 / ---	.113* / ---	.093 / ---	.102 / ---	109*** / ---
USS → USE	--- / .158*	--- / .149	--- / .195*	--- / .168	--- / .164	--- / .174***
USE → INDI	.315*** / .321***	.319*** / .319***	.251*** / .249***	.291*** / .291***	.300*** / .299***	.285*** / .284***
USS → INDI	.539*** / .540***	.581*** / .584***	.637*** / .639***	.594*** / .594***	.571*** / .571***	.601*** / .602***
* significant at p<.050; ** significant at p<.010; *** significant at p<.001						

Table 4. Comparison Between Industries

The results of the multi-group comparison indicate differences between the industries investigated. These group differences relate to both the strength and significance of the structural paths. A closer look at the results reveals the most important findings for each of the industry groups:

- In consulting, the impact of *system quality* on *user satisfaction* is considerably stronger than in any of the other industries analyzed. In contrast, of the five sub-samples, *collaboration quality* has the least impact on *use*; however, it has a rather strong influence on *user satisfaction*. Accordingly, *system* and *collaboration quality* seem to be important antecedents of *user satisfaction*. In consulting companies, *management support* has a particularly strong impact on *use*. Thus, the extent to which an employee portal is used seems to be largely dependent on the supervisors' encouragement.
- Within the financial service sector, *information quality* shows a significant impact on *user satisfaction*. Accordingly and in comparison to the other industries, the quality of information presented in the employee portals plays a more important role. Similar to the consulting business, *collaboration quality* has relatively little impact on *use* compared to the other sub-groups. In addition, it has rather little impact on *user satisfaction*. Consequently, collaboration via an employee portal appears to be relatively unimportant in financial services.
- In automotive and manufacturing companies, *process quality* has the strongest impact on *user satisfaction*. The same is true for the impact of *collaboration quality* on *use*. In contrast, *information quality* does not show any significant impact in the model. Accordingly, in this industry sector, the quality of an employee portal to support business processes and collaboration among the employees appears to be essential, whereas the quality of information presented seems less important.

- For companies in the software and IT sector, the impact of *collaboration quality* and *management support* on *user satisfaction* is stronger than in any of the other industries. Similar to the automotive and manufacturing sector, *process quality* has a rather strong impact on *user satisfaction*. Accordingly, the satisfaction of users in this sector seems to be influenced by the leaderships' encouragement as well as the employee portal's support of business processes and collaboration to a higher degree than in the other sectors.

DISCUSSION AND IMPLICATIONS

The results of our causal analysis using the full data sample indicate that *collaboration quality* is the only quality dimension that significantly influences both *use* and *user satisfaction*. Thus, the quality of an employee portal's collaborative features seems to be an important success factor. If available, these features are utilized by the users and lead to a higher overall satisfaction with the portal. Accordingly, providing additional collaborative features and/or improving existing ones may directly increase *use* and *user satisfaction* and, consequently, the *individual impact* gained from using employee portals. Furthermore, our results confirm that *system* and *process quality*, as well as *management support* have a significant impact on *user satisfaction* and/or *use*, and can therefore be considered additional success factors.

In contrast, *information* and *service quality* do not significantly influence *user satisfaction*. Since these success dimensions show the highest performance index of all the variables, we attribute our findings to a habituation effect. The performance has already been on a high level for quite some time and, thus, no longer influences the impact level. Our finding that *system*, *information* and *process quality* do not significantly influence the perceived actual *use* is inconsistent with several other comparable studies. This may be explained by assuming that, despite the non-mandatory nature of employee portals, certain tasks can only be performed and certain information only gathered through the portal. Accordingly, *use* could be considered quasi-mandatory, although it is not required by any organizational policy, which would inflate the significance of *use* in the model.

Related to the employee portal, the results of the multi-group comparison indicate that there are differences between the industries in our sample. Our findings demonstrate that the impacts of the success factors that influence *use* and *user satisfaction* and finally the *individual impact* differ in intensity and significance.

Our research is limited in that we used a convenience sample of companies for collecting empirical data. A random sample from a pool of companies would have increased the generalizability of the results. However, this was not possible due to the relatively small number of companies participating in the benchmarking study. Furthermore, the multi-group comparison's results of the different sub-groups are each based on a relatively small number of companies. A larger number of participating companies would have increased the validity of the results. Furthermore, to analyze industry differences, we only compared the sub-group results without quantifying the group differences. Future research could extend the present study by conducting a t-test for assessing the differences' significances as described by Keil et al. (2000) or by applying more sophisticated approaches, such as the permutation procedure proposed by Chin (2003) and the PLS-based multigroup analysis (PLS-MGA) which was initially proposed by Henseler (2007).

Keeping the study's limitations in mind, our results contribute to both theory and practice. From a practical point of view, our model offers a means for organizations to evaluate and predict the success of employee portals. Employee portal success – like the success of any other IS – is multidimensional and interdependent. Owing to our results, practitioners can gain deeper insights into the levers that help to improve their employee portals. Furthermore, they can consider the differences between different industries and prioritize their investments accordingly. Our contribution to theory is the extension and further empirical testing of the D&M IS Success Model in a different setting and system context than in previous studies, as recommended by various authors (e.g., DeLone and McLean 2003; Iivari 2005). Our results advance theoretical development in the area of employee portals, serving as a basis for future research in this field.

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