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The Deployment of Business Process Management Systems: A Quantitative Analysis of End-Users' Evaluations

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Abstract

Business process management technology is used at many sites as an instrument to improve the efficiency and agility of business operations. Currently, only a fragmented insight exists into the determinants for successful usage of this technology. The study in this paper is a first approach to more systematically investigate this issue, in particular by taking the end-user perspective into account. The study draws from quantitative data on two different implementations of business process management technology, as generated by the involvement of 342 end users. A major finding is that the proposed research model, inspired by the DeLone and McLean IS success model, has a very high power to explain the successfulness of the investigated implementations. It is found in particular that input and output quality and the quality of the IT support during operations are key factors that are more important than the characteristics of the actual system, which has important ramifications for IT praxis and research.

Keywords: BPM, Workflow Management, Technology Acceptance, Field study.

1 INTRODUCTION

In harmony with the rise of process orientation in management thinking, information technologies that are aware of the wider contours of the business processes they are supporting have proliferated in the past two decades (Dumas et al. 2005). Most prominently among them are Business Process Management Systems (BPMSs). In essence, a BPMS will ensure that the right work is being executed by the right resource at the right time. It does so by handing out work items in accordance to the logic that is captured in a pre-defined workflow schema. This concept of process coordination by an IT system goes at least back to the days of office automation and is also quite well-known under the earlier "workflow management" moniker.

In the current economic situation, BPMSs can be considered as lifelines for companies (Gartner 2009). After all, these systems provide the means to quickly adapt to changing circumstances, such as a reduced order inflow or changing customer demands. Through a BPMS' reliance on explicit process logic in an updatable schema, it is easy to change the routing of work through a process (*routing flexibility*) as well as the way work is distributed to resources (*allocation flexibility*). But while the advantages of such increased agility are clear, the daily work of numerous employees is touched and affected by the deployment of a BPMS. Therefore, it seems reasonable that the full potential of a BPMS can only be exploited when targeted end-users are adopting the technology and feel comfortable in its usage.

Up to this point, there is only limited insight into the adoption of BPMSs or workflow management systems (their immediate predecessors). Various authors have pointed to difficulties in matching the capabilities of such systems with the realistic demands from the business (E.g. Bowers et al. 1995; Dourish 2001). Nonetheless, successful implementations have been reported as well as substantial associated benefits (E.g. Doherty et al. 2001; Kueng et al. 2004). Doherty et al. (2001) for instance find that managers' attitudes to WFMS in the financial sector "show suspicion as well as enthusiasm" and identify cultural impacts such as integration, customer focus and performance control. Kueng (et al. 2004) assess the implementation of a BPMS in a Swiss Bank. They report that the cycle times and reliability of the re-engineered and automated business processes have been reduced, which was a good basis for further enhanced performance.

While the cited studies relate to success factors of BPMS implementations and recognize the importance of user adoption, the offered analyses are qualitative in nature and do not extend beyond the scope of single case studies. A different approach can be found in De Waal (et al. 2009) and Poelmans (2002). More specifically, De Waal (et al.) focus on the importance of user influence, workflow system quality and the impact of a workflow system on the perceived job quality. Whereas the authors validate a quantitative satisfaction model; their sample of users is yet limited to one insurance workflow project. In Poelmans (2002), several workflow projects are analyzed and a success model is validated by means of a sample of users gathered from five workflow projects. The study concludes that certain task characteristics and factors such as user influence, training and support are significant determinants of the perceived suitability of workflow systems.

The goal of the present study is to further improve the understanding of the usage and success of operational BPMSs. It adopts a quantitative approach, acquiring data from multiple case studies, to examine a robust research model as proposed in this paper. The research model is inspired by general IS success models and incorporates different measures for the success of BPMS deployment as well as their determinants. Through this approach, it becomes possible to more accurately pin down the factors that contribute to successful adoption of BPM technology, which can provide a fruitful basis for knowledge transfer to IT praxis and guide directions for further research in this field.

The structure of the paper is organized as follows. First, we present and justify the rationale of our research model. Thereafter, the research design is clarified and the results of the statistical analyses are discussed. In the final section, we reveal our conclusions and present the research that we intend to do in the future.

2 EXPLANATION OF THE RESEARCH MODEL

Technology acceptance has been studied using a variety of perspectives and theories. These efforts are reflected in numerous empirical studies, concepts, measures and theoretical frameworks. Two frameworks or models that have been tested extensively and have dominated the field of IT acceptance and usage literature are the Technology Acceptance Model (TAM) (Davis 1989) and the DeLone and McLean (D&M) IS success model (DeLone et al. 2003).

Both models focus on the individual end-user's evaluations and have been used to assess the success of a variety of IT systems (like ERP systems, GSS systems, e-commerce systems, e-learning systems etc.) (E.g. Wu et al. 2006; DeLone et al. 2004; Pavlou 2003; Karahanna 2002, Seddon 1997).

The TAM utilizes behavior beliefs, attitudes and intentions and it is particularly useful to predict future voluntary usage. The Delone & McLean's IS success (ISS) model identifies specific system and information characteristics or attributes that can enhance user satisfaction, use and net benefits of an information system. By focusing on design attributes (like system or information qualities), the ISS model is appropriate to provide designers with guidelines to build improved ISs (Wixom et al. 2005). In the literature, the ISS model has been used in hundreds of studies with varying constructs and measures, so that it can be regarded as a success reference framework that is applicable to evaluate both mandatory and voluntary use of information systems.

In order to evaluate BPMSs in a systematic (and reproducible) way, we based our evaluation on the D&M framework, while integrating important concepts from the TAM. Figure 1 depicts our BPM success model. In the following three subsections, we present the rationale for this model.

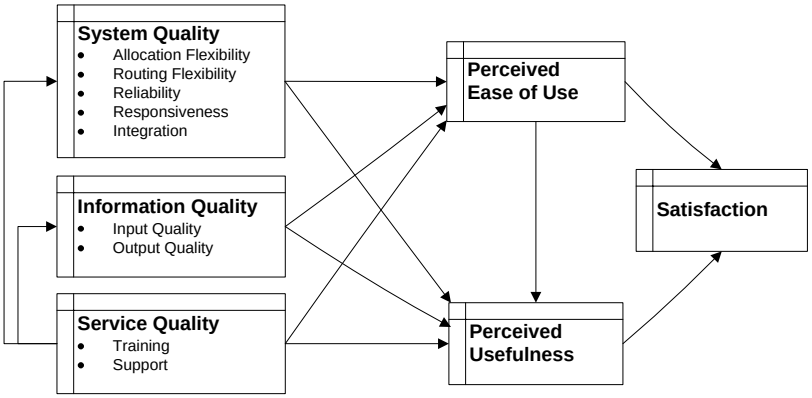


Figure 1. BPM Success Model, based on the DeLone & McLean Information Success Model

2.1 The impact of System and Information Quality

The left part of figure 1 depicts system and information quality, which corresponds with the original D&M framework. DeLone and McLean assumed that both types of quality are an essential part of IS success, influencing system use or intention to use a system and user satisfaction. System quality is a multi-dimensional concept and pertains to the qualities of the hard- and software that is used. It is measured in terms of several sub-dimensions such as reliability, flexibility, integration, responsiveness, etc. Information quality relates to the accuracy, timeliness, completeness, relevance and consistency of the information that is provided with the system.

In our research context, we aimed at evaluating the reliability, responsiveness, integration (with legacy systems) and flexibility of BPMSs. Since the main features of a BPMS include the allocation of business cases (or work items) to employees (within a certain step or role) and the routing of cases along the different steps (activities) of a business process (Jablonski et al. 1996; van der Aalst et al. 2002), we measured flexibility as the extent to which the declarative process logic is variable or configurable (to the end-user). In particular, routing flexibility measures the degree to which an end-user can alter or determine the routing (conditions) of a case in a business process. It refers to options to send a case forward or backward along the process. Allocation flexibility measures the degree to which end-users can choose or allocate cases within a particular step in the process.

D&M define information quality as the degree to which an IS generates information in a sufficient, and appropriate way. Based on our previous research and on interviews that we conducted with end-users, we contend that 'information quality' is not sufficient as an evaluation instrument for a BPMS. Typically, BPM technology is used by diverse types of employees. Some end-users, particularly those with purely administrative jobs only use the BPMS as an application to register their tasks or to insert data that will be used by other employees along the business process. For those kinds of users, data entry facilities were even more important than getting information out of the system. Usually, a combination of both was required. Therefore, we distinguish between 'input quality' and 'output quality'. As far as we know, this distinction has not been applied elsewhere.

In their updated version, DeLone and McLean also include service quality, measuring the quality of the provided training and support as a determinant of use and satisfaction. Although included in our study we treat service quality also as a determinant of information and system quality (see section 2.3).

While numerous studies have shown that the quality suites are indeed appropriate determinants, there have been many disputes on the role of use in the ISS model. Seddon et al. (1997), for instance, model IS use as a behavior that is caused by IS success, and thus not an integral part of it. In their adapted version of the D&M framework, perceived usefulness, but also user satisfaction are key success measures (influenced by system and information quality). More recently, both Rai (et al. 2002) and Landrum (et al. 2008) conclude that usefulness and use can be used as alternative outcome measures, leading to comparable success models.

These arguments are particularly valid in the context of BPMSs. Since such a system is pervasive, connecting several other systems and numerous end-users (Jablonski et al. 1996; van der Aalst et al. 2002), an individual cannot simply choose to ignore it once it is operational. What is more, since a BPMS might be highly structured, end-users might not have many options as to how to use it. Therefore, usage was not included in our study.

Not only usage, but also the net benefits measure (the ultimate dependent variable in the updated D&M model) has been challenged. In an ideal scenario, it is desirable to measure those benefits in an objective way using, for instance, cost savings or individual performance measures. In practice, however, it is often not possible to distil those benefits because the required data is not accessible or because benefits are intangible. For these reasons, net benefits are often replaced by "perceived benefits", and "perceived usefulness" (stemming from the TAM) as reliable surrogates to measure benefits (Wu et al. 2005).

2.2 BPM Acceptance: Satisfaction, Usefulness and Ease of Use

In the previous section, we indicated some difficulties with the right-part of the D&M framework and mentioned that perceived usefulness and satisfaction have been used as measures that are caused by system and information quality. User satisfaction is an important success measure that has been defined as the feelings and attitudes that stem from aggregating all the efforts and benefits that an end-user receives from using an IS. It should be seen as a more general attitude that does not influence system benefits (as proposed by DeLone & McLean), but is influenced by system benefits (Wu et al. 2005). Consequently, we model usefulness (as a measure of perceived system benefits) as a

determinant of satisfaction. This approach is in line with other studies such as Seddon et al. (1997), Rai et al. (2002) and Landrum et al. (2008).

In the literature, ease of use has recurrently been defined as a sub-dimension of system quality (DeLone et al. 2003, Landrum et al. 2008, Wu et al. 2006). In line with the TAM and Wixom et al.'s integrated model however, we see ease of use as a general behavioral belief, which measures "the degree to which the usage of a system is free of effort" (Davis 1989, Wixom et al. 2005). Seeing ease of use as a behavioral belief implies that it can be a result of a number of system configurations and qualities, but it is not a part of it. We also argue that ease of use is not only a consequence of system qualities; it is likely also related to information qualities. If a BPMS requires a lot of efforts to insert and retrieve appropriate and up-to-date information, it is to be expected that end-users will find the system "hard to use". Therefore, we model ease of use as influenced by both information and system quality. It is a separate success measure that we deploy, in accordance with the TAM, as a determinant of usefulness. Looking at ease of use in this way, we are also interested in measuring the direct effect of ease of use on satisfaction. A BPMS might be useful, but if it requires a lot of efforts to interact with, the end-user's general attitude is likely to be affected.

2.3 Service Quality

In the updated D&M framework (2003), service quality has been added on the same level as information and system quality, making it a dimension of IS success. Service quality is in this context defined as the quality of the support for end-users. In our research, we follow this definition and measured support and training as factors belonging to service quality.

However, as argued by other researchers (e.g. Wu et al. 2006), training and support are not the purpose of a successful IS. Instead, they are a means to increase end-user acceptance and help the end-user to deal with an IS in a successful way. Therefore, we also regard service quality as a concept influencing success measures rather than being a part of it.

In this paper, we investigate whether the effect of service quality is indeed mediated by system and information quality or whether it has also a direct effect on the behavioral success measures.

3 RESEARCH METHODOLOGY

3.1 Research Design and Data Collection

The sample in this study was collected using an online survey that we administered in the course of 2007 and 2008. The sample consists of 342 end-users of two BPMSs in different organizations in Europe. Prior to the administration of the survey, some in-depth interviews were conducted with management, IT personnel and key users in order to appropriate the survey to the specifics of a project.

Both BPM applications have been used for several years. In the first organization, a BPM application was developed in the 'TIBCO BPM Suite', in order to enact and monitor a well-structured communal invoice and order process. The business process has more than 450 end-users. 108 end-users responded to the survey. In the second organization, a BPM application was developed in Flower (now: BPM One). The application was (and is) used nationwide (with more than 1200 end-users) to support a strictly regulated governmental process that deals with objection and appeal requests from citizens. From this organization we received 234 responses.

3.2 Construct Measurement

Each construct was measured using several items. Where possible, we based ourselves on existing scales and adapted them if necessary. All items were measured on a 6-point Likert-scale, ranging from 1 ('totally disagree' or 'not at all') to 6 ('totally agree' or 'almost always').

3.2.1 Satisfaction, Perceived Usefulness and Perceived Ease of Use

To measure perceived usefulness and ease of use, we used (and slightly adapted) respectively 4 and 3 (reflective) items of the original measure of Davis' TAM.

As end-user satisfaction reflects a more general attitude towards the IS, we used 2 (reflective) items asking in a general way whether the employee was satisfied with the provided BPM solution.

3.2.2 System Quality

System quality is a multi-faceted concept consisting of dimensions such as: reliability, responsiveness, integration and flexibility, of the provided hardware and software solution (DeLone et al. 2003).

Reliability was measured using 3 formative items. (E.g.: Is the BPMS available if required? Does it crash? Does information get lost in the system?). Responsiveness was measured with two formative items, evaluating the speed and reaction time of the system. In order to evaluate whether the provided solution was well integrated with legacy systems, we listed the specific ISs that were integrated with the BPM solutions (such as Word, Excel, databases, etc.), resulting in 2 and 4 formative items in the two projects.

Since we are analyzing BPMSs, we measured allocation and routing flexibility as two separate constructs, consisting of 3 to 5 formative items. We asked respondents, for instance, to what extent they could choose the work items they were going to process; to what extent the routing procedure was alterable and to what extent they could access work items of colleagues.

3.2.3 Information Quality

As explained previously and contrary to the IS success literature, we split information quality into two disjoints factors: input and output quality.

Input quality is measured using 6 formative items; output quality is composed of 9 formative items. The items concern issues such as: the provided facilities to insert and retrieve information, and the degree to which information can be entered and retrieved in a complete, understandable and timely way.

- Some items that measure input quality:
  "Do you have sufficient data entry facilities?", "Can data input be done in a clear and understandable way (with the help of windows, menus, labels and fields)?"," Do you have sufficient help or support to diminish the required data entry (for instance pre-entered data or lists to choose from,...)?"
- Some items that measure output quality:
  "How do you evaluate: the completeness of the information, the readability of the reports, the up-to-datedness of the information, etc...."

3.2.4 Service Quality: Training and Support

To measure service quality, we asked the participants to evaluate the training and support they received and whether sufficient service had been provided. The resulting evaluations were then used

as formative items. The support and training measures are based on 2 to 6 items, depending on the case at hand.

3.2.5 Case Dummy

Because our data stems from two different BPM applications in two different organizations, we add a 'case dummy' as a determinant of each regression in PLS (see section 4). In this way we want to take into account context-specific factors that were not measured but that may influence the results.

4 DATA ANALYSES AND RESULTS

Next to descriptive statistics, we applied partial least squares analysis (PLS) (using SmartPLS) and bootstrapping to test our explanatory model. PLS is less restrictive than covariance-based structural equation modeling such as LISREL in terms of sample size, and distributional requirements (Chin et al. 1999, 1998). PLS combines a structural model (paths between constructs) with a measurement model (relationships between a construct and its items). PLS has become very popular in the past decade with multiple applications in IS-related journals such as "Information & Management" or "Information Systems Research".

Convergent validity was evaluated by examining the factor loadings of the constructs with reflective items (ease of use, usefulness and satisfaction). With loadings of more than 0.7, our reflective items exceed the threshold level of 0.5 (Hair et al. 1992). A reliability analysis resulted in Cronbach alpha's of at least 0.85. Discriminant validity is achieved (i) when the items load much higher on their own latent variable than on other variables, and (ii) when the square root of each construct's Average Variance Extracted (AVE) is larger than its correlations with other constructs (Chin 1998). In our sample both conditions are met for the latent variables with reflective items. The relevant loadings, Cronbach alphas, correlations and AVE's can be obtained from the authors upon request.

4.1 General Descriptives

The mean scores on all the factors are presented in table 1. System quality (SQ) is represented by its constituting factors (SQ1 to SQ5). The scores on usefulness, ease of use and satisfaction vary between 3.89 and 4.22 (on a 6-point scale). This means that in general the end-users evaluate their BPM solution as rather good or satisfying. The third column shows that 60 to 76 % of all respondents give an answer that is at least 4 (starting from "rather good").

In general, the BPM applications are considered as flexible. Particularly allocation flexibility has a high score in both cases (> 4.5). Routing flexibility is rated significantly lower in case 2. Table 1 also shows that training and support were well provided and organized in a sufficient way, with 75% and 87% of the respondents giving a score of at least 4. Both applications are "reliable", but integration and responsiveness leave room for improvement in both projects.

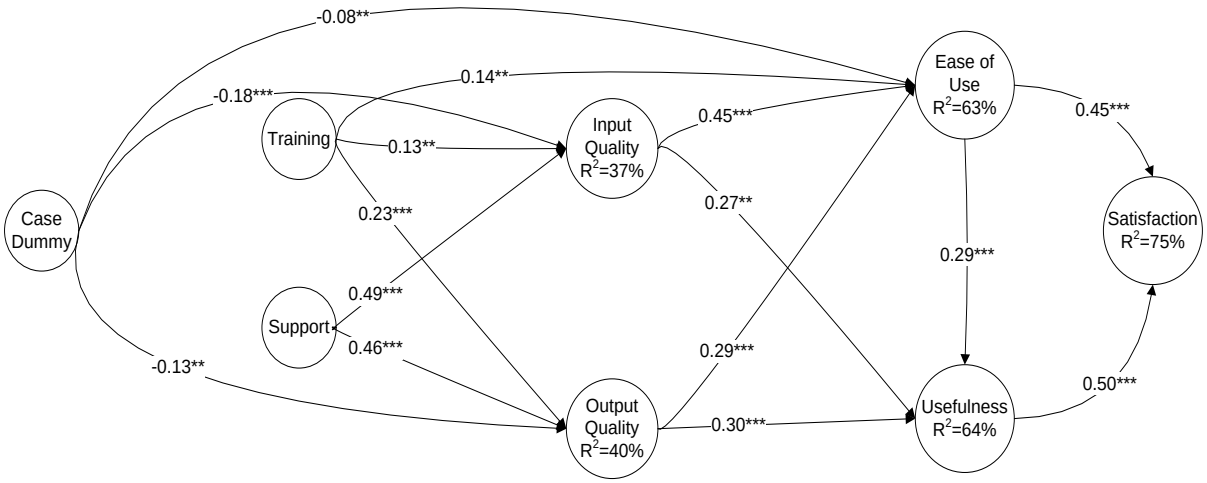
An important remark concerns usefulness and ease of use. Their scores are still positive but significantly less than the scores on satisfaction. Based on the interviews, we argue that the BPMSs have been improved over the years, leading to a satisfying solution. However, usefulness and to a lesser extent ease of use appraise also the impact on an individual's job performance. We therefore contend that end-users were more critical regarding the impact on their own productivity, believing that the application could still be improved to support their daily, individual needs.

Using ANOVA, table 1 also points to significant differences between the two projects, whereby the invoice & order application (case 1) is better assessed than the objection and appeal requests process (case 2).

Construct	*Mean (n=342)*	*S.D.*	*Positive Scores (> =4)*	*Mean Case1 (n=108)*	*Mean Case2 (n=234)*
Satisfaction	4.22	1.11	76%	4.51	4.08*
Usefulness	3.89	1.17	60%	4.24	3.73*
Ease of Use	3.92	1.15	59%	4.34	3.72*
Routing Flexibility (SQ1)	4.03	1.15	68%	4.47	3.82*
Allocation Flexibility (SQ2)	4.68	0.99	82%	4.97	4.54*
Responsiveness (SQ3)	3.60	0.67	66%	3.48	3.65
Reliability (SQ4)	4.45	1.05	65%	4.44	4.08*
Integration (SQ5)	3.81[1]	1.28	53%	3.77	3.82
Input Quality	4.00	0.87	56%	4.32	3.86*
Output Quality	4.21	0.72	66%	4.40	4.13*
Training[1]	4.18	1.18	76%	4.26	4.13*
Support[2]	4.39	0.91	87%	4.62	4.29*
**: significant difference (ANOVA-test); 1: 21 missing values; 2: 4 missing values*					

Table 1 General Descriptive Statistics

4.2 The BPM Success Model



*P< 0.05; ** p< 0.01; *** p<0.001

Figure 2. Trimmed BPM Success Model, without System Quality (applying PLS)

In Figure 2 the trimmed BPM success model is presented (without the non-significant paths). The model shows that no less than 75% of the variances in satisfaction can be explained by ease of use and usefulness. Both input and output quality are the main determinants of the latter behavioral beliefs (with R-squares of at least 63%). The constituting factors of system quality are not depicted in the model because they have no significant paths towards ease of use or usefulness. In the following section, we will show that system quality is not entirely without importance, as it is strongly correlated with both input and output quality. In fact, the data even suggests that the impact of system quality is mediated by information quality.

Another important finding concerns the impact of service quality. In particular, we can see a significant but limited influence of training on input & output quality and ease of use. The evaluation of the provided support has no direct impact on the behavioral beliefs, but strongly influences input and output quality. The latter finding is remarkable since both BPMSs are being used for more than 5 years. Providing sufficient support (i.e. using a helpdesk or key-users) still remains essential to increase end-users' perceptions of information quality. The smaller effect of training can be (partly)

contributed to the existing experiences of end-users and to the fact that their evaluation of the training they received is retrospective.

The case dummy finally only has a significant (but limited) impact on input and output quality and to a lesser extent on ease of use. This result indicates that the objection and appeal process has a significant lower score on input and output quality; an impact that cannot be explained with the variables that we tested. The impact of the case dummy on usefulness and satisfaction was non-significant.

4.3 Relationships between system and information quality

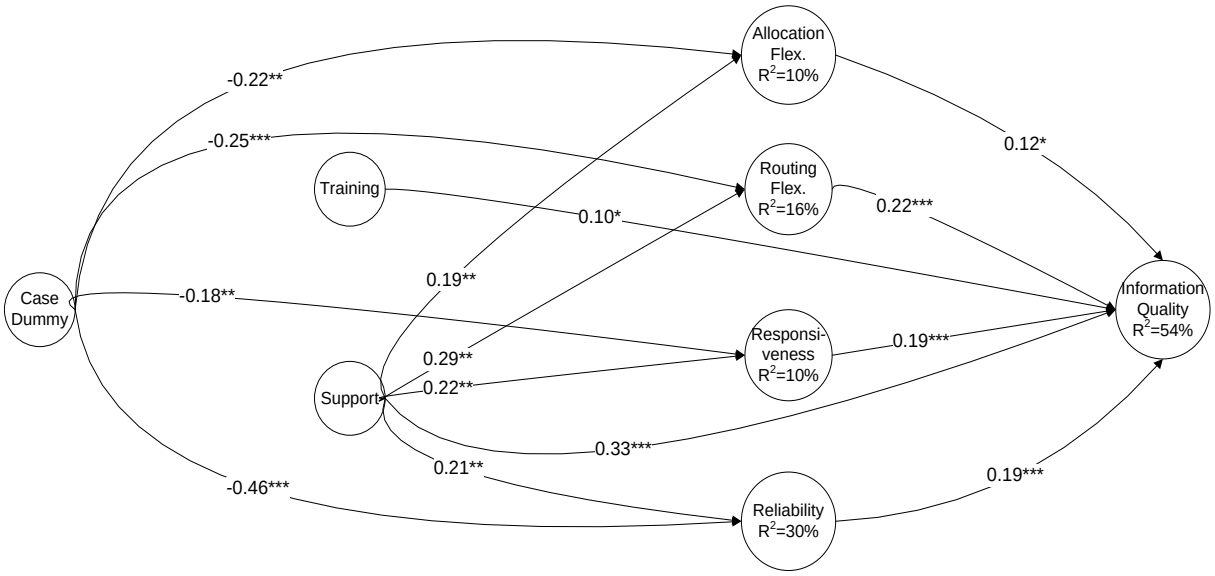
In the D&M model, system and information quality are seen as independent determinants of usage (or its substitutes) and satisfaction; and no path is assumed between them. In our sample, the system quality factors have no significant impact on ease of use, usefulness and also satisfaction (not even if we use one secondary 'system quality' factor). However, using both Pearson and Kendall's tau correlation analyses, the data clearly shows significant correlations between each SQ variable and input and output quality (with coefficients varying between 0.23 and 0.43).

Although this relationship is not (yet) investigated in most D&M studies, it seems plausible to presume that if the hard- and software is not reliable, responsive, flexible or well integrated, this will have an impact on the quality of the information that is provided by the system.

Next to this argument we did find the following pattern in the data: (i) input and output quality have strong direct paths to ease of use and usefulness, (ii) system quality has no such direct paths when information quality is taken into account, and (iii) system quality is significantly correlated with both input and output quality. Following Baron and Kenny (1986) we can as a result hypothesize that the impact of system quality (on ease of use and usefulness) is fully mediated via information quality. In Figure 3, we present the system quality variables seen as determinants of information quality (a secondary factor composed of input and output quality). The figure shows the significant impact of each factor, explaining 54% of the variances in Information Quality.[1] The underlying rationale is that end-users who evaluate system characteristics as being below their expectations, experience a significant lower information quality, which will affect their general behavioral beliefs about the system.

Besides this, the importance of support as a determinant of system quality is clear. We belief that end-users who are not sufficiently supported might not know the possibilities of the BPMS and thus perceive it as less reliable, flexible and/or responsive. On the other hand, organizations have to focus on data entry and information-retrieval facilities, but without sufficiently reliable, responsive, flexible and integrated BPMSs, achieving a high level of information quality is hard to achieve.

[1] Because of missing values, integration was left out of this structural model, but its correlation coefficients with both support and information quality clearly point to the same pattern.



**P< 0.05; ** p< 0.01; *** p<0.001*

Figure 3. Trimmed PLS Model: The Relationship between System and Information Quality

5 SUMMARY AND CONCLUSIONS

Business process management systems are being used in many organizations to improve the efficiency and agility of business processes. Through a BPMS' reliance on explicit process logic in an updatable schema, the routing of work (items) through a process as well as the way work is allocated to resources can be changed when required. But while the advantages of such increased flexibility are clear, the daily work of numerous employees is significantly affected by the deployment of a pervasive BPMS. Therefore, the full potential of a BPMS can only be achieved when targeted end-users are really adopting the technology and feel comfortable using it.

Yet, at the moment of this writing, only limited insights into the adoption of BPMSs or workflow management systems exist in the literature. While successful implementations have been reported, the great majority of the presented studies are purely qualitative and do not extend beyond the scope of a single case study. The presented work is thought to improve the understanding of the success and adoption of operational BPMSs.

Administering an online survey, we collected data from 342 end-users (a response rate of more than 20%) in two workflow projects (in different organizations). The BPM systems under scrutiny have been used for more than 5 years and they manage well-structured business processes.

With this sample, we validated a generic and reusable BPM success model. The model is inspired by the DeLone and McLean IS success model and incorporates measures from the Technology Acceptance Model as well. The data shows that end-users have adopted both systems well, with mean scores on satisfaction, usefulness and ease of that vary between 3.9 and 4.2 (on a 6-point scale). Moreover, 60% or more of the respondents gave a clear positive score on these measures.

The application of Partial Least Squares confirmed most of the hypothesized relationships (or paths) in our model. Ease of use and usefulness are strong determinants of satisfaction, and input quality and output quality are the main determinants of the former. At first sight, the different variables of system quality (reliability, responsiveness, integration and flexibility) did not have an impact on ease of use and usefulness. However, the data clearly shows that the system quality variables are significantly correlated with both input and output quality (and also the combination of both qualities in one

second-order factor). The underlying rationale is that end-users who evaluate system characteristics as being below their expectations, experience a significant lower information quality, which affects their general behavioral beliefs about the system.

In line with the DeLone and McLean framework, we also tested for the importance of the provided training and support, i.e. service quality. Because we do not see service quality as a goal, but as a means to facilitate a smooth and comfortable BPMS usage, we modeled training and support as antecedents of the system and information qualities and the behavioral beliefs. The data shows that training has a significant but limited impact on input and output quality and ease of use. Support on the contrary is a strong determinant of input and output quality, but also various system qualities.

From a practical point of view, this finding is remarkable since the systems are being used for more than 5 years. In the two organizations, several channels were used to support end-users, including a help desk, documentation and special key users. Interviews confirmed that even after 5 years, these services are absolutely necessary. Continuous appropriation of the BPMSs and new end-users, but also the occurrence of rare cases can account for this necessity.

The importance of factors such as ease of use and input and output quality emphasizes that BPM project teams should not only focus on system qualities and functionalities, but should pay considerable attention to facilitate and alleviate the required efforts to interact with the BPMS. In particular, BPM systems should endow end-users with sufficient information-retrieval facilities (in the form of reports, search features, etc.); but it seems equally important to provide the targeted users with sufficient means to enable them to enter data in a complete, consistent, accurate and timely way (as reflected in the impact of input quality).

With this study, we also aimed at establishing a number of benchmarks that can be used to evaluate additional case studies and workflow projects. We acknowledge that only governmental processes have been regarded in this paper. The BPM systems were implemented to support well-structured processes with several legal constraints. In the future, we want to enlarge our sample with other workflow projects in other organizations. Building on the presented results, we will also enrich our BPMS success model with more antecedents, including several individual and task characteristics.

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