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INFORMATION QUALITY DIMENSIONS: TWO EXPLORATORY CASE STUDIES WITH ENTERPRISE CONTENT MANAGEMENT SYSTEM USERS

Research

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Abstract

Using two explorative case studies we theorize in this paper about information quality as one variable of the IS success model explaining user satisfaction. We derive four dimensions of information quality which have a diverse and unique impact on user satisfaction: information characteristics, information access and security, information format, and task-information fit. Moreover, we identify contextual factors such as the pace of information change and update, legal and compliance requirements, and employees' skills which determine the importance of each dimensions for explaining user satisfaction. This more nuanced view of information quality as one component of the IS success model enables a better guidance of organizations in improving information quality to increase user satisfaction. Therefore, several organizational interventions are discussed that can be used to improve information quality by focusing on each of the four unique information quality dimensions separately.

Keywords: Information quality, IS success model, case study research, context, user satisfaction, enterprise content management

1 Introduction

Information systems (IS) that satisfy employees' needs have a higher probability of being used and thus of being successful in organizations as opposed to IS that are not accepted (DeLone and McLean 2003; Devaraj and Kohli 2003). With this in mind finding explanations for user satisfaction is one of the most intense researched fields in the area of IS research (Petter et al. 2012), nevertheless IS implemented in organizations are still challenged by a lack of user satisfaction (Polites and Karahanna 2012). This induces that IS do not generate the expected value in terms of profitability, efficiency, or organizational performance (e.g. Alter 2013; Melville et al. 2004; Sabherwal et al. 2006).

One reason for this might be that research focusing on user satisfaction defines an IS as a technical artefact, meaning the users treat an IS as "*a thing that is used*" (Alter 2013, p. 73). This definition leads to restricted views of user satisfaction as only the technical aspects of an IS are considered (Alter 2013). Nonetheless, Petter et al. (2012, p. 354) highlight the importance of information quality in today's information age: "*[I]t is not just the technical quality of the system that will drive benefits to the organization or society, but the information that is produced by the system*". Hence, information quality has not been focused on even though it is one key component of explaining of user satisfaction (Petter et al. 2012).

Building on Petter et al.'s (2012) identification of the importance of information quality it is important to acknowledge that, for example, if users perceive the format or the presentation of information as a threat, organizations should redesign the format of the information. However, if users perceive the usability of the information as a threat to their task, organizations should realign the information with tasks. The interventions an organization would implement to improve information quality differ for these two dimensions. As user satisfaction research does not differentiate between these, we intend in this paper to identify and analyze different dimensions of information quality to better guide organizations in improving information quality to increase user satisfaction. Hence, our research questions are: ***What are different dimensions of information quality and how does their influence on user satisfaction differ?***

Based on our results we are able to extend the current state of user satisfaction research by revealing different dimensions of information quality. We rely on the IS success model (DeLone and McLean 2003), which assumes that user satisfaction and the corresponding usage and net benefits are equivalent to the success of IS and information quality as one determinant of user satisfaction. Therefore, we conduct two exploratory in-depth case studies in which we analyze IS implemented in organizations and focus especially on information quality and user satisfaction.

The remainder of the paper is as follow. We will present in section two the research background about user satisfaction and information quality. The details about our methodology are presented in section three. Section four illustrates the results. Finally, the results will be discussed in section five deriving an extended model of IS success and information quality as well as an agenda for future research.

2 Research background

For analyzing and identifying different dimensions of information quality we rely on the IS success model (DeLone and McLean 2003), which will be described in the following.

2.1 Information system success

DeLone and McLean proposed a model in 1992 and updated it in 2003 to explain successful IS in organizations. The model assumes that the success of an IS can be evaluated in terms of information,

system, and services quality. These three variables influence subsequent user satisfaction, intention to use and use behavior. Certain benefits will be achieved by using the system.

System quality constitutes the desirable characteristics of the technology itself. These characteristics focus among others on usability, complexity, flexibility or navigation (Petter et al. 2013). Service quality represents the quality of the support the users receive from the IS department and information technology (IT) support personnel in using the IS, such as training, a hotline, or a helpdesk (Petter et al. 2013). These characteristics focus on service responsiveness and reliability. The IS success model proposes one variable of information quality, which refers to the desirable characteristics of information as the output of an IS (DeLone and McLean 2003), which will be described in more detail in Section 2.2.

In addition to factors focusing on the IS, system use represents the degree and manner to which an IS is utilized by its users and user satisfaction reflects the user’s level of satisfaction when using an IS (Petter et al. 2013). Finally, net benefits reflect the extent to which IS are contributing to the success of the stakeholders (Iivari 2005; Rai et al. 2002). The nomological network of the IS success model is illustrated by Figure 1, which will be used in this paper to identify different dimensions of information quality.



Figure 1: Nomological network of the IS success model based on DeLone and McLean (2003)

2.2 Information quality

In general, the role of information in employees’ daily work is that employees perform work by following work routines and by using information, technology and other resources to produce products or services for customers (Alter 2013). Hence, information need to be aligned with work routines because employees require information to produce a product or service for customers (Alter 2013). The fundamental core of an IS is to manage information and to provide employees information they need for their daily work such that “we can consider the potential of information systems to provide information for value creation, rather than just system efficiency” (Petter et al. 2012, p. 354). It is argued that the quality of information as an output of an IS is one of the major components explaining user satisfaction (DeLone and McLean 2003). In general, information quality is defined as “a measure of the quality of (the IS) outputs: namely, the quality of the information the system produces in reports and on-screen” (Gable et al. 2008, p. 389). In prior research studies, the information quality construct focuses on the following information characteristics: importance, availability, usability, understandability, relevance, format, content accuracy, conciseness, timeliness, and uniqueness (see Figure 1; Gable et al. 2008; Petter et al. 2012). However, researchers rather focus on information quality as a single construct when conducting research on user satisfaction and did not reveal different dimensions of information quality (e.g., Gable et al. 2008). Consequently, we will focus on different information quality dimensions to subsume information characteristics and to analyze their diverse impact on user satisfaction by conducting two exploratory case studies.

3 Method

In order to reveal different dimension of information quality we conducted two exploratory case studies. In line with Yin (2009), case study research is suitable for answering the hows and whys of phenomena as it provides a good understanding and explanation of phenomena in a local context (Eisenhardt and Graebner 2007). Therefore, case studies are chosen to analyze the phenomenon of information quality, to provide and discuss different dimensions of information quality and to analyze their influence on user satisfaction.

3.1 Enterprise content management

In our case studies we focus on enterprise content management (ECM), which “*comprise[s] the strategies, processes, methods, systems, and technologies that are necessary for capturing, creating, managing, using, publishing, storing, preserving, and disposing content within and between organizations*” (Grahmann et al. 2011, p. 272). In other words, ECM is a technology-based solution often used to make information accessible to employees (Laumer et al. 2013). ECM systems provide organizations with several benefits (Zardini et al. 2010). However, a recent study indicates that 30 percent of ECM users surveyed prefer other means of managing unstructured content and develop workarounds to avoid using an ECM system (Koplowitz et al. 2013). This makes ECM systems focusing on providing information to employees a suitable context to investigate the influence of information quality dimensions on user satisfaction.

3.2 Case study research

Our case study research is conceptualized as a multi-case design such that we focused on different work systems in different organizations and used several interviews to capture different opinions and perspectives on each work system analyzed. For each case we conducted interviews, which lasted between one and three hours. Each interview followed a two-step approach. First, we used the critical incident technique (Flanagan 1954) to capture employees’ beliefs about the ECM system they were interviewed about. This technique suggests asking our interview partners about major positive or negative reactions and critical occurrences in relation to the IS (“*What are your three most important positive and negative experiences with the ECM system?*”). Based on these insights, the second part of the interview started. Here, we tried to identify how and why these occurrences happened. Additionally, we tried to identify how the organization and employees behaved under these circumstances. Therefore, we extended our case study to interviews with managers to understand what kind of interventions they implement to increase information quality and whether these interventions focus on information quality in general or on a particular dimension of information quality. Hence, we are able to identify beliefs first, then drivers and consequences of these beliefs and finally interventions that are used to positively influence these beliefs and consequences.

For analyzing the data, we systematically structured the statements about different characteristics of the IS provided by our interviewees according to the different constructs of the IS success model. In a second step all statements related to information quality were structured and assigned to an information quality characteristic. In this step we grouped them according to the characteristics already investigated by prior research and if no assignment was possible, we assigned them to newly defined characteristics. Afterwards, each member of our research team was provided with the different information quality characteristics identified in our interviews and was asked to group them to one or more dimensions. For each dimension each member of our research team should state a description and a name. Moreover, each member of our research team should justify why one has subsumed different characteristics within one dimension. With this technique we were able to identify those information quality characteristics employees talked about when interviewed about an IS used in a specific work system and to group these characteristics into different information quality dimensions.

3.3 The case studies

3.3.1 Case A: Financial service provider

The ECM system investigated by our case study is used by a financial service provider with approximately 900 German speaking employees and total assets of EUR 3.2 billion. The product portfolio of the organization is rather constant such that information requirements do not change on a regular base; however, the organization's enterprise content management has to ensure the implementation of several legal and compliance requirements. The organization has implemented a web-based ECM system to support organizational processes and employees' working routines, providing content not covered by the banking and financial IS but required in support of sales talks and other work routines. Within the work system different types of information, including product and process information, or case-related information, are processed and used by employees. Case related information is provided by the financial and banking IS, whereas product and process information is made accessible through the ECM system. The interviews were conducted when the system had been used for almost ten years. In total we conducted 34 interviews. Besides the CEO and his two deputies, we interviewed the head of sales, the process manager of the organization, the CIO and two managers of rather back office departments. From the back office departments, we interviewed six employees in total. We also interviewed three branch managers and seven sales employees. Their ages vary from 22 to 65 years old. Most of the employees interviewed have a business or banking educational background.

3.3.2 Case B: Software vendor and IT service provider

The ECM system investigated in our second case study is used by a software vendor and IT service provider with approximately 100 German and English speaking employees working in Europe, USA and China. With new services offered each month the organization needs to provide information constantly and frequently. From a legal and compliance requirements point of view the organization's core information system have to follow several regulations, whereas the ECM-system is not affected by these. The organization has implemented a Microsoft SharePoint system to support the product development and deployment process as well as all sales and marketing activities. The ECM system is only used for information exchange, whereas sales information is managed in a customer relationship management (CRM) system, financial information in an enterprise resource planning (ERP) system and the development of software services is supported by development tools. Hence, the work system uses different IS, whereby the ECM system is central for exchanging information between the departments. The interviews were conducted when the system was used for almost two years. In total, we conducted 31 interviews. We interviewed the CEO, the ECM managers, and several employees whereby for each department at least one employee was interviewed. Therefore, we captured opinions of the ECM system from the sales, marketing, development, support, product and business management departments and from employees working at different international branches. Their ages vary between 26 and 64 years and most of the employees have a computer science or information system educational background.

4 Research results

When analyzing our case study data as described above we derive four dimensions of information quality: **information characteristics**, **information access and security**, **information format**, and **task-information fit**. We also identified that the **context** in which the IS is used is important. To present these results, we will first describe the information quality characteristics employees talked about which we subsume into one dimension. Moreover, we will illustrate how organizations have dealt with these dimensions in terms of improving information quality. Finally, we derive propositions for each dimension.

4.1 Information characteristics

The first dimension of information quality which we identified in our data analysis is labeled **information characteristics**. This dimension reflects those characteristics of information quality which are related to the information itself and are independent of its use (Alter 2006). Based on our interviews and our analysis as described above we were able to identify *accuracy*, *age*, *believability*, *consistency*, and *uniqueness* as characteristics of this dimension (see Table 1). *Accuracy* reflects the correctness of the information provided. *Age* is the amount of time between the publication of the information and the day it is accessed. *Believability* refers to the evaluation in terms of a bias in previous information from the same source. *Consistency* reflects the homogeneity of information published at different sources and *uniqueness* focuses on the singularity of information. All these characteristics have in common that they are independent of the use of information in a specific context such that they are subsumed in our analysis into one dimension of information quality reflecting the characteristics of the information itself independent of its use.

Dimension	Characteristics	Quotation
Information characteristics	Accuracy Case A: 6 (17.6%) Case B: 24 (77.4%)	<i>"Sometimes the information is simply not correct."</i>
	Age Case A: 16 (47.1%) Case B: 15 (48.4%)	<i>"In my point of view we have a lot of information that has been published a long time ago. When I see this kind of information I always take into question whether it is still up to date. This is rather dissatisfying."</i>
	Believability Case A: 7 (20.6%) Case B: 26 (83.9%)	<i>"I don't know if I can trust this information. I've had to look up information in this matrix before, and it turns out that the information was incorrect. So I have to take the believability for this source into question which is rather dissatisfying."</i>
	Consistency Case A: 25 (73.5%) Case B: 20 (64.5%)	<i>"When I look at our sales department's sites I get a different kind of information than when I go to the website of another department. Hence, for the same type of information I get different values at the same time. This is frustrating."</i>
	Uniqueness Case A: 4 (11.8%) Case B: 20 (64.5%)	<i>"We need arguments why this product is unique for our company. Hence, information that only we can present to our customers. However, this kind of information is missing as we always use the same arguments as our competitors."</i>

Table 1: Information characteristics as a dimension of information quality and its characteristics¹

Interventions implemented by the organization of case B focused on the characteristics of the information itself, rather than on the use of information. For example, the believability of information has been revealed as especially important. In order to address this challenge one manager of case B explained that *"employees do not trust this information as they believe that the information is rather old or not up-to-date anymore. Therefore, we implemented a timestamp that shows when the information was checked the last time and an information policy that requires that each information is checked at least once a year. This increased the satisfaction by our employees."* Hence, for the organization of case B it was important to understand that to increase user satisfaction they have to focus on the general information characteristics rather than on other dimensions of information quality like information access and security, format, or task-information fit.

¹ The percentage number indicates the amount of interviews a quotation was assigned to the respective characteristics compared to the total number of interviews. For example, in 6 out of 34 interviews we identified quotations in which employees talked about the accuracy of information.

Although most of the characteristics derived from our interviews have already been discussed in previous research (Gable et al. 2008; Iivari 2005; Wang 2008; Wang and Strong 1996), our analysis indicates that characteristics of the information itself is a unique dimension of information quality and that interventions to increase user satisfaction would be different for the characteristics of this dimension compared to the other ones. Therefore, the subsumed characteristics of this dimension are different from those of other dimensions as these characteristics focus on the information itself, and not on the use of information. Therefore, we propose based on our analysis the characteristics of the information itself as a distinct dimension of information quality:

Proposition 1: Characteristics of the information itself determine user satisfaction of an IS and are consequently a unique dimension of information quality.

4.2 Information access and security

In our analysis we have identified **information access and security** as a second dimension of information quality. This dimension reflects those characteristics which are related to the access of information and especially the restrictive access to information to enable information security. Hence, on the one side this dimension subsumes characteristics that make information usable and on the other side those characteristics that prevent the misuse of information. In our analysis we identified *access control*, *availability*, *ease of publishing*, *ease of access*, and *inappropriate use* as information characteristics and subsumed them into the information access and security dimension (see Table 2). *Access control* is the extent to which only intended users have formal permission to access the information and can also include the amount of extra work and authorizations needed in order to access the information (Alter 2006). *Availability* reflects that users believe that information is not existent. *Ease of publishing* and *ease of access* are related to ease of use of the system to publish information or to access and search for information. *Inappropriate use* focuses on the misuse of information. All these characteristics have the common factor that they focus on the way employees access or publish information and how this access prevents the misuse of information such that they are subsumed in our analysis into one dimension of information quality reflecting the characteristics of the information access and security, which are independent of the characteristics of the information itself, the format of information and the use of information in a specific context.

The interventions used by an organization to improve information quality would focus on enabling easier access to information and on enabling secure access to them. For example, in case A the inappropriate use of information has been highlighted as a concern. The manager of case A interviewed explained how they have addressed this issue: “*We were challenged by the security of our ECM system. Our board of directors resisted to use the ECM system for their work as they did not trust the system to protect their confidential information. Therefore, we implemented special security features and provided our board of directors with special security. Afterwards, the board of directors agreed to use the ECM system.*”

Hence, organizations revealing information access and security as a threat of an IS need to focus on those characteristics which we derived from our analysis and which we subsumed into the dimension of information access and security. Although, some of these characteristics have already been discussed in previous research (Gable et al. 2008; Iivari 2005; Strong et al. 1997; Wang and Strong 1996) the intervention of case A illustrates that access and security related interventions to improve information quality are different to the ones related to the other dimensions derived from this analysis. Hence, we can conclude from our analysis that how information can be accessed and how information is secured is a unique dimension of information quality. Therefore, we propose information access and security as a distinct dimension of information quality:

Proposition 2: Characteristics of information access and security determine user satisfaction of an IS and are consequently a unique dimension of information quality.

Dimension	Characteristics	Quotation
Information access and security	Access control Case A: 8 (23.5%) Case B: 3 (9.7%)	"I am not sure whether only those employees can access this information who are allowed to when I publish them on the new intranet. Hence, the use of the ECM system is not really satisfying as I am always afraid to contravene our compliance requirements."
	Availability Case A: 15 (44.1%) Case B: 4 (12.9%)	"Some information is simply not available. I do not have access to it."
	Ease of publishing Case A: 3 (8.8%) Case B: 10 (32.3%)	"I am not really satisfied with the ECM system as the new security policies require extra efforts such that I need more time than before to publish information."
	Ease of access Case A: 18 (52.9%) Case B: 14 (45.2%)	"The interface provides an easy entry point as I can access the information I need easily. Therefore, I am rather satisfied with the ECM system."
	Inappropriate use Case A: 10 (29.4%) Case B: 4 (12.9%)	"I believe that sometimes people have access to these kind of information and use them who shouldn't have access. Hence, I take the adequacy of our information security into question."

Table 2: Information access and security as a dimension of information quality and its characteristics

4.3 Information format

The third dimension derived from our analysis is **information format**. When analyzing the interviews of our case studies the format of information turns out to be an important influencing factor for user satisfaction and has been revealed as a unique dimension in our additional analysis. This dimension subsumes those characteristics of information that focus on the way the information is presented to the user. In our analysis we identified *conciseness*, *presentation* and *understandability* as information format characteristics. *Conciseness* reflects the rigor and the sententiousness of information. *Presentation* focuses on the format and the way information is designed to make it understandable to users and *understandability* itself is the extent to which information is clear, unambiguous and easily comprehensible (see Table 3). All these characteristics have in common that they focus on the way information is presented to the user and reflects the requirement that information needs to be represented in an appropriate format that accentuates its meaning (Alter 2006). They are independent of the characteristics of the information itself, the access and security of information and the use of information in a specific context.

Dimension	Characteristics	Quotation
Information format	Conciseness Case A: 26 (76.5%) Case B: 5 (16.1%)	"The way information is presented is succinct. I always believe one can say it with the half of the words they use".
	Presentation Case A: 24 (70.6%) Case B: 13 (41.9%)	"The information on the intranet is in an inappropriate language. Most of the information is in German, whereby the employees in New York only speak English".
	Understandability Case A: 14 (41.2%) Case B: 19 (61.3%)	"The information I need for my work is formatted in a way that it requires extra efforts to understand it".

Table 3: Information format as a dimension of information quality and its characteristics

Interventions implemented by an organization to improve user satisfaction would focus on the layout, format, language or general presentation of the information. For example, in case B the presentation of the information was criticized as most information was presented in German and English speaking employees are not able to understand this information. One manager of case B explained that "we used

to provide information in German. However, our international colleagues constantly complained about the language such that we started to publish information in German and English”.

In prior IS success research the format of information has also been investigated (Alter 2006; Gable et al. 2008; Iivari 2005). Our analysis indicates that the information format is different to the intrinsic characteristics of information, the access or security dimension of information quality, and the task-information fit. Organizations only need to focus on one dimension of information quality and can neglect the other ones. Increasing user satisfaction when information format is a challenge does not require interventions that focus on the general information characteristics, the access and security of information, or the task-information fit. Hence, we can conclude from our analysis that how information is presented to the user is a unique dimension of information quality. Therefore, we propose the characteristics of the format of information as a distinct dimension of information quality:

Proposition 3: Characteristics of the format of information determine user satisfaction of an IS and are consequently a dimension of information quality.

4.4 Task-information fit

As a fourth dimension we identified in our case study analysis the **task-information fit** as an important influencing factor for user satisfaction. This dimension reflects the extent to which information fits the needs of the task the information is used in (Alter 2006). In our analysis we identified *appropriateness, completeness, importance, relevance, timeliness, and usability* as information characteristics which we subsumed into the task-information fit dimension (see Table 4). *Appropriateness* reflects the extent to which information is suitable for a task in a given context. *Completeness* is the extent to which stated requirements for a specific information required for a specific task are fulfilled. *Importance* and *relevance* focuses on the extent to which information can be used to perform a tasks and to produce a qualitative outcome. Importance reflects whether information is significant for a task and relevance whether information is pertinent for a task. *Timeliness* focuses on whether information is available for a specific task or has arrived after a deadline. *Usability* reflects the applicability of information to a specific task. All these characteristics have in common that they focus on the use of information for a specific task such that they are subsumed in our analysis into one dimension of information quality. They are independent of the characteristics of the information itself, the access and security of information and the format of information.

Moreover, interventions implemented by an organization to improve user satisfaction would focus on the use of information in daily work routines and would improve the way employees use information to produce products and services for customers. For example, in case A the relevance of information was highlighted by employees as much of the information provided was simply irrelevant. One manager explained that *“We decided to implement a process-oriented approach such that information is now structured according to the process of our organization which enables a better fit between the information provided and the respective tasks. With this approach we are able based on the respective task to differentiate between relevant and irrelevant information”.*

Hence, although in prior IS success research the fit of information and tasks has already been focused on (Gable et al. 2008; Iivari 2005; McKinney et al. 2002), it becomes obvious in our analysis that the task-information fit is different to the intrinsic characteristics of information, the access or security dimension of information quality, and the information format. Organizations only need to focus on the task-information fit dimension of information quality and can neglect the other ones when those characteristics identified in our analysis (see Table 4) are perceived as a threat by employees. Increasing user satisfaction when task-information fit is a challenge does not require interventions that focus on the general information characteristics, the access and security of information, or the format of information. Hence, we can conclude from our analysis that the task-information fit as the extent to which information fits with the respective task should be considered a unique dimension of information qual-

ity (Alter 2006). Therefore, we propose task-information fit as a distinct dimension of information quality:

Proposition 4: Characteristics of the task-information fit determine user satisfaction of an IS and are consequently a dimension of information quality.

Dimension	Characteristics	Quotation
Task-information fit	Appropriateness Case A: 24 (70.6%) Case B: 7 (22.6%)	<i>"I don't think that the information is appropriate for my tasks. I believe support and the technical employees can use them, but they are not appropriate for me as a sales person"</i>
	Completeness Case A: 15 (44.1%) Case B: 14 (45.2%)	<i>"The information provided is not complete. I am missing explicit information that helps me to prepare my sales talks"</i>
	Importance Case A: 23 (67.6%) Case B: 12 (38.7%)	<i>"There is so many unimportant information published on the intranet which I cannot use for my work"</i>
	Relevance Case A: 27 (79.4%) Case B: 10 (32.3%)	<i>"The information provided is not relevant for my task. It does not make it easier for me to decide which task to follow and to which department I should forward the customer request to."</i>
	Timeliness Case A: 12 (35.3%) Case B: 23 (74.2%)	<i>"They expect us to sell products when our update is online. However, a lot of information is missing at this day such that it is hard for us to explain the new services to our customers in an appropriate way."</i>
	Usability Case A: 28 (82.4%) Case B: 12 (38.7%)	<i>"For our task information is simply not usable as there is so much information presented that we cannot use it"</i>

Table 4: Task-information fit as a dimension of information quality and its characteristics

4.5 Context

In addition to the general analysis of the two case studies our multi-case design also enables us to compare the results of the two case studies to highlight that the context the IS is used in is crucial to conclude the importance of different information quality dimensions for explaining user satisfaction.

Information characteristics. A comparison of the two case studies reveals that in case B the believability of information was mentioned more often than in case A, since based on previous experience employees do not trust published information anymore and always take their correctness into question (see Table 1: case A: 20.6%, case B: 83.9%). The organization investigated in case B is a software vendor and IT service provider that develops and offers services for internet payments. On a monthly base new payment services are deployed or updated based on the requirements of different internet shops (see 3.3.2). Hence, in case B new information needs to be provided constantly whereas in case A the information about the general financial products offered remain rather constant. Hence, in the context of case B in which information is changed constantly employees rather take the believability into question. In contrast, in case A in which information remains rather constant employees have more positive experience in using the information than in case B. Hence, the comparison of the two case studies reveals that the importance of this dimension differ based on the *pace of information change and update*.

Information access and security. In case A security and inappropriate use of information was a concern highlighted especially by top management (see Table 2: case A: 29.4%, case B: 12.9%). A financial service provider has to ensure several legal requirements such that information compliance is of particular importance for the organization investigated in case A (see 3.3.1). The software vendor investigated in case B has also ensured that several legal requirements are fulfilled whereby the IS investigated in case A is directly related to legal requirements and only indirectly in case B (see 3.3.2).

Hence, our comparison of the two cases indicate that information security is of particular importance based on the *legal or compliance requirements*.

Information format. In case A the format of the documents containing information was identified as a concern (see Table 3: case A: 70.6%, case B: 41.9%). In the point of view of the ECM manager of this case “*employees do not have the required skills to use authoring tools in an appropriate way*”. In contrast, in case B employees are well-educated in the use of IT as they all have an IT background and work in an IT company. Hence, the importance of this dimension differs based on employees’ skills as in case A employees do not have the required skills to format information appropriately (see 3.3). Consequently, the comparison of the two cases reveals the influence of the information format dimensions on user satisfaction varies based on *employees’ skills*.

Task-information fit. In case B the timeliness of information was mentioned more often than in case A (see Table 4: case A: 35.3%, case B: 74.2%). As already mentioned the software vendor and IT service provider of case B constantly develops and offers new services for internet payments (see 3.3.2). In the point of view of the ECM manager “*it is simply impossible to have all information up-to-date when we launch new products. Our product development does not provide an appropriate timeframe for providing information about the new services. Information is always published when the service is already deployed*”. In contrast, based on the lower frequency of deploying new products employees of case A can provide information on time (see 3.3.1) such that the comparison of the two cases reveals again the *pace of information change and update* as an important contextual variable for explaining the importance of different information quality dimensions on user satisfaction.

In summary, based on the comparison of the two case studies we can conclude that the context the IS is used in is important to understand the influence of the derived dimensions of information quality on user satisfaction. Therefore, we propose to consider the context of the IS when analyzing the importance of the different information quality dimensions:

Proposition 5: The importance of the different information quality dimensions differs for the context the IS is used in.

5 Discussion and implications

The importance of information for value creation or organizational performance has been highlighted as being even more important than system efficiency (Petter et al. 2012). However, it has also been concluded that information quality as part of IS success (DeLone and McLean 2003) has been rather understudied (Petter et al. 2012). Therefore, in this paper we focus on information quality in two explorative case studies to reveal different information quality dimensions and to analyze their distinct effects on user satisfaction. Based on our analysis we are able to derive four dimensions of information quality: information characteristics, information access and security, information format, and task-information fit. The analysis of our case studies provides evidence that these dimensions are unique and have a diverse impact on user satisfaction. Furthermore, our analysis also indicates that the importance of these dimensions in terms of determining user satisfaction differs based on the context an IS is used in. Consequently, we derived five propositions from our exploratory qualitative analysis, which are summarized in Figure 3. The implications of these propositions for theory and practice will be discussed in the following.

5.1 Theoretical implications

First of all, our results imply an extension of the IS success model and especially of the information quality construct of the IS success model. Prior research approaches argue that information quality including characteristics like accuracy, completeness, consistency, ease of understanding, personalization, relevance, security and timeliness (Gable et al. 2008; Petter et al. 2012) has an influence on user satisfaction and prior research measured information quality with a single construct including different

characteristics (Gable et al. 2008; McKinney et al. 2002; Petter et al. 2008, 2012). Based on the explorative qualitative analysis of the two case studies we derive four dimensions of information quality. These extend the theoretical understanding of information of the IS success model (Petter et al. 2012). The results indicate four unique dimensions of information quality and they also indicate that their influence is different in the two case studies analyzed. Hence, our results imply that similar to the technology components of the IS success model the information also needs to be differentiated into unique dimensions. From our case studies we can conclude four dimensions, which are illustrated in Figure 2. Based on this extension of the IS success model future research should differentiate between these dimensions when analyzing and discussing the importance of information quality and the need to focus on additional dimensions, which we might not have observed in our two case studies.

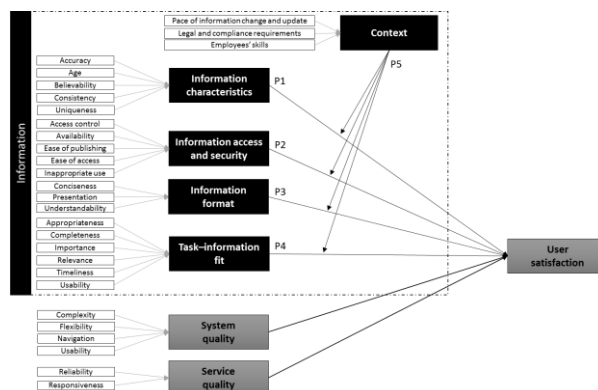


Figure 2: Implications: Information quality dimensions and user satisfaction

Second, beside the identification of four unique dimensions of information quality our results also imply that the IS success model needs to be extended by contextual factors. So far, the IS success model assumes that information, system, and service quality have a similar impact on user satisfaction in different contexts, whereby other researchers have called for a better understanding of context (Avgerou 2001; Davidson and Chiasson 2005; Johns 2006; Laumer et al. 2016). Our results illustrate that based on context factors the influence of the four unique information quality dimensions is different revealing the importance of context in IS success research studies. In particular, our study reveals pace of information change and update, legal and compliance requirements and employees' skills as contextual factors that explain why the influence of the four information quality dimensions on user satisfaction is different in the two case studies. As prior research has rather neglected contextual factors (Petter et al. 2012) we extend the IS success model by deriving a general proposition for the influence of contextual factor and reveal three contextual factors that have an influence in our study. These factors need to be further analyzed by future research in order to reveal additional factors not only for the information quality, but also for system and service quality.

Third, as prior research has especially focused on specific characteristics of information quality (see Figure 1; Gable et al. 2008; Petter et al. 2012) we also extend information quality research by revealing additional characteristics and in particular by assigning information quality characteristics to one of the four unique information quality dimensions. Especially for the information characteristics dimension we revealed information *age*, *believability* and *consistency* as characteristics that have rather not been focused on in prior research. Moreover, we revealed that *access control*, *ease of publishing or access*, and *inappropriate use* are characteristics of the information access and security dimension. Hence, we can conclude from our study additional characteristics that had not been focused on in prior information quality research. These can be used to better differentiate the effect of information quality dimensions on user satisfaction. This enables an extended understanding of user satisfaction determinants (Petter et al. 2013). Future research can build on these results by further analyzing these characteristics and by further identifying additional ones.

Nonetheless, our approach is also limited by several factors. First of all, we only analyzed two case studies which prevents the generalizability of our results. There might be additional dimensions and especially characteristics which have not been analyzed in our studies. We also did not control for the influence of individual differences (Laumer et al. 2015). Moreover, a quantitative analysis of these factors are missing. In this context future research might conduct a quantitative study and conduct a factor analysis and additional hypotheses testing to statistically illustrate that information quality consists of four dimensions and that each dimension has a distinct influence on user satisfaction. With our exploratory case study approach we are only able to identify these dimensions and to conclude propositions, which need to be further tested by quantitative approaches. Second, our results are limited as we only focused on ECM systems. There might be differences for other enterprise systems (Eckhardt et al. 2014) or business to consumer technologies (Maier et al. 2015a; Maier et al. 2015b). In this context future research might conduct a cross-system study to illustrate different dimensions of information in different contexts in order to show that for different IS different approaches might be more appropriate than an overall shot-gun approach to improve information quality.

In summary, the focus of our study on the information quality aspect of IS success revealed four dimensions of information quality which enable a better analysis of information quality of IS in a specific context. Moreover, our analysis reveals that the context is important to conclude the significance of the four dimensions of information quality. In our analysis we revealed the pace of information change and updates in an organization, the external compliance and legal requirements for an organization, and employees' skills as relevant context factors determining the importance of the information quality dimensions. Therefore, we imply for general IS success research (e.g. Petter et al. 2012, 2013) to consider contextual variables when analyzing the importance of the different information quality dimensions and also to consider analyzing these contextual variables for other aspects of IS success including system and service quality.

5.2 Practical implications

From a practical point of view our studies indicate that simply improving information quality might not necessarily lead to user satisfaction. When interpreting information quality as one variable of the IS success model one would implement interventions following the shot-gun approach. One would improve each characteristic subsumed under the general term information quality. With our results we are able to better guide organizations to improve information quality, as on the one side we derive four dimensions of information quality and on the other side illustrate that the importance of these factors varies for the context the IS is used in. Hence, we can generally advise that when organizations intend to improve user satisfaction, the focus on specific dimensions of information quality is vital and that before implementing any measures it is necessary to analyze which dimension of information quality is perceived as a threat by the organization's employees. In particular, the case studies illustrate that information policies including information retention dates enable a better evaluation of the information characteristics dimension. Special security trainings for the board of directors lead to a better evaluation of information access and security. A switch to a bilingual presentation of information and a revised document template address information format concerns. Finally, a reorganization of information according to the respective organizational products and processes increase user satisfaction based on the task-information fit. In summary, our case study research implies for organizations that it is important to identify the information quality dimensions inducing challenges to avoid a shot-gun approach and to target interventions for the most challenging information quality dimensions.

6 Conclusion

Our exploratory case study approach implies for IS theory and practice that information quality consists of four dimensions and that this more nuanced view of information quality enables a better guide for organizations to improve information quality and thus to increase user satisfaction.

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