ERP system fit – an explorative task and data quality perspective

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Abstract

Purpose – The purpose of this paper is to facilitate understanding of enterprise resource planning (ERP) system and data quality interdependency by presenting ERP systems’ use within data quality management.

Design/methodology/approach – The authors apply task technology fit (TTF) in an explorative study, conducting semi-structured expert interviews with participants in information technology strategic decision making. The authors analyzed the interviews with iterative descriptive and subsequent interpretive coding.

Findings – Although considered sustainable, continuously increasing regulations challenge ERP systems. However, compliance with regulations may serve as a bridge for organizations to engage in data analysis. Organizations are embedded into evolving task environments with the need to continuously adapt their systems or the organization and the need for contextual understanding of data quality.

Research limitations/implications – With ERP systems being used for administrative functions, future research might draw on extant ERP systems research from the manufacturing sector. However, for insurance-specific tasks, ERP systems and their data need to be considered in a sector-specific context with the need for further research.

Practical implications – ERP systems are considered sustainable. High initial fit is desirable, but the sector’s relevance for ERP system vendors might be more important for sustainability. Ensuring TTF will be an increasing challenge with increasing task non-routineness.

Originality/value – Applying TTF provides guidance for fit research, while the qualitative approach accounts for a deeper understanding, especially when exploring data quality issues since deficiencies might have several root causes. The authors show that ERP systems have an impact on data quality beyond its typically examined functionality.

Keywords ERP systems, Enterprise resource planning, Data quality, Data analysis, Insurance, Task-technology-fit

Paper type Research paper

1. Introduction

Impacts of poor data quality are multifaceted, including social and economic aspects (Wang and Strong, 1996; Haug and Arlbjorn, 2011; Haug et al., 2011). For instance, customer and employee dissatisfaction, reputation damage, failed data integration, and information technology (IT) projects result in estimated costs of up to 20 percent of a company’s revenue (Redman, 2004; Redman, 1998; Marsh, 2005). With continuously increasing amount and diversity of data, importance of data quality for organizational success increases (cf. Madnick et al., 2009). Data quality management (DQM) – concerned with definition, measurement, and optimization of data quality – is crucial to identify and mitigate poor data quality as well as entailed direct and hidden costs (cf. Haug et al., 2011). However, data quality is highly context-dependent and root causes of visible data quality issues should be examined within the respective context (Wang and Strong, 1996; Fehrenbacher and Helfert, 2012; Glowalla and Sunyaev, 2013c).

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For instance, in a large, worldwide operating company, the data quality problem of erroneous mapping of product identifiers led to additional rework in subsequent process steps and additional costs by unnecessary use of identifiers across retailers and markets (Hu¨ ner et al., 2011; Ofner et al., 2013). Even in smaller organizations with assumingly less complex processes data quality needs to be managed. For instance, in a medium-sized company, erroneous product data within one site led to production failures and high costs due to hidden problems in the information production process (Glowalla et al., 2014).

Most manufacturing and service organizations use enterprise resource planning (ERP) systems (Botta-Genoulaz and Millet, 2006). ERP systems are unlikely to fit completely to organizations’ needs (Strong and Volkoff, 2010). The imperfect fit is more severe in the service sector, where ERP system benefits lag behind (Botta-Genoulaz and Millet, 2006; Glowalla and Sunyaev, 2012). Few articles in extant ERP systems literature are specifically concerned with the service sector (Moon, 2007; Addo-Tenkorang and Helo, 2011; Glowalla and Sunyaev, 2013a).

We are interested in ERP systems’ use in the service sector from a data quality perspective. More specifically, we examine the information-intensive insurance sector (Bassellier et al., 2003) applying the theoretical lens of task technology fit (TTF) theory. TTF theory allows considering use and fit of information systems (IS) in the context of tasks with differing information needs, with data quality being one aspect of TTF (Goodhue and Thompson, 1995; Karimi et al., 2004). We address the research gap with the following research question:

**RQ1.** How are ERP systems used within DQM to provide a data quality fit for tasks within the insurance sector?

We apply TTF theory in an explorative study. We conducted semi-structured expert interviews with participants in IT strategic decision making. Our results show the need to apply a broad perspective on ERP systems to account for data quality impacts beyond the system itself. Our post-implementation perspective adds valuable sector-specific and general insights for practitioners and researchers, linking ERP systems’ use to DQM in evolving task environments.

The following section provides related research. Section 3 presents the applied research method and the study’s context. Section 4 starts with an overview of DQM and ERP systems in the examined organizations, followed by the analysis of DQM and ERP systems in the task context as well as ERP systems’ interdependency with DQM beyond particular tasks. Subsequently, the discussion and research synthesis reflect the findings from a TTF and organizational fit perspective, additionally drawing theoretical and practical implications. Finally, a short conclusion is provided.

2. Related work and theoretical background

2.1 TTF theory

TTF theory was developed in order to assess linkage between IS use and individual performance, depending on the IS fit for tasks (Goodhue and Thompson, 1995). TTF theory is applied varyingly: outcomes are mostly systems use and performance at different levels (Furneaux, 2012) although other outcomes, such as satisfaction (e.g. Karimi et al., 2004), are considered as well. Performance benefits imply a mix of improved efficiency, effectiveness, and quality (Goodhue and Thompson, 1995). The “use” was reconceptualized by Burton-Jones and Straub (2006) considering “use”...
context-dependently in relation to user, task, and/or system. Varying tasks and technologies have been examined and accordingly, different definitions and scopes of fit are applied (Furneaux, 2012). Following our research question, focusing on tasks and ERP systems’ use, we see the TTF model a helpful guidance for our explorative study. We conducted an explorative study since the presented tasks were not determined in advance (cf. Section 3.1). We rely on the main concepts from TTF (Goodhue, 1998; Furneaux, 2012) while additionally considering the context of the task environment and the examined organizations (Figure 1). In the following, we present our adaption of TTF theory in the study’s context structured according to the applied TTF concepts. Since the organizational environment has several implications for tasks characteristics (Karimi et al., 2004), we first present characteristics of the insurance sector to provide an understanding of the task context.

2.2 Task environment and task characteristics

The insurance sector heavily relies on storing, processing, and using information (Bassellier et al., 2003). Unification and deregulation of the financial service sector and the concept of the single European market allow insurance organizations to expand under common regulations throughout Europe (Mahlberg and Url, 2010; Fenn et al., 2008). We focus on the need to comply with regulations and data analysis. Both tasks are considered important and differ in characteristics relevant from a data quality perspective as well as ERP system fit perspective.

Regulations are externally imposed standards (cf. Sia and Soh, 2007), constituting defined tasks with low uncertainty and therefore considered routine tasks (cf. Karimi et al., 2004). However, insurance companies underlie several regulations (Beltratti and Corvino, 2008). Besides reporting standards such as the Sarbanes-Oxley Act (Wallace et al., 2011) or the International Financial Reporting Standards (Lindberg and Seifert, 2010), the directive “Solvency II” demands increased transparency to guard organizations and customers against economic risks (European Commission, 2011). Due to the increasing amount and diversity of data as well as analysis capabilities, data analysis is an evolving topic (Chen et al., 2012), implying non-routine tasks which may be voluntarily acquired by organizations. Data analysis in the insurance sector encompasses purposes that are relevant across sectors (e.g. targeting customers.

Figure 1.
Research framework adapted from general TTF model

Sources: Goodhue (1998); Furneaux (2012)
(Kulkarni and Devale, 2012)) and sector-specific purposes (e.g. insurance fraud detection (Ngai et al., 2011)).

2.3 Technology – ERP systems

ERP systems are commercial software packages enabling data integration across the organization (Haug et al., 2009; Davenport, 1998). Furthermore, ERP systems are commonly used as enterprise-wide standard software systems to integrate and optimize transactions and core business processes across functions (Addo-Tenkorang and Helo, 2011; Hoermann et al., 2010).

Instead of providing specific TTF profiles (e.g. Zigurs and Buckland, 1998; Baloh, 2007), extant research provides a methodology for assessing ERP system misfit before implementation (Wu et al., 2007). Moreover, enterprise and ERP system (mis)fit types are examined (Sia and Soh, 2007; Strong and Volkoff, 2010). Since we are interested in how ERP systems are used for tasks, which first needed to be identified, no detailed task specifications are available (cf. Wu et al., 2007).

2.4 Fit – ERP systems and DQM

There is no general agreement about which set of dimensions defines data quality, nor about the exact meaning of each dimension (Haug and Arlbjørn, 2011; Knight, 2011; Batini et al., 2009; Haug et al., 2009). According to our explorative approach, we apply a definition focussing on contextual aspects. Thus, data quality describes data’s fitness for the intended use or task by users or user groups. The quality is measured with regard to the user requirements and the intended use (cf. Haug and Arlbjørn, 2011; Wang and Strong, 1996). DQM refers to the definition, measurement, and optimization of data quality. Besides intrinsic data quality, which denotes context-independent data quality, we emphasize contextual data quality, which denotes requirements with respect to the task context (cf. Wang and Strong, 1996).

We apply a post-implementation perspective. Despite data quality’s impact on achievements of business benefits beyond implementation (Staehr et al., 2012), extant research neglects a post-implementation perspective on ERP systems (Gallagher and Gallagher, 2012; Schlichter and Kraemmergaard, 2010) and their impact on data quality and DQM (Glowalla and Sunyaev, 2013b). Hence, we examine ERP systems’ use within DQM in an evolving task environment instead of their implementation for predefined tasks.

2.5 ERP systems’ use

Our qualitative research approach allows a rich perspective on use compared to simple use or non-use (cf. Goodhue and Thompson, 1995), for instance, exploring subtasks ERP systems are used for. Moreover, it allows focussing on ERP systems, whereas the quantitative TTF instrument is designed for overall IS, not for individual application systems (Goodhue, 1998). The explorative research design helps to understand the interdependency of ERP systems and DQM, which should be evaluated in the organizational context (Karimi et al., 2004). The chosen participants are not necessarily direct users of the ERP system for the identified tasks. Thus, we examine a variety of uses of the ERP system from the managerial level (cf. Burton-Jones and Straub, 2006) and capture participants’ individual characteristics by their role (cf. Goodhue and Thompson, 1995). Assessment from employees involved in IT strategic decision making is especially important with regard to future acquisition and development of IT.
2.6 ERP system performance benefits
Given the managerial perspective, we rely on a more abstract assessment of ERP systems’ performance benefit that fits our selected participants. We assess performance by addressing fulfillment of strategic goals aimed at during implementation and, if the ERP systems are still considered sustainable, indicating a positive net benefit. Since ERP systems generally do not provide optimal fit and fit varies between operational and strategic levels (e.g. Strong and Volkoff, 2005; Gattiker and Goodhue, 2004) we see our assessment as an indicator if ERP systems will be used in the future for the identified and upcoming tasks.

Figure 1 summarizes the use of the TTP theory within our qualitative research approach, emphasizing the use of ERP systems from a post-implementation perspective within the evolving task environment.

3. Research approach
Figure 2 presents an overview of our data collection and analysis process which will be explained in this section. An overview of the findings is provided at the end of this section (Figure 3).

3.1 Data collection
For identifying tasks and exploring ERP systems’ use within DQM, we conducted semi-structured interviews, allowing to pose open questions and follow-up on new aspects (Myers, 2009; Kvale, 2007). We aimed to interview participants involved in IT strategic decision making. This selection of experts made access difficult (cf. Flick et al., 2009), therefore, we cooperated with a financial services consulting organization. We focussed our selection of organizations on large insurance providers in Germany with implemented ERP systems. For further information on the organizations (e.g. business figures, lines-of-business), we used public sources such as business reports.

Table I provides the 14 organizations where we conducted 15 interviews. The two interviews within the same organization were conducted independently of each other at different sites. Two organizations (participants no. 8 and no. 12) are no insurance-providers, but an insurance association and insurance consulting organization (not our cooperating organization). These interview partners were valuable for providing broad insights into the insurance sector since they are affiliated with several insurance...
### Tasks and general statements

<table>
<thead>
<tr>
<th>General statements</th>
<th>DQM</th>
<th>ERP system</th>
<th>ERP system and DQM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding and overview</td>
<td>Increasing requirements for data quality due to regulations</td>
<td>ERP system used to comply with regulations</td>
<td>ERP systems’ interdependency with data quality and DQM</td>
</tr>
<tr>
<td>Increasing need for DQM due to regulations</td>
<td>ERP system used to comply with regulations</td>
<td>Regulations have impact on ERP system</td>
<td>ERP facilitates DQM to comply with regulations</td>
</tr>
<tr>
<td>Data analysis to comply with regulations</td>
<td>Data analysis is beyond ERP system</td>
<td>Data warehouse used for data analysis (beyond regulations)</td>
<td></td>
</tr>
<tr>
<td>Data analysis necessary beyond regulations</td>
<td>Data warehouse used for data analysis (beyond regulations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longevity of products challenges data analysis</td>
<td>Data warehouse used for data analysis (beyond regulations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broad variety of input data for diverse analysis subtasks</td>
<td>Data warehouse used for data analysis (beyond regulations)</td>
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</tbody>
</table>

**Note:** ERP system’s limitations
From the insurance providers, only two organizations (participants no. 2 and no. 13) had no ERP systems implemented, although one of them was on the brink of doing so. These organizations provide contrasting insights, which are important to be aware of when drawing conclusions. All organizations but one can be considered large companies (Eling and Luhnen, 2010).

To facilitate truthful interviews, we ensured participants’ anonymity (cf. Walsham, 2006). Of the 15 participants (Table I), 13 are involved in IT strategic decision making as decision makers or direct advisors. All participants have a minimum job experience in the financial service sector of 11 years and a mean of 19.8 years. We developed a guideline, which was reviewed by a fellow researcher, who was not involved in the study, and a practitioner from our supporting organization. Additionally, we conducted two interviews in advance for validation. After posing questions regarding the organization and the participant, we asked for market developments, IT trends and organizational IT strategy to gain understanding of relevant topics in the examined organizations. Regarding the ERP system, we asked for implemented modules, potential customizations as well as extensions, supported lines-of-business, main strategic goals pursued with the implementation, and whether the ERP system – in its current state – is considered appropriate to support upcoming IT strategic developments. Regarding DQM, we posed questions on data quality key issues, how DQM is conducted currently and will be conducted in the future. Additionally, we explicitly asked about the role ERP systems have concerning definition, measurement, and optimization of data quality and picked up the topics the participants mentioned at the beginning of the interview. Besides providing insights into ERP systems and DQM, these questions allowed identifying relevant asks from the participant’s perspective and addressing them in an ERP system and DQM context. The interviews took 37-75 minutes, with an average of 58 minutes. We recorded and transcribed the interviews and sent them back to the participants for communicative validation (Flick et al., 2009) resulting in minor wording adjustments.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Participants’ position</th>
<th>Organizations’ premium income in million euros</th>
<th>No. of employees</th>
<th>Operating countries</th>
<th>Life-of-business</th>
<th>ERP system</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>CIO</td>
<td>1,000-5,000</td>
<td>1,000-5,000</td>
<td>Worldwide</td>
<td>Composite</td>
<td>X</td>
</tr>
<tr>
<td>No. 2</td>
<td>Head of IT</td>
<td>&lt;1,000</td>
<td>&lt;1,000</td>
<td>Europe</td>
<td>Composite</td>
<td>–</td>
</tr>
<tr>
<td>No. 3</td>
<td>Head of IT</td>
<td>1,000-5,000</td>
<td>1,000-5,000</td>
<td>Germany</td>
<td>Composite</td>
<td>X</td>
</tr>
<tr>
<td>No. 4/No. 6</td>
<td>Enterprise architect/CIO</td>
<td>&gt; 10,000</td>
<td>&gt; 10,000</td>
<td>Worldwide</td>
<td>Composite</td>
<td>X</td>
</tr>
<tr>
<td>No. 5</td>
<td>Head of IT</td>
<td>1,000-5,000</td>
<td>1,000-5,000</td>
<td>Germany</td>
<td>Composite</td>
<td>X</td>
</tr>
<tr>
<td>No. 7</td>
<td>Head of IT</td>
<td>&lt;1,000</td>
<td>&lt;1,000</td>
<td>Germany</td>
<td>Life</td>
<td>X</td>
</tr>
<tr>
<td>No. 8</td>
<td>CIO</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>X</td>
</tr>
<tr>
<td>No. 9</td>
<td>Executive board member</td>
<td>1,000-5,000</td>
<td>1,000-5,000</td>
<td>Europe</td>
<td>Non-life</td>
<td>X</td>
</tr>
<tr>
<td>No. 10</td>
<td>CIO</td>
<td>&lt;1,000</td>
<td>&lt;1,000</td>
<td>Germany</td>
<td>Non-life</td>
<td>X</td>
</tr>
<tr>
<td>No. 11</td>
<td>Head of IT</td>
<td>5,001-10,000</td>
<td>5,001-10,000</td>
<td>Europe</td>
<td>Non-life</td>
<td>X</td>
</tr>
<tr>
<td>No. 12</td>
<td>CIO</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>No. 13</td>
<td>Enterprise architect</td>
<td>&gt; 10,000</td>
<td>&gt; 10,000</td>
<td>Worldwide</td>
<td>Composite</td>
<td>–</td>
</tr>
<tr>
<td>No. 14</td>
<td>Head of IT</td>
<td>5,001-10,000</td>
<td>5,001-10,000</td>
<td>Germany</td>
<td>Composite</td>
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<tr>
<td>No. 15</td>
<td>CIO</td>
<td>&lt;1,000</td>
<td>&lt;1,000</td>
<td>Germany</td>
<td>Composite</td>
<td>X</td>
</tr>
</tbody>
</table>

Table I. Participants and examined organizations
3.2 Data analysis
We analyzed the interviews starting with iterative descriptive coding (Myers, 2009). Given the interpretive nature of our study, we wrote down assumptions and potential insights during the interviews and coding for subsequent interpretation (Klein and Myers, 1999). The preliminary categorization was reviewed by a second independent researcher followed by iterative descriptive and interpretive coding (Myers, 2009) in order to saturate the codes and allow for context-specific interpretation of the findings. We analyzed all interviews iteratively and again after conducting all interviews, since data collection was continued throughout the study. We applied an open source software tool (Huang, 2011) especially for meaning condensation and the interpretation of statements in their original context (Kvale, 2007).

First, statements regarding, for instance, market developments, ERP systems, and DQM were categorized accordingly. Then, we examined the use and benefit of ERP systems and DQM in general, resulting in an understanding and overview of DQM and ERP systems (cf. Figure 3 and Section 4.1). In order to provide a task-related examination of ERP systems and DQM interdependency, we analyzed DQM and ERP systems within different contexts (e.g. regulations, mergers, and acquisitions). For a detailed presentation of our results, the provided analysis focuses on the two major and dissimilar tasks in the examined insurance organizations, namely comply with regulations and data analysis (cf. Figure 3 and Sections 4.2 and 4.3). The analysis indicated further valuable insights into ERP systems and DQM interdependency beyond the tasks. Therefore, we additionally examined ERP systems and DQM beyond particular tasks (cf. Figure 3 and Section 4.4). To facilitate understanding and transparency of our interpretation, we provide further task-related statements from insurance providers with implemented ERP systems in the Appendix, additionally to the ones used in the body text, which aim to provide comprehensible examples.

4. Findings
4.1 Understanding and overview of DQM and ERP systems
We asked all participants to review each definition for questions or comments. Whereas understanding of ERP systems is rather homogeneous, understanding of data quality and according key issues differs among participants. Seven participants consider the definition of the data purpose and the user requirements as key issues. In contrast, the other eight participants start off with quality dimensions (e.g. completeness, accuracy) or specific needs (e.g. data quality for simulation).

One reason for the heterogeneous understanding of DQM might be the early state of DQM within the examined organizations. Considering the insurance providers with ERP systems, five manage data issues ad hoc if reports deviate from expected results or data quality issues appear. Extending DQM in these organizations is not planned, although data quality is a main topic. Another five organizations provide rudimentarily structured approaches to DQM. The remaining two organizations aim at automating DQM processes and transferring migration practices to continuous operational business.

ERP systems in the examined organizations are mainly used for administrative functions, especially accounting. To additionally support insurance-specific functions (e.g. claims processing), further integration with other systems is necessary. The participants see the strategic goals (e.g. standardization across organizational sites, standardized accounting) that were aimed at with the ERP system implementation fulfilled and only in one organization the sustainability of the existing ERP system is questioned.
4.2 Comply with regulations
Solvency II is the main concern in the examined organizations. According to the participants, an increasing number of business figures needs to be reported frequently and transparently. Additionally, regulations require increasingly detailed levels at which data are provided. ERP systems are used extensively to comply with regulations. Except for one, all participants state a dependency between ERP systems and regulations. ERP systems are used to comply with current and upcoming regulations, supporting obligatory reporting. Therefore, the continuous extension of regulations facilitates the importance of ERP systems. This is the more the case, when participants rely on ERP system vendors to support upcoming regulations with future releases: “I assume that functionalities, for instance IFRS 5, that are currently missing in the general ledger, will be provided in future releases” (no. 09).

On the other hand, nine participants address the impact of regulations on ERP systems. The challenges, besides gathering new data, include increasingly shorter reporting cycles as mentioned by one CIO: “We should think about how to consider Solvency II within the ERP systems in order to have a chance to calculate our numbers in increasingly shorter cycles and to control for data’s consistency” (no. 15).

When participants refer to DQM and ERP systems in the context of regulations, the statements are implicit, rather referring to the provided functions to comply with regulations than directly addressing a positive impact on data quality: “When we have the standardized data in the central ERP system, we are able to fulfill the legislative requirements” (no. 14).

Implemented ERP systems have their limits despite being used to comply with regulations. Two participants refer to data warehouses to comply with regulations, allowing for data lineage and adequate reporting. Both participants work at internationally operating organizations. A CIO from a national insurance organization addresses limits of their ERP system in the context of Solvency II as well, and the need to gather data not available in the ERP system: “Due to the requirements from Solvency, much data comes from administrative systems which are not in the traditional ERP system” (no. 15).

4.3 Data analysis
Data analysis and the entailed need for high data quality are diverse regarding the purpose of data analysis as well as the input data. The high amount of available data and the plethora of analysis purposes make DQM difficult since analysis purposes might be unknown prior to data collection. As one CIO explained: “In the core business, when completing an insurance policy form, I once knew why I need the data. Today, we are able to collect more and more data, but I don’t know what to do, what to search if I have far too much data” (no. 06).

Even if the purpose of data analysis is defined within an organization, data quality needs to be reassessed for this purpose. Employees or data analysts, respectively, might rely on data, which was used and created in another context. In this case, the entailed limitations of the data for analysis need to be understood to gain valid results. One CIO of an insurance provider explained their approach to data analysis in more detail, focussing on issues of analyzing data in a new context. Within the organization, data analysis was extended across formerly disjoint data and users. When merging different data or using data in a new context, data users need to understand the data as well as their implications and limitations for the analysis task: “The difference needs to be understood. If someone is used to work with fairly robust numbers, which can be
extrapolated over the next five years; and now is forced to work with numbers, where inaccurateness is much greater and several scenarios might occur” (no. 15).

ERP systems’ use for data analysis is limited. Participants do not consider ERP systems in the data analysis context or explicitly point out their limitation. When referring to specific systems for data analysis, participants mention data warehouses beyond the compliance with regulations: “Measuring and improving data quality wouldn’t necessarily have to do with the ERP system. I think data quality within the ERP system is very high because it enters the system through very formalized data collection processes. Less reliable or tangible is data that I collect by-the-way, which flows through the market. That has certainly more impact on data warehouse systems, on customer relationship [management] systems, where data is stored” (no. 06).

Compliance with regulations and data analysis overlap since data analysis is necessary for obligatory reporting. With increasing need to gather new and more detailed data to comply with regulations, DQM will be increasingly challenged. Additionally, out of the obligatory tasks, further data analysis possibilities arise and potential analysis insights need to be evaluated. However, data analysis goes beyond compliance with regulations and two participants explicitly address the need to engage in data analysis beyond given obligatory requirements. We consider a broader perspective in the following to assess ERP systems within DQM beyond particular tasks.

4.4 ERP systems’ interdependency with data quality and DQM

We examine participants’ statements on the interdependency of ERP systems with data quality and DQM beyond particular tasks. If participants refer to the impact ERP systems have on data quality, they state positive impacts, for instance, due to build-in plausibility checks and reporting functions. “The ERP system can facilitate work massively or not. If it does not support your processes, you need to do it all manually, extract data from system A and system B, define a report that compares data. […] That is done by the ERP system, it has all those reports” (no. 01). Three of nine participants stating a positive impact on data quality, see the positive impact on data quality compared to legacy systems.

The positive impact affects other systems as well. The impact of ERP systems on data quality is important for subsequent systems, for instance, if data from the ERP system is consolidated for further analysis in a centralized system or data warehouse: “We expect that the interfaces will be updated, using [ERP system’s API function], and therefore achieving another data availability in our data warehouses” (no. 09). Furthermore, the ERP system might have an impact on preceding systems if data quality issues are identified through data consolidation: “And in the end, the ERP system […] that actually gets aggregated data only, has the requirement that all data can be traced back very detailed into the inventory control system. And that is a question of data quality as well. Therefore, the ERP system has mostly a backlash on the delivering systems” (no. 11).

However, depending on the understanding of DQM and the use of the ERP system, the system’s impact might be perceived differently. According to five participants, data within other systems might be equally or even more important: “And the big challenge is to set both data sides from the ERP and other systems into relation for calculating our business figures” (no. 15). Similarly, in a broader organizational context, data quality in core business processes will be more important: “The data collected in the data warehouse primarily originate in the core processes. Of course there are some data
from the ERP system, financial statements, controlling data” (no. 11). More rigorously, one participant answered the question which role the ERP system has for definition, measurement, and optimization of the data quality: “None. Our standardized, central accounting ERP system: none” (no. 14).

Beyond ERP systems, defining data owners seems to be a main step toward DQM, addressed by three participants. There are no clear statements about if and how DQM embeds ERP systems strategically or about other potential strategic aspects, for instance, that ERP systems may provide a framework for DQM.

5. Discussion and research synthesis
5.1 ERP systems’ TTF in the insurance sector
The results indicate that ERP systems support compliance with regulations, whereas data analysis relies on other systems or applications. Presumably task routineness plays a major role (Karimi et al., 2004). In the insurance sector, ERP systems are primarily used for administrative functions, such as accounting. Thus, ERP systems provide functions and data for compliance with standardized regulations. In contrast, data analysis draws on diverse data to gain new insights and adequate input data and the output might be unknown in advance. Although reporting is basic data analysis (Chen et al., 2012), such analysis in administrative functions might be seen as obligatory, not bringing competitive advantage. However, the current requirements of Solvency II for additional detailed data increase non-routineness and therefore lead to higher task complexity (cf. Karimi et al., 2004). Continuously increasing regulations challenge implemented ERP systems and may blur the distinction between compliance with regulations and data analysis regarding task routineness. Moreover, regulations may serve as a bridge for organizations to engage in data analysis, with ERP systems being used for accounting which is a starting point for data analysis (LaValle et al., 2011). In the insurance sector, we see ERP systems an adequate starting point for data analysis due to their first, primary use for accounting; second, their positive impact on data quality, additionally affecting preceding and subsequent systems; and third, an overlap of regulations compliance and data analysis. There is a need for further research in order to identify insurance-specific requirements for data analysis and on how to lever ERP systems’ potential.

ERP systems seem to provide performance benefits at the global organizational level since strategic goals related to their implementation seem to be fulfilled and most ERP systems are sustainable. Explanations for sustainability are that ERP systems are considered having a positive impact on data quality and that ERP system vendors are expected to extend functionality for upcoming regulations in future releases. The positive impact on data quality needs to be reflected carefully. Although participants state a general positive impact on data quality, data quality needs to be addressed within the respective context. The reliance on ERP system vendors to extend functionality for upcoming regulations represents filling functionality deficiencies (cf. Strong and Volkoff, 2010). Since regulations are externally imposed by the task environment (cf. Sia and Soh, 2007), they apply to the whole sector and might be delivered by vendors.

5.2 ERP systems’ fit from the organizational perspective
From the post-implementation perspective, ERP systems are embedded into an evolving task environment. If misfits arise, organizations have the choice to customize the ERP system or to adapt to it (Sia and Soh, 2007). Therefore, changes can be made to
the deep and surface structure of the ERP system or at the latent structures level. Latent structures comprise organizational culture, control, and roles, which emerge from ERP systems’ use and may lead to misfits as well (Strong and Volkoff, 2010).

Regulations are externally imposed and, if leading to misfits, a customization of the ERP system might be the preferred solution (cf. Sia and Soh, 2007). In the case of Solvency II, missing functionality represents a deficiency and should be timely delivered by vendors. In contrast, data analysis beyond regulations is voluntarily acquired. Customizing the ERP system or adapting to it might not be a feasible solution, since the functionality will rather be provided by other systems. However, data necessary for analysis is part of the deep structure of the ERP system already structured for specific tasks. When data are used for other tasks, its quality needs to be defined and assessed within the new context although the ERP system might provide high intrinsic data quality. Therefore, ERP systems need to be embedded within DQM at the latent structures level.

Extending the TTF perspective with the latent structures perspective accounts for general statements (cf. Sections 4.1 and 4.4), abstracting from (insurance) specific tasks, and facilitates embedding ERP systems into a strategic context (cf. Mathrani et al., 2013). Intrinsic understanding of data quality and the initial state of DQM may inhibit using ERP system’s data for other tasks such as data analysis. The task environment evolves around ERP systems and thus misfits will arise continuously. Strategies on how to resolve different types of misfits (Sia and Soh, 2007) and the consideration of the latent structures (Strong and Volkoff, 2010) provide a starting point for coping with misfits from an ERP system post-implementation perspective. Stakeholders affected by adapting the organization might argue for changing the ERP system because of reluctance to adapt themselves or due to lacking awareness of the impact of changing the ERP system. Hence, latent structures and their interdependency with underlying systems should be identified and it should be avoided that stakeholders decide about changes in their own interest or from their own limited viewpoint. In order to avoid the latter issue, according (data quality) management structures need to be implemented. Introducing data owners is one possibility to consider data quality beyond the ERP system and facilitate a better understanding of data quality across the organization, but the data owners need to be aware of the different tasks and data quality requirements across data consumers (cf. Knight, 2011; Lee and Strong, 2003; Staehr et al., 2012).

5.3 Theoretical implications
Qualitative studies have gained little attention in context of TTF theory (cf. Furneaux, 2012). By providing a qualitative approach to TTF (Figure 1), we address shortcomings of quantitative TTF research, which is rather a starting point for identifying issues (Goodhue, 1998). For instance, poor data quality might be attributed to the application which merely presents data instead of flaws in preceding systems. Regarding data quality, several dimensions are used to assess satisfaction with data (Goodhue and Thompson, 1995; Karimi et al., 2004) without considering which dimensions of data quality depend on which system or even on other factors (e.g., data collectors). Deficiencies with data quality might have several root causes, which are not visible to the data consumer (Lee, 2006). For instance, data may be perceived incomplete, although its accessibility is impeded. A qualitative TTF theory approach accounts for complex, cross-sectional data quality issues and tasks that are influenced by different systems. In our study, the qualitative research approach allows to draw a more detailed picture of a system’s fit with respect to different tasks as well as different system perspectives
(e.g. data vs function) which were not defined in advance. This is helpful when task environments evolve and limitations in task fulfillment arise. A qualitative approach helps to identify and understand such limitations and their underlying reasons, helping to guide further context-specific research.

5.4 Practical implications
ERP systems have an impact on several tasks and systems, intended or not. Practitioners should align administrative tasks – such as compliance with regulations – with organization-specific needs. Therefore, we see missing DQM a main challenge. First, organizations may unintentionally adopt the data quality perspective of the legislative body. Second, ERP systems' data quality might be considered high for original tasks, but missing context-sensitivity might lead to unexpected challenges when using data in a new context (e.g. for new analysis purposes).

Data owners need to be aware of different contexts data is used in to ensure data quality across systems, departments, and tasks. ERP systems’ mentioned positive impact on (intrinsic) data quality should be levered, but the requirements on data quality need to be reassessed. Therefore, the ERP system might impose data structures that are relevant for existing tasks and data misfits need to be resolved within other systems or through adaption at the latent structures level.

The insurance-specific insights into the post-implementation perspective inform pre-implementation fit considerations (Wu et al., 2007). Organizations might delay implementation of ERP systems until packages are localized to the country or sector (Sia and Soh, 2007). Although a high initial fit is desirable, the sector's relevance for ERP system vendors might be more important for ERP systems' sustainability. Evolving task environments pose new requirements on tasks already supported by systems or introduce new tasks. Especially in volatile sectors with continuously evolving regulations, ensuring TTF will be an increasing challenge since non-routinerness of tasks increases due to organizations' environment.

5.5 Limitation and future work
Due to the explorative research approach and the number of organizations, a generalization of this study is limited to specific implications and rich insights (Walsham, 2006), which need to be reevaluated when used in other contexts. The selection of participants focusses the study on IT strategic issues. Other data quality issues may exist from a functional accounting or distribution perspective. Further research focussing on lines-of-business, across different organizational sites and including participants from different levels is necessary to assess local and global effects of ERP systems and provide guidance for ERP systems' use and integration within a DQM context.

6. Conclusion
This work presents current practices of ERP systems’ use in the insurance sector. Our research helps practitioners and ERP system vendors providing insights into ERP systems’ use, sustainability, and positive impact on data quality:

- main use of ERP systems for administrative (standard) functions allows drawing on existing ERP system experiences and research from other (e.g. manufacturing) sectors;
- ERP systems’ use, particularly for accounting, supports DQM to comply with regulations in large insurance organizations;
ERP systems provide a starting point for data analysis if data quality is reassessed for the new task and context;
when focussing on interdependent, complex tasks (e.g. data analysis), sector-specific approaches are more important and ERP systems and their data need to be considered within a broader organizational setting and system landscape; and
potential ERP system adopters should be aware of fit not only for ERP system implementation but assess volatility of task environments to ensure sustainability of the ERP system and vendor support.

Our qualitative approach to TTF additionally helps framing future ERP system research:
• Building on our results, future research should be aware of sector-specific and more general ERP systems’ use. In the latter case, the plethora of extant ERP systems research might be levered for the insurance and service sector, whereas several insurance-specific topics and more specific use of ERP systems need to be examined in more detail.
• Qualitative approaches to TTF add to a broader picture of potential TTF in an organizational context and will gain importance with increasing task non-routineness.
• ERP system misfits will arise continuously. Future research needs to be aware of ERP systems being embedded into increasingly complex IT and organizational structures. Our approach allows exploring and understanding ERP systems’ use for particular tasks and, moreover, sets tasks and ERP systems into a broader organizational context. Such an approach is important for DQM, since especially ERP system’s data is used for different tasks and across different systems.

References


Myers, M.D. (2009), Qualitative Research in Business & Management, Sage, Los Angeles, CA.


### Appendix

**Task: comply with regulations**

<table>
<thead>
<tr>
<th>DQM statements</th>
<th>ERP system fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing requirements for data quality due to regulations (no. 7, no. 9, no. 11, no. 15)</td>
<td>Data quality management will gain importance precisely because of the legal requirements. Many figures, much more predictive calculations, verifications are demanded (no. 7)</td>
</tr>
<tr>
<td>Increased need for DQM due to regulations (no. 1, no. 4)</td>
<td>Information quality regarding Solvency II surely will be a quite big challenge because one actually needs an integrated data model. And there, the lines-of-business, life, health, composite, cannot be as independent as they like to be (no. 11)</td>
</tr>
<tr>
<td>ERP system statements</td>
<td>Things like Solvency II certainly concern the ERP system; generally the issues regarding controls, control reports. Of course, I expect that the system supports the whole thing. With each release providing tools for control reports (no. 1)</td>
</tr>
<tr>
<td>Regulations have impact on ERP system (no. 1, no. 3, no. 4, no. 5, no. 6, no. 7, no. 11, no. 14, no. 15)</td>
<td>In preparation of the single euro payments area, all cash flow is processed through the ERP system. […] For legislative topics the ERP system contributes to a greater extent (no. 14)</td>
</tr>
<tr>
<td>DQM/ERP system statements</td>
<td>Our ERP system is not as much depending on market developments as on legislative requirements (no. 11)</td>
</tr>
<tr>
<td>ERP system facilitates DQM to comply with regulations (no. 1, no. 5, no. 14, no. 15)</td>
<td>Our biggest market observation is that we are driven by the legislative body, strongly affecting our ERP systems. Solvency, minimal requirements on risk management and so on, drive the market stronger than product development or other requirements (no. 14)</td>
</tr>
</tbody>
</table>

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**Table AI.** Example statements from TTF perspective

(continued)
Task: data analysis

DQM statements

Data analysis to comply with regulations
(no. 4, no. 9, no. 15)

For Solvency II, insurers need to carry out considerable efforts in order to fulfill the requirements and one of these efforts strongly concerns business intelligence (no. 4) Especially for predictive calculations we are able to conduct in Solvency, consistent data is crucial (no. 15)

Data analysis necessary beyond regulations
(no. 1, no. 4)

We go for models beyond the standards for being able to conduct simulations in order to see how the market will develop in the future. That we can predict: “What will happen if the interest rates increase?” (no. 1)

Longevity of products challenges data analysis
(no. 10)

Since an insurance provider has a perspective of at least ten to fifteen years, it is interesting to know, on which basis respective rate and product calculations, etc. can be made (no. 10)

Broad variety of input data for diverse analysis subtasks (no. 1, no. 4, no. 6, no. 10, no. 15)

If I know what to do with the data, I think I am able to target customers through systematic collection, consolidation and analysis. The question is: What data do you collect from insurance associations, from any analysis and consulting company, from social networks and for which purpose? (no. 6)

There is “statistics” or “capturing process data”. Though we already know processing time, lead time etc. very detailed, we want to know it in even more detail (no. 10)

Table AI.

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