Influential Factors on IS Project Quality: A Total Quality Management Perspective

Research-in-Progress

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Abstract

Successful accomplishment of information system (IS) projects is a crucial challenge for researchers and practitioners. Agreement on influential factors, that is, success and failure factors, and on what constitutes success is lacking. Considering process and product quality an integral part of IS project success, we examine how project success and failure factors influence IS project quality. We conducted semi-structured interviews with 19 practitioners involved in IS projects and strategic decision making. This research-in-progress is based on total quality management (TQM), which facilitates continuous improvement of IS project quality. By applying an influential factor framework, we allow for a more detailed examination of success and failure factors not addressed in TQM. Our results suggest quality-specific themes, while acknowledging their context-dependency. By examining IS project quality and applying the influential factor framework, we expect to equip researchers and practitioners with an approach to examine specific dimensions of IS project success in detail.

Keywords: Total quality management, information system projects, success factors, failure factors

Introduction

The high rate of problematic or failed information system (IS) projects is an ongoing problem with high relevance for researchers and practitioners (Cecez-Kecmanovic et al. 2014; Agarwal and Rathod 2006). Despite three decades of research on this topic, there is still a lack of agreement on the definition of IS project success and on influential factors, that is, success and failure factors (Doherty et al. 2012; McLeod and MacDonell 2011). Quality of the product and the process are integral parts of IS project success (cf. Pankratz and Basten 2013; Subramanian et al. 2007; Baccarini 1999). Along with the missing agreement on success and failure factors of IS projects, we are unaware of research specifically focusing on success and failure factors with a quality focus. When aiming at improvement of IS project quality in general, that is, beyond a single IS project, quality improvement is a long-term endeavor, with the need to learn across projects (cf. Poth and Sunyaev 2014; McLeod and MacDonell 2011; Subramanian et al. 2007). To address the research gap while explicitly taking long-term improvement into consideration, we pose the research question: *How do success and failure factors influence IS project quality within and across IS projects?*

To answer the research question, we rely on total quality management (TQM). TQM provides a causal framework, enabling and fostering continuous quality improvement of the development process and the resulting product (Rothenberger et al. 2010; Ravichandran and Rai 2000). In this context, TQM is a broadly applicable quality framework, which simultaneously limits its use for more detailed analyses of factors influencing quality outcomes. We apply an extensive framework of influential factors on IS project outcomes (McLeod and MacDonell 2011) to allow for a comprehensive examination of influential factors. This research-in-progress aims to build the methodological basis for further in-depth research on influential factors on IS project quality and their interplay within organizational contexts.

We conduct an explanatory study building on 19 semi-structured interviews and a subsequent workshop with eight participants aiming at perceptions of the study's results by various IS project stakeholders. We selected participants knowledgeable about IT strategy and IS projects in their respective organizations. The study has implications for researchers and practitioners. For researchers, we show the usefulness of the influential factors framework to examine more detailed aspects of IS project success by analyzing their influence on quality-specific themes in IS projects. For practitioners, we provide insights into quality-specific themes for IS project quality improvement with respect to several influential factors. We also emphasize the need to not only establish top-down structures, but to implement feedback structures allowing for continuous quality improvement.

In the next section, we present prior research on TQM and influential factors of IS projects. Subsequently, we describe the *Research Context and Approach*. The section *Quality-Specific Themes in IS Projects* presents the results of applying TQM and the influential factors framework. Finally, we discuss the results and provide an outlook on our future work.

Background

Total Quality Management (TQM) in IS Research

TQM is a management philosophy broadly applied across sectors and domains and a basis for maturing quality management (Dahlgaard-Park et al. 2013; Zakuan et al. 2012; Rahman and Sohal 2002; Wang 1998). TQM principles for continuous quality improvement provide a basis for systems development (Ravichandran and Rai 2000, Ravichandran and Rai 1999-2000, cf. Figure 1) and broadly applied standards, such as the Capability Maturity Model and ISO 9000 (Rothenberger et al. 2010). While standards might be more specific (e.g., domain-specific), TQM allows to examine the general and still valid principles for continuous quality improvement, regardless whether organizations apply common standards or not. *Top management leadership* is a consistent factor across quality management frameworks. In the systems development context, Ravichandran and Rai (2000) specifically examine the IS management support for quality. Top management commitment to quality needs to be translated into actions through adequate *management infrastructure*. Besides articulating top management's vision in policies and goals, organization members need to be equipped with skills for continuous quality improvement and rewarded for pursuing quality goals. In order to deliver quality products and services that satisfy customer needs, quality processes are necessary (Deming 1989). *Process management*

efficacy encompasses continuous process improvement, a core principle of TQM (Dahlgaard-Park et al. 2013; Parzinger and Nath 2000). Formalization of and adherence to analysis and design methods aim to reduce or eliminate quality problems in the system development process. Fostering reusability in the development processes is important for avoidance of waste and error prevention. Continuous process improvement should be controlled based on explicit performance standards and fact based management, systematically collecting and using data for formulating improvement actions. *Stakeholder participation* facilitates consolidating dispersed knowledge and creating a common understanding between users, vendors, and developers in design and development processes. *Quality performance* encompasses the quality of the final product as well as the efficiency of the development process. The differentiation of process and product will be addressed in the next section.
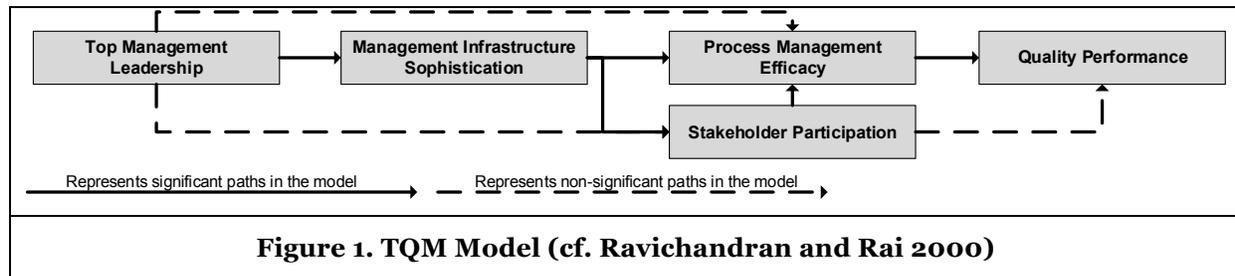
Figure 1. TQM Model (cf. Ravichandran and Rai 2000)

Influential Factors in IS Projects

A main research stream on IS projects deals with analyses of project success and failure (cf. Doherty et al. 2012; McLeod and MacDonell 2011; Napier et al. 2009). IS projects are projects in which IS are developed, extended, or adapted (Pankratz and Basten 2013). IS research provides both factors contributing to IS project success and factors contributing to IS project failure. McLeod and MacDonell (2011) develop an extensive synthesis of influential factors mapped on four dimensions. TQM focuses on factors important for high quality while neglecting consideration of failure factors. Research on influential factors, including success and failure factors adds a problem-oriented perspective to TQM, which is important since failure factors are not just counterparts to success factors (Pankratz and Basten 2013).

Despite varying dimensions considered to constitute IS project success (e.g., Joosten et al. 2014; Pankratz and Basten 2013; Liu et al. 2011; Baccarini 1999), researchers broadly distinguish development process and product (Pankratz and Basten 2013; McLeod and MacDonell 2011), analogously to TQM. Hence, we consider IS project quality to consist of process and product quality. The product is also referred to as the system. Building on TQM, we apply a user-oriented perspective and define product quality as appropriateness of the system for users and their tasks. Process quality refers to efficiency of the process to develop the system. The definitions allow to emphasize quality aspects with respect to the iron triangle (Atkinson 1999) of adherence to schedule, budget, and quality (conformance with specified functional and non-functional requirements) (cf. Ika 2009; Karlsen et al. 2005; Pinto 2004; Wateridge 1998).

To sum up, on the one hand, we address how top management leadership influences quality of IS projects in the long term. On the other hand, TQM bridges the gap between the strategic level and the actual outcomes, that is, the process and product quality constituting IS project quality. Enriching TQM with the extensive influential factors framework allows a far more detailed analysis of IS project quality, which is still neglected since extant research focuses on few factors (Basten and Sunyaev 2014).

Research Context and Approach

The study is conducted in the insurance sector, limiting heterogeneity of strategic importance of IS and use of IS (cf. Nolan and McFarlan 2005). The insurance sector has a high rate of self-developed systems. Especially when considering core business processes, use of standard software is limited or not possible (Glowalla and Sunyaev 2013a, Glowalla and Sunyaev 2013b). We chose semi-structured interviews to understand how the interview participants perceive success and failure factors and their interdependencies while being able to pose open questions and follow up on new aspects (Kvale 2007; Myers and Newman 2007). Moreover, we used public sources (e.g., business reports) to gain further insights into the examined organizations. The interview guideline (see Appendix) aimed at gaining an

overview of the organizational and IT governance structure, before proceeding to questions derived from TQM. The guideline was derived from literature and refined by a practitioner review from a software quality consultant. Based on the feedback, we included questions, for instance, about the perception of participants regarding the priority of quality vs. time and budget and if predefined goal metrics exist.

We interviewed 19 participants from 16 different insurance providers and 18 different organizational sites in Germany (11 sites) and Austria (7 sites) from July to October 2013. To encourage truthful interviews, we assured the organizations' and interviewees' anonymity (Walsham 2006) and provide an aggregated presentation in Table 1. We specifically asked for the number of IT employees to get a picture of the IT departments and employees to which participants refer to when talking about IS projects. We selected participants according to their knowledge and influence on IT strategy and IS projects. Participants have a job experience in IT-specific roles or in the insurance sector ranging from 10 to 40 years and a mean of 23 years. The interviews had an average of 62 minutes. All interviews were recorded and transcribed for analysis across researchers (Walsham 2006) and for venting, that is, for discussion of results with and interpretations by professional colleagues (Ågerfalk and Fitzgerald 2008; Conboy 2010; Goetz and LeCompte 1984). The final study, including a more extensive set of participants' statements, was distributed through the involved consultant to international colleagues for feedback on the interpretation of the interviews. This was followed by a venting workshop for result presentation and discussion. Since feedback was obtained in advance and to facilitate an efficient discussion, the workshop consisted of eight participants. Four researchers with a research focus on IS quality took part as well as four practitioners, consisting of the consultant company's CEO and three project managers from three countries.

Insurance providers' overall premium income (million euros)	No. of organi- zations	No. of IT employees at the respective sites or IT departments	No. of sites	Participants' position at country level	No. of partici pants
< 1000	2	< 100	3	Executive level	4
$1000 - 5000$	5	$100 - 500$	10	Directly reporting to executive level	6
$5000 - 10000$	4	$500 - 1000$	3	No executive level	9
> 10000	5	> 1000	3		

Table 1. Overview of Participants and Examined Organizations

For the data analysis, we applied an initial coding scheme corresponding to the questions from our interview guideline for descriptive coding (Myers 2013; Kvale 2007). Descriptive coding provided a basis to identify commonalities and differences across interviews with regard to the topics addressed. During descriptive coding, we also coded further emerging quality-specific themes, which could not be assigned to the initial coding scheme. Moreover, we took notes of potential insights for subsequent interpretation (Klein and Myers 1999). Subsequent descriptive and interpretative coding was conducted iteratively to saturate codes and allow for context-specific interpretation of insights.

After seven interviews, we discussed emerging themes with an otherwise not involved researcher with a research focus in IT project management and did so again after completing all interviews. Several themes could be derived directly from TQM and the structure of the interview guideline (e.g., quality responsibility). Other emerging themes were mapped into related TQM properties (e.g., image of testing was integrated into user participation, since it was addressed by participants in this context). One theme did not fit into a specific TQM construct (invisibility of quality). The themes were analyzed applying the influential factors framework (McLeod and MacDonell 2011), allowing to present themes with respect to different, intersecting factors. Focusing on understanding of the quality-specific themes, each theme is presented in detail, enhanced with representative quotes. Due to the validation of the results in the venting workshop we are confident to have achieved a high comprehensibility of the study's results.

Quality Specific Themes in IS Projects

The analysis results in seven themes, of which six are mapped on TQM constructs (Table 2). Moreover, each theme is referred to influential factors. 'Top management' was addressed in the context of IT

governance and is considered an influential factor as well (McLeod and MacDonell 2011). In the venting workshop, the discussion of the results and potential measures to govern IS project quality constantly led to statements about top management commitment being the basis to enable achievement of adequate IS project quality. 'Quality performance', (cf. Figure 1), was addressed in the interviews, but aimed at eliciting themes and influential factors and not on assessing process or product quality. With respect to stakeholder participation, we focus on users. Not all questions were addressed in each interview. The number of participants addressing specific themes is provided in brackets. In the theme descriptions, we provide the number of participants with respect to specific perspectives. The numbers are provided for transparency and are not to be confused with statistical statements. In the following, italic terms in the body text will refer to the influential factors provided in Table 2, which resulted from the data analysis.

TQM constructs and properties (Ravichandran and Rai 2000)	Themes	Interdependencies with influential factors (McLeod and MacDonell 2011)
Management infrastructure sophistication		
Quality policy and goals	Quality responsibility (17)	IC – organizational properties PA – project team – defined roles & responsibilities PA – project team – social interaction PC – project scope PC – project characteristics
	Quality policy (12)	IC – organizational properties – policies & practices related to development PA – social interaction – understanding
	Priority of quality vs. time and budget (18)	IC – organizational properties – organizational culture PC – project goals & objectives
Process management efficacy		
Fact-based management and control	Metrics for quality assessment (19)	IC – organizational properties – history of system development and use PA – external agents PA – project team – social interaction PA – top management DP – user participation DP – project management – management & control
Formalization of analysis and design	Standardized development process (18)	IC – organizational properties IC – organizational properties – organizational culture DP – use of a standard method DP – project management – management & control PC – project characteristics
Stakeholder participation		
	User participation (10)	IC – organizational properties PA – users PA – project team – understanding DP – user participation
Other		
	Invisibility of quality (2)	IC – organizational properties PA – social interaction – understanding
IC = Institutional context; PA = People and Action; DP = Development processes; PC = Project content		

Table 2. Themes in Context of TQM and Influential Factors on IS Project Outcomes

Priority of Quality vs. Time and Budget

To account for the problem of quality being neglected in favor of time and budget, we asked how quality is prioritized within the examined organizations. Five participants explicitly demarcated projects conducted due to legislative requirements, which have a clear focus on the 'time' dimension. The overall picture is heterogeneous across organizations. Three participants do not provide a prioritization and five participants state that priority is project-dependent (*project goals & objectives*). The general priority of the remaining participants is on quality (five participants) or time (five participants). Although budget is addressed by four participants, it is always mentioned in combination with time or quality. The remaining participant working in test and release management mentions a beginning shift in the company's

organizational culture. „*There is a change of mind that one says I need enough room for quality assurance, rather than reducing functionalities. [...] But mostly, customers want to realize functions until the end although one knows that this won't meet quality requirements.*"

The prioritization is also heterogeneous regardless of participants' levels and functions. For instance, one head of software development considers the time dimension dominating. „*It's as simple as that: Changes of a [IT] system have to be conducted before a specific date.*" In contrast, a manager responsible for IT and operational management puts the focus on quality, describing it as follows. „*The actual performance, quality, and content are decisive. We would not introduce software not meeting functionality or containing too many major defects. In such a case we would rather invest at the time and budget axes.*" However, the actual effort for ensuring quality may suffer in running projects due to several reasons. The head of a quality competence center states that a minimum quality level should not be a topic for discussion, but becomes one in late projects. „*The adjustable parameters are functionality, time, or budget. I do not have a parameter where I can put as much quality into a product or project as I desire. [But quality becomes an] adjustable parameter, we are partially dishonest in the projects.*"

Metrics for Quality Assessment

Aside from metrics for assessing process and product quality to determine quality performance and to *manage & control projects*, we asked if costs for quality assurance are determined, which is necessary to derive adequacy of investments. Since our definition of quality has a user focus (cf. section Influential Factors in IS Projects), we asked if user satisfaction is assessed as well.

With respect to product quality metrics, categorization of errors after testing or system delivery is mentioned by ten participants as a measure for product quality or for product approval. Two of the small insurance providers (*organizational properties*) do not have or use metrics for product quality and two other participants from integrated software providers (*external agents*) refer to their SLAs as a measure for product quality. Specialization on, for instance, specific systems allows for an improved assessment of product quality across projects or regular release cycles. In contrast, internal or external software providers with high project variety have limited comparability of metrics (*history of system development and use*). „*You can get an idea of quality [...] but first you need to define quality. [...] We do not say with 1000 open calls quality is poor and between 500 and 1000 it is moderate.*"

Although meaning of metrics needs to be interpreted within projects, at least some tangible measures exist. Compared to product quality, assessment of process quality is less tangible. Four participants mention comparison of errors against expectancy values or comparison of errors before and after the system deployment and a CIO refers to the number of versions built. „*We count and document the cycles. [...] Each time software needs to be deployed, even in the testing environment, it means rework and you need to retest everything.*" The focus is on providing a standard process, addressed in the next section. However, missing process quality assessment inhibits assessment of improvements as well.

To justify quality investments in light of potential or achieved improvements, costs for quality investments need to be calculated. We addressed the topic with 13 participants. Eight participants state that costs for quality cannot be or are not calculated. Four participants consider their organizations' cost assessment of testing and error correction. Only one participant refers to costs tracked throughout the development process, including employee resources involved in quality activities from design to testing. The assessment of investment and return on quality is even more severe and quality investments might solely depend on *top management's* limited impressions.

Another approach for product quality assessment is measurement of user satisfaction, addressed with 18 participants. Systematic assessment of user satisfaction in the examined organizations is the exception. Only one external provider conducts regular customer surveys. 14 participants rely on user feedback through participation in a project, including feedback from reported errors or usability issues. Only four participants address user feedback on usability. Solely relying on error reporting ignores other sources of potential dissatisfaction with the system. Depending on *user participation* in the project, *social interaction* might substitute for regular surveys and provide an assessment of satisfaction. However, informal channels, explicitly addressed by two participants, might inhibit improvement of standards or quality across different projects and stakeholders. „*I didn't get metrics about user satisfaction yet. That*

would be interesting. I get my feedback – I know many people since I'm in this company for a long time – through conversations with users, head of departments, or team leaders."

Standardized development process

To get an overview of the formalization of methods across projects, we asked if and how lessons learned from single projects are communicated and used beyond a single project. All examined organizations developing systems have standard processes (*use of a standard method*), for instance, with predefined quality gates to improve continuous controlling of system development. These approaches need to be adapted for specific projects. For smaller projects, standardized approaches may be too much overhead (*project characteristics*). *"[Application of quality gates] refers to project with a volume of [amount] euros. Small projects cannot be conducted with such an overhead."*

Exceptions for using standardized approaches at all are smaller organizations, where few employees are engaged in system development (*organizational properties*). The number of quality gates mentioned ranges from four to over 20 and even if processes are considered standardized, we are not able to assess their overall efficiency or even employees' adherence to them.

Therefore, we focus on standardized approaches on how development processes are continuously improved. Given the few metrics and the problem of their comparison across projects, metric-based continuous improvement seems to be the exception. Five participants address quantitative approaches beyond single projects such as regularly publishing statistics about systems, using error expectation values to standardize planning and system development. Despite standardizing such approaches, assessment across projects might still be limited due to missing comparability of projects. *"We realize that the projects, regarding complexity or the infrastructure, are different and [the metrics] can only be used as rough reference values. If deviations occur, these need to be analyzed."*

Five further participants explain qualitative but regular or systematic approaches to transfer improvements across projects. Although such reviews aim to learn across projects, they might be limited, for instance, if not all stakeholders are involved or, as mentioned above, adherence to improvements is not controlled (*management & control*). *"[Lessons learned] are provided for project leaders, but I'm not sure if they consult these things or ask another project leader for advice."*

Regardless if improvements are grounded in quantitative or qualitative insights, exchange platforms are necessary. Qualitative exchange increases awareness about quality, builds a basis for improvements, and allows for exchanging practices across varying projects. However, such changes need to be implemented, which requires a respective culture or cultural change (*organizational culture*). *"A change [due to introduction of quality gates] is perceivable since the IT knows earlier what it wants, needs, and needs to realize. [...] That is a cultural change, which is not possible overnight. It takes about five years, depending on the acting persons [...] also from management."*

User Participation

User participation is important to develop systems with high quality for the user (cf. section Metrics for Quality Assessment). Whereas testing by (key) users is typical, the extent of participation depends on how early tests or reviews are conducted. To align development with user expectations, users should participate early in development and testing, addressed by four participants. However, users might be reluctant to participate despite being interested in high quality. A problem already mentioned is high business competency in IT leading to reliability on development teams, which might shift responsibility from users to development teams. In such a case user participation might be especially necessary for usability testing. Another problem, stated by two participants, is the image of testing, leading to a lack of internal testers and testing professionals, inhibiting user participation. *"Testing is rather considered destructive; where you demonstrate other people's deficiencies and that is an unpopular job."* This issue led to surprising reactions in the venting workshop. Being aware of the need for quality assurance, for instance, a researcher wondered that such problems 'still' exist in practice. Finally, high and continuous participation might lead to additional overhead for users. To counter the mentioned problems, users need to be released from other duties and rewarded for their involvement (*users*).

Invisibility of Quality

Invisibility of high as well as low quality concerns all organizational levels. Invisibility of high quality refers to missing acknowledgement of quality efforts since they might not be perceived and put into question. Invisibility and missing acknowledgement neglects quality-oriented reward schemes (*organizational properties*). *"When it's getting critical, running out of time and budget, then utopian demands are posed on quality management, specifically test management [and then] we are criticized. And if it works out after all, it may be that the appraisal is missing."* Also, invisibility of high quality encourages arbitrary quality management. *"Everybody asks why we invest into quality assurance since we have such high [system] availability. [...] If something really goes wrong again, then one says again 'now we need to invest more into testing'."* Invisibility of low quality encompasses not directly visible quality issues and not considered costs of rework after deployment and future costs due to side effects. *"We needed to modify the architecture. Then the business side asks about their benefits and they say 'no' if they don't understand. Then you develop hidden future costs."* Due to (missing) assessment of quality, such pitfalls need to be addressed at a qualitative level, providing *understanding* for the importance of quality across organizational levels. A focus needs to be put on making potential costs, risks, and impacts of poor quality visible to cope with them. *"[If risks are not adequately addressed] you still can deploy software at an early stage [...] but the important thing is that such a decision is made consciously and not implicitly due to time restrictions."* In the venting workshop, the CEO corroborated the invisibility of quality at the top management level. The CEO mentioned examples where quality investment was reduced by the management's after a cost-benefit analysis, resulting in IT system breakdowns in the long term.

Discussion and Future Work

In the long term, policies and resulting practices lead to cultural change when applied regularly (Butler and Fitzgerald 1997, 2001). However, to facilitate a more detailed understanding of quality and issues resulting from poor quality, skill development and training are necessary (Ravichandran and Rai 2000). The **priority of quality vs. time and budget** is at the intersection of a clear definition, understanding, and culture. (Imperiled) time and budget constraints in running projects additionally comprise what stakeholders may constitute 'good enough' quality. To assess quality, it needs to be defined. The **metrics for quality assessment** used, provide only a limited quality assessment and participants seem to be aware of it. Existing metrics are necessary for tangible project management and control and already facilitate quantitative assessment of quality activities. However, if deviations occur, additional qualitative assessment is necessary. Since formalization of project management might improve outcomes (Kautz et al. 2004; Barki et al. 2001) qualitative measures should be formalized as well. With respect to further metrics, quality assessment of user satisfaction is especially neglected. **User participation** and informal feedback are mentioned as substitutes for assessing user satisfaction, which might have severe limitations. First, exchange depends on social interaction and might differ across stakeholders and project teams. Second, informal exchange limits systematic assessment not only of errors, which are reported nevertheless, but, for instance, of usability problems which lead to user dissatisfaction. Third, missing systematic collection and dissemination of user information inhibit learning across projects and knowledge resides with single stakeholders. Fourth, problems as well as feedback of key or power users deviate from issues encountered by regular users (Deng and Chi 2012) and high participation does not necessarily lead to high buy-in (Shen et al. 2013). An important issue is the differentiation of user participation and user involvement (Barki and Hartwick 1994) due to the increased need for social interaction in quality management. User involvement has a positive impact on project success (Jiang et al. 2002; Schmidt et al. 2001; Hwang and Thorn 1999) while the effect of user participation is inconclusive (McLeod and MacDonell 2011). Users' involvement should be facilitated and rewarded rather than considering users only necessary for requirements determination and testing, especially since the latter might be considered a destructive task. The **invisibility of quality** is a quality-specific theme providing a problem-oriented view why understanding is important and what common understanding is required. Besides knowledge of strategic IS projects goals (McLeod and MacDonell 2011), understanding of quality is necessary at the top management level as well. Development of high quality systems needs to be acknowledged and managed actively. For instance, quality assurance might be considered a punishment instead of being facilitated with a reward as advocated by TQM.

Relying on the influential factors framework (McLeod and MacDonell 2011), we show the importance of intersecting factors for IS project quality. It allows for problem-oriented identification of themes, whereas TQM allows identifying additional quality-specific themes. Such a focused use leads to more detailed (e.g., image of testing in user participation) and new (e.g., invisibility of quality) themes, forming a basis for our future research. Building the basis for quality is a top management task, which was corroborated in our venting workshop. Most of the identified themes were known by practitioners, who are confronted with similar situations repeatedly. Whereas our results provide important insights for top management and organizations in general, one open question from the venting workshop remains: How can top management, not interested in IS project quality, be sensitized about it? Since top management commitment is a success and risk factor for several organizational and project issues (e.g., Hoermann et al. 2010; Pankratz and Basten 2013), further research is necessary to address this question. Our future research aims to analyze how to make high and low quality visible to stakeholder groups to ensure an increased impact of the study results. According to our preliminary result, the research needs to reach beyond metrics and needs to be meaningfully extended with qualitative measures to address the manifold cultural and social issues involved in this topic to close the TQM feedback cycle. To not only address single quality themes, but focus on their interplay, we laid this methodological groundwork for our future research. Especially the use of a ***standardized development process*** is a basis for long term quality improvement across development projects and, in turn, is instantiated for management and control of specific development projects. However, a standard method does not imply a significant improvement of project success (McLeod and MacDonell, 2011) and is rather a means for integrating the themes addressed above. In order to deal with this complexity, we aim to conduct a longitudinal, in-depth case study within an organization, accompanying a current IS development project. We select a single case study design since quality specific themes are embedded in an organizational context (see Myers 2013; Orlikowski and Iacono 2001; Yin 2009). The objective is to arrive at a more comprehensive and detailed analysis of quality specific themes in IS projects with respect to their context-dependent impact on quality and its visibility. The results should provide researchers and practitioners with means to balance quantitative and qualitative measures to address quality across stakeholder levels.

Appendix

Questions regarding the organization	
Questions regarding the participant	
Questions on IT governance	
- Is the IT governance clearly defined [regarding decision rights and accountability in IT strategic decision making]? - Who is responsible for IT strategic decision making?	- How and in which intervals are projects reported [to you and/or in IT strategic boards]? - How do IT governance and project governance work across organizational levels?
Questions on TQM	
- Who is responsible for quality? - Does your organization have a quality policy [or overall quality principles]? - Do guidelines exist for prioritization of quality? - Is quality more important than adherence to time and budget? - Is quality a goal metric [or is there a minimum quality goal]? - Is user satisfaction used for assessing quality? - How is information about quality collected and reported? - Are root causes for data quality problems identified and corrected?	- Are there metrics to assess quality costs? - Are there [further] standards, principles, or metrics to assess performance of development phases [or the whole development process]? - Are the standards, principles, or metrics regularly updated after projects? - Do the developed systems usually achieve high product quality [from your, user, or management perspective]? - Does the development have usually high process quality? - Is the investment into quality adequate? - How are the different [and external] stakeholders involved into the governance structures?
Questions on quality governance	
- Do you think a differentiation between IT and quality governance is necessary? - Where do you see a need to improve IT governance? - Where do you see a need to improve quality governance? - At which organizational level should an overall quality approach be established?	- Does the current IT governance facilitate high quality? - Is more IT know how necessary in the executive board or top management? - Is more quality know how necessary in the executive board or top management? - Is more awareness necessary in the executive board or top management?

References

Agarwal, N. and Rathod, U. 2006. "Defining 'success' for software projects: An exploratory revelation," *International Journal of Project Management* (24:4), pp. 358–370.

Ågerfalk, P.J. and Fitzgerald, B. 2008. "Outsourcing to an Unknown Workforce: Exploring Opensourcing as a Global Sourcing Strategy," *MIS Quarterly* (32:2), pp. 385–409.

Al-Karaghouli, W., Alshawi, S., and Fitzgerald, G. 2005. "Promoting requirement identification quality: Enhancing the human interaction dimension," *Journal of Enterprise Information Management* (18:2), pp. 256–267.

Atkinson, R. 1999. "Project Management: Cost, Time and Quality, Two Best Guesses and a Phenomenon, its Time to Accept other Success Criteria," *International Journal of Project Management* (17:6), pp. 337–342.

Baccarini, D. 1999. "The Logical Framework Method for Defining Project Success," *Project Management Journal* (30:4), p. 25.

Baker, G. 2012. *"20 questions directors should ask about IT,"* 2nd Edition. Canadian Institute of Chartered Accountants, Toronto.

Barki, H. and Hartwick, J. 1994. "Measuring User Participation, User involvement and User Attitude," *MIS Quarterly* (18:1), pp. 59–82.

Barki, H., Rivard, S., and Talbot, J. 2001. "An Integrative Contingency Model of Software Project Risk Management," *Journal of Management Information Systems* (17:4), pp. 37–69.

Basten, D. and Sunyaev, A. 2014. "A Systematic Mapping of Factors Affecting Accuracy of Software Development Effort Estimation," *Communications of the Association for Information Systems (CAIS)* (34), pp. 51–86.

Butler, T. and Fitzgerald, B. 1997. "A case study of user participation in the Information Systems process," in *Proceedings of the 18th International Conference on Information Systems (ICIS 1997)*, Atlanta, USA, pp. 411–426.

Butler, T. and Fitzgerald, B. 2001. "The Relationship Between User Participation and the Management of Change Surrounding the Development of Information Systems: A European Perspective," *Journal of Organizational and End User Computing* (13:1), pp. 12–25.

Cecez-Kecmanovic, D., Kautz, K. and Abrahall, R. 2014. "Reframaing Success and Failure of Information Systems: a Performative Perspective," *MIS Quarterly* (38:2), pp. 561–588.

Conboy, K. 2010. "Project failure en masse: a study of loose budgetary control in ISD projects," *European Journal of Information Systems* (19:3), pp. 273–287.

Coughlan, J., Lycett, M., and Macredie, R. D. 2003. "Communication issues in requirements elicitation: a content analysis of stakeholder experiences," *Information and Software Technology* (45:8), pp. 525–537.

Dahlgaard-Park, S. M., Chen, C.-K., Jang, J.-Y., and Dahlgaard, J. J. 2013. "Diagnosing and Prognosticating the Quality Movement – a Review on the 25 Years Quality Literature (1987–2011)," *Total Quality Management & Business Excellence* (24:1), pp. 1–18.

Deming, W. E. 1989. *Out of the Crisis*, Cambridge, MA, USA: MIT Press.

Deng, X. and Chi, L. 2012. "Understanding Postadoptive Behaviors in Information Systems Use: A Longitudinal Analysis of System Use Problems in the Business Intelligence Context," *Journal of Management Information Systems* (29:3), pp. 291–326.

Doherty, N.F., Ashurst, C. and Peppard, J. 2012. "Factors Affecting the Successful Realisation of Benefits from Systems Development Projects: Findings from Three Case Studies," *Journal of Information Technology* (27:1), pp. 1–16.

Glowalla, P., and Sunyaev, A. 2013a. "Managing Data Quality with ERP Systems - Insights from the Insurance Sector," in *Proceedings of the European Conference on Information Systems (ECIS 2013)*, Utrecht, Netherlands. June 5-8.

Glowalla, P., and Sunyaev, A. 2013b. "Process-driven Data Quality Management – Integration of Data Quality into Existing Process Models," *Business & Information Systems Engineering (5:6)*, pp. 433–448.

Goetz, J. and M.D. LeCompte 1984. *Ethnography and Qualitative Design in Educational Research,* Orlando: Academic Press.

Hoermann, S., Kienegger, H., Langermeier, M., Mayer, M. and H. Krcmar 2010. "Comparing Risk and Success Factors in ERP Projects: A Literature Review," in *Proceedings of the Americas Conference on Information Systems (AMCIS)*, Lima, Peru.

Hwang, M. I. and Thorn, R. G. 1999. "The Effect of User Engagement on System Success: a Meta-Analytical Integration of Research Findings," *Information & Management* (35:4), pp. 229–236.

Ika, L. A. 2009. "Project Success as a Topic in Project Management Journals," *Project Management Journal* (40:4), pp. 6–19.

Jiang, J., Chen, E., and Klein, G. 2002. "The Importance of Building a Foundation for User Involvement in Information Systems Projects," *Project Management Journal* (33:1), pp. 20–26.

Jiang, J.J., Klein, G. and Discenza, R. 2002. "Perception differences of software success: provider and user views of system metrics," *Journal of Systems and Software* (63:1), pp. 17–27.

Joosten, D., Basten, D., and Mellis, W. 2014. „Measurement of Information System Project Success in German Organizations," *International Journal of Information Technology Project Management (IJITPM) (*5:3), pp. 1-20.

Karlsen, J. T., Andersen, J., Birkely, L. S., and Ødegård, E. 2005. "What Characterizes Successful It Projects," *International Journal of Information Technology & Decision Making (IJITDM)* (4:4), pp. 525–540.

Kautz, K., Hansen, B., and Jacobsen, D. 2004. "The utilization of information systems development methodologies in practice," *Journal of Information Technology Cases and Applications* (6:4), pp. 1–20.

Keil, M., Tiwana, A., and Bush, A. 2002. "Reconciling user and project manager perceptions of IT project risk: a Delphi study," *Information Systems Journal* (12:2), pp. 103–119.

Kiely, G. and Fitzgerald, B. 2002. "An Investigation of the Information Systems Development Environment: the Nature of Development Life Cycles and the Use of Methods," in *Proceedings of the 8th Americas Conference of Information Systems (AMCIS 2002),* Dallas, Texas. August 9-11.

Klein, H. K., and Myers, M. D. 1999. "A set of principles for conducting and evaluating interpretive field studies in information systems," *MIS Quarterly* (23:1), pp. 67–94.

Kvale, S. 2007. *Doing interviews*, London: Sage Publications.

Liu, J. Y.-C., Chen, H.-G., Chen, C. C., and Sheu, T. S. 2011. "Relationships among interpersonal conflict, requirements uncertainty, and software project performance," *International Journal of Project Management* (29:5), pp. 547–556.

McLeod, L., and MacDonell, S. G. 2011. "Factors that affect software systems development project outcomes," *ACM Computing Surveys* (43:4), pp. 1–56.

Myers, M. D. 2013. *Qualitative research in business & management*, London: SAGE.

Myers, M. D., and Newman, M. 2007. "The qualitative interview in IS research: Examining the craft," *Information and Organization* (17:1), pp. 2–26.

Napier, N. P., Keil, M., and Tan, F. B. 2009. "IT Project Managers' Construction of Successful Project Management Practice: a Repertory Grid Investigation," *Information Systems Journal* (19:3), pp. 255–282.

Nolan, R. and McFarlan, F. W. 2005. "Information Technology and the Board of Directors," *Harvard Business Review* (83:10), pp. 96–106.

Orlikowski, W. J., and Iacono, C. S. 2001. "Research Commentary: Desperately Seeking the 'IT' in IT Research—A Call to Theorizing the IT Artifact," *Information Systems Research* (12:2), pp. 121–134.

Pankratz, O. and Basten, D. 2013. "Eliminating Failure by Learning from it - Systematic Review of IS Project Failure," in *Proceedings of the International Conference on Information Systems (ICIS 2013)*, December 15-18, Milano, Italy.

Parzinger, M.J. and Nath, R. 2000. "A Study of the Relationships between Total Quality Management Implementation Factors and Software Quality," *Total Quality Management* (11:3), pp. 353–371.

Pinto, J. K. 2004. "The Elements of Project Success," in *Field Guide to Project Management*, D. I. Cleland (ed.), Hoboken: John Wiley & Sons, Inc, pp. 14–27.

Poth, A. and Sunyaev, A. (2014): Effective Quality Management: Value- and Risk-Based Software Quality Management. In: IEEE Software. Volume 31, Issue 6, 79–85. DOI: 10.1109/MS.2013.138.

Rahman, S.-u. and Sohal, A. S. 2002. "A Review and Classification of Total Quality Management Research in Australia and an Agenda for Future Research," *The International Journal of Quality & Reliability Management* (19:1), pp. 46–66.

Ravichandran, T., and Rai, A. 1999-2000. "Total Quality Management in Information Systems Development: Key Constructs and Relationships," *Journal of Management Information Systems* (16:3), pp. 119–155.

Ravichandran, T. and Rai, A. 2000. "Quality Management in Systems Development: An Organizational System Perspective," *MIS Quarterly* (24:3), pp. 381–415.

Rothenberger, M. A., Kao, Y.-C., and van Wassenhove, L. N. 2010. "Total quality in software development: An empirical study of quality drivers and benefits in Indian software projects," *Information & Management* (47:7-8), pp. 372–379.

Schmidt, R., Lyytinen, K., Keil, M., and Cule, P. 2001. "Identifying Software Project Risks: an International Delphi Study," *Journal of Management Information Systems* (17:4), pp. 5–36.

Shen, K.N., Khalifa, M. and A. AlMulla 2013. "When Users are Professionals: Effective User Participation for Information Systems Assimilation," in *Proceedings of the International Conference on Information Systems (ICIS)*, Milano, Italy.

Subramanian, G.H., Jiang, J.J. and Klein, G. 2007. "Software Quality and IS Project Performance Improvements from Software Development Process Maturity and IS Implementation strategies," *The Journal of Systems and Software* (80:4), pp. 616–627.

Walsham, G. 2006. "Doing interpretive research," *European Journal of Information Systems* (15:3), pp. 320–330.

Wang, R. Y. 1998. "A Product Perspective on Total Data Quality Management," *Communications of the ACM* (41:2), pp. 58-65.

Wateridge, J. 1998. "How can IS/IT Projects be Measured for Success?" *International Journal of Project Management* (16:1), pp. 59–63.

Yin, R. K. 2009. *Case study research: Design and methods*, Los Angeles, California: SAGE.

Zakuan, N., Muniandy, S., Mat Saman, M. Z., Md Ariff, M. S., Sulaiman, S., and Abd Jalil, R. 2012. "Critical Success Factors of Total Quality Management Implementation In Higher Education Institution: A Review," *International Journal of Academic Research in Business & Social Sciences* (2:12), pp. 19–32.