Influence of Communication on Client Satisfaction in Information System Projects – A Quantitative Field Study

Abstract

This study illuminates the role of client-vendor communication in relation to project performance and client satisfaction in information system projects. Results from a field study with managers on the client side suggest that both process and product performance positively influence the confirmation of expectations. However, process expectations do not – which might be due to the normality of budget and schedule overruns – whereas communication wields an important influence on client satisfaction. Future research should address the contribution of different communication mediums and contrast agile and non-agile projects.

Keywords

Information systems, project success, expectation-confirmation theory, client-vendor communication, quantitative field study.

INTRODUCTION

The unsettled question of how to assess IS project success is reflected in research and might require new theory (Barclay & Osei-Bryson, 2009; Cuellar, 2010; Glass, 1999). In general, a holistic IS project success measurement has to encompass the development *process* as well as the developed *product* (Saarinen & Sääksjärvi, 1992; Thomas & Fernández, 2008; Wateridge, 1998). As such, it is important to know whether to prioritize the process (i.e., budget and schedule) or the product (i.e., requirements).

Despite calls for an extended set of criteria (Ika, 2009; Jugdev & Müller, 2005), companies continue to assess success of IS projects in terms of adherence to planning (ATP), that is, adherence to budget, adherence to schedule, and conformance with requirements (Collins & Baccarini, 2004; Joosten, Basten, & Mellis, 2014; Thomas & Fernández, 2008), thereby neglecting the relevance of the clients contracting such projects (Anderson, Fornell, & Lehmann, 1994; Anderson & Sullivan, 1993; Nelson, 2005). The ATP approach as a rather objective assessment is opposed to assessing success in terms of stakeholder satisfaction, which is substantiated by projects that are perceived as failures despite satisfying the ATP criteria and vice versa (Anderson et al., 1994; Anderson & Sullivan, 1993; Nelson, 2005). Considering success to be a matter of perception is in accordance with the hermeneutical view of Myers (1995). As client satisfaction is crucial for vendor's reputation and decisions about follow-up projects (Anderson et al., 1994; Anderson & Sullivan, 1993), we suggest the client to be the most important stakeholder and, accordingly, client satisfaction to be the uppermost success criterion.

To differentiate between these two types of success – ATP and perceived success – we now denote the former as project performance and the latter as client satisfaction. While project performance refers to the overall, aggregated performance regarding the project, we differentiate further between product performance (i.e., the performance regarding the final

product), and process performance (i.e., the performance regarding the process of creating the final product).

In this context, Expectation-Confirmation Theory (ECT) is an adequate means for a theoretical explanation of satisfaction (Bhattacherjee, 2001). According to the ECT, satisfaction depends on confirmation (or disconfirmation in case of dissatisfaction) of expectations towards the outcome compared to the actual outcome as perceived subjectively. In IS projects, this corresponds to client satisfaction with the project, depending on the degree to which initial expectations are confirmed by final performance perceptions.

Understanding and managing expectations is supposed to be an important management objective (Mintzberg, 1971; Parasuraman, Berry, & Zeithaml, 1991). Since we assume client satisfaction to depend on the confirmation of expectations, the vendor should manage client expectations. For managing client expectations, communication needs to be designed in a way that ensures that the client is well informed about the project state at any time during the project. To keep the client well informed, qualified and regular client-vendor communication (CVC) has been suggested as suitable means (Pankratz & Loebbecke, 2011). In line with research calling for an explicit analysis of the linkage between success factors (i.e., the perceived quality of CVC) and success criteria (Siau, Long, & Ling, 2010), we state our research questions (RQs) as follows:

RQ1: To which extent does ECT explain client satisfaction in IS projects?

RQ2: To which extent does CVC influence project performance and satisfaction in IS projects?

We answer these RQs by developing a research model based on ECT, which we test with data from a field study from the client perspective. Our findings indicate that expectations towards the process are not relevant for client satisfaction. Moreover, our study confirms that both product and process performances positively influence the confirmation of

expectations. Our results thus advance theory concerning IS project success and provide helpful guidance for managers of IS projects.

This paper proceeds as follows. First, we reflect upon prior research on IS project success, ECT, and CVC. Second, we argue for our hypotheses and develop our research model. Third, we explain our research design. Fourth, we describe our data analysis and results. Fifth, we discuss our findings, followed by a short conclusion.

THEORETICAL BACKGROUND AND RELATED WORK

Measuring Information System Project Success

A project is generally defined as "a temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2013, p. 3). An IS can be defined as "a work system whose processes and activities are devoted to processing information, that is, capturing, transmitting, storing, retrieving, manipulating, and displaying information. Thus, an IS is a system in which human participants and/or machines perform work (processes and activities) using information, technology, and other resources to produce informational products and/or services for internal or external customers" (Alter, 2008, p. 451). An IS includes both information technology (IT) artifacts, that is, hardware and software, and business artifacts, that is, processes, organizational structures, informational flows, etc. (Aier, Bucher, & Winter, 2011). Combining these definitions, an IS project can be seen as a project in above terms to develop, extend, or adapt an IS.

Scholars have controversially discussed the definition and measurement of IS project success for decades. Varying approaches demonstrate that there is no consensus concerning the definition and understanding of IS project success (e.g., Agarwal & Rathod, 2006; Baker, Murphy, & Fisher, 1988; Barclay & Osei-Bryson, 2009; Cuellar, 2010; Wateridge, 1998; Yetton, Martin, Sharma, & Johnston, 2000). Ika (2009) provides a comprehensive overview of research concerning (IS) project success over the past decades.

Measuring success and failure of IS projects as of today is traditionally often equated with adherence to budget and schedule as well as fulfillment of requirements (Ika, 2009; Joosten et al., 2014; Pinto & Slevin, 1988; Thomas & Fernández, 2008). Nevertheless, many scholars consider this ATP approach inappropriate (Agarwal & Rathod, 2006; Baker et al., 1988) or at least insufficient (Dvir, Lipovetsky, Shenhar, & Tishler, 1998; Jugdev & Müller, 2005; Pinto & Slevin, 1988; Shenhar, Levy, & Dvir, 1997; Shenhar, Dvir, Levy, & Maltz, 2001). It is argued that this measurement approach leads to an inadequate evaluation of (IS) project success (Dvir et al., 1998; Shenhar et al., 2001). Nevertheless, ATP is in many cases the sole or main criterion used (Joosten et al., 2014; Thomas & Fernández, 2008). Reasons for using these simplified measurement methods and rules of thumb are assumed to be the lack of a clear definition of project success and the easy measurability of ATP (Pinto & Slevin, 1988).

Empirical research provides extensive evidence for projects failing to meet the traditional criteria and nevertheless being considered successful or satisfying the traditional criteria but being perceived as failures (Baker et al., 1988; Ika, 2009; Pinto & Slevin, 1988). Nelson (2005) denotes such projects as *successful failures* or *failed successes*, respectively. In this context, many researchers emphasize (IS) project success to be a matter of perspective (Jugdev & Müller, 2005; Shenhar et al., 1997). Nelson (2005) equates (IS) project success to stakeholder satisfaction. As client satisfaction is crucial for vendor's reputation and decisions about follow-up projects (Anderson et al., 1994; Anderson & Sullivan, 1993), we suggest client satisfaction to be the uppermost criterion. This criterion can only be met if the client perceives the course of a project to be frictionless, that is, without unsolved problems. We therefore distinguish between project performance measured in terms of ATP and satisfaction of the client organization measured in terms of client's subjective performance perceptions.

Expectation-Confirmation Theory

A framework centering on client satisfaction is ECT, which is rooted in the theory of cognitive dissonance (Festinger, 1957). The theory of cognitive dissonance rests upon the idea that information or knowledge can be contradicting. Festinger (1957) calls these pieces of knowledge *cognitions* and emphasizes contradicting cognitions as *inconsistent*. If cognitions are not only inconsistent but also relevant to each other, they cause psychological dissonance. The level of dissonance – or as Harmon-Jones, Harmon-Jones, and Levy (2015) label it, psychological discomfort – depends on the importance of the cognitions in question to the subject. In the context of ECT, this theory becomes relevant for understanding the evaluation of expectations and project performance as well as their influence on satisfaction as the construct of confirmation. Aronson and Carlsmith (1962) show that unmet expectations or disconfirmation of expectations lead to a higher amount of discomfort, which is similar to lower satisfaction. While they focus on expectations regarding one's own performance rather than performance of others, subsequent research applied ECT to consumer satisfaction (Engel, Kollat, & Blackwell, 1968; Howard & Sheth, 1969; Oliver, 1980).

Bhattacherjee (2001) integrated ideas from this consumer-behavior-centric literature as well as from preceding IS research into a new model explaining continuous usage of IS. Narrowing the field of study to IS, Bhattacherjee (2001) takes ECT to the context of IS usage. The author states that user intention to continue using a certain IS is based on user satisfaction, which is influenced by the satisfaction of users' a priori expectations (here: client's initial performance expectation of the project) and the users' a posteriori perceived performance of the product or service (here: perceived actual performance of the project). Figure 1 illustrates the baseline of Bhattacherjee's model.

A recent review concerning the use of ECT in IS research reveals the diverse domains of its application (Hossain & Quaddus, 2012). Predominantly, ECT has been applied to explain IS user satisfaction and continuance intentions. It has been used to explain

information systems continuance in regard to habit forming (Limayem, Hirt, & Cheung, 2007), and has been further refined, for instance regarding application service provision (Susarla, Barua, & Whinston, 2003). Additionally, attitudes and beliefs were integrated (Bhattacherjee & Premkumar, 2004). ECT has also been combined with prominent research streams such as technology acceptance (Venkatesh & Goyal, 2010). In the context of information system development (ISD) projects, exemplary applications of ECT include analyzing personnel skill discrepancies (Tesch et al., 2003) and managing user expectations towards the product (Petter, 2008) as well as client expectations towards the process (Basten, Stavrou, & Pankratz, 2016).

(INSERT FIGURE 1 ABOUT HERE)

Following ECT, higher expectations have a negative influence on confirmation since they are more difficult to fulfill. A positive relation is found for project performance. The higher product or service performance is perceived, the more likely expectations are fulfilled or even exceeded and the higher the level of confirmation will be. In sum, confirmation is influenced positively if expectations are met or exceeded by project performance, and influenced negatively if the project performance is below expectations. The level of confirmation positively influences user satisfaction, with a higher level of confirmation leading to increased satisfaction and a lower level of confirmation to a lower level of satisfaction.

Client-Vendor Collaboration and Communication

For achieving sustainable competitive advantage, research has identified inter-organizational relationships as one of the most important resources (Claycomb & Frankwick, 2010; Dyer & Singh, 1998). Successful inter-organizational relationships involve

organizations that collaborate to reach high communication quality (Claycomb & Frankwick, 2010; Mohr, Fisher, & Nevin, 1996; Nunlee, 2005). Thus, communication is seen as critical for the effectiveness of such relationships (Celuch, Bantham, & Kasouf, 2011; Claycomb & Frankwick, 2004, 2010). Based on seminal works (Mohr et al., 1996; Mohr & Nevin, 1990), communication in this context can be defined as "the extent to which manufacturers communicate with their suppliers on a frequent, formal, and reciprocal basis while using rationality as a means by which to influence them" (Joshi, 2009, p. 134). Such collaborative communication drives performance of business partners, is critical for strategic collaboration (Paulraj, Lado, & Chen, 2008) and establishing value-enhancing inter-organizational relationships in the long-term perspective (Powers & Reagan, 2007), enhances the knowledge base of the business partners (Joshi, 2009), and helps resolve conflicts (Celuch et al., 2011; Claycomb & Frankwick, 2004).

Inter-organizational communication, to which we refer as client-vendor communication (CVC), is suggested to be particularly important in the IS industry (Hyväri, 2006; Mohr et al., 1996; Pankratz & Basten, 2013) due to the technical nature of products, technological changes, and dynamic competitive environments (Mohr et al., 1996). Close inter-organizational relationship helps foster information sharing between clients and vendors in order to both correctly reflect business needs and achieve business goals (Han, Lee, Chun, & Seo, 2013).

An exploratory study concerning the interrelatedness of IS project success factors indicates the relevance of qualified and regular CVC for clients to be satisfied in IS projects (Pankratz & Loebbecke, 2011). In particular, the quality and temporal dimension of communication is supposed to contribute to making projects transparent to clients, thus improving clients' perceptions concerning IS projects. Communication as an integral part of software development, especially in IT outsourcing, helps define needs and reduces misunderstandings (Pettit, Goris, & Vaught, 1997; Poston, Simon, & Jain, 2010; Sharma,

Apoorva, Madireddy, & Jain, 2008). Sharma et al. (2008) state that especially in IT environments inadequate communication might increase the risk of failing and is therefore a crucial aspect of (project) management. In general, more open and supportive communication is seen as beneficial for building trust and reducing misunderstandings (Walton & McKersie, 1965). If the vendor communicates and justifies reasons for deviations from the project plan in an open and comprehensible way, the client might be satisfied with the overall project despite budget and schedule overruns. While this study focuses on the importance of the vendor keeping the client well informed, we acknowledge that communication in a client-vendor relationship is of collaborative, two-way nature.

Considering the relevance of CVC in the context of ECT, we propose that CVC has a positive influence on client satisfaction in ISD projects. This positive influence results from the role of CVC for managing client expectations towards the process and product dimensions in ISD projects.

RESEARCH MODEL AND HYPOTHESES

Figure 2 illustrates our hypothesized research model, which is based on the work by Bhattacherjee (2001) and extended by CVC (Lee & Kim, 1999). In the following, we argue for the respective hypotheses in the context of IS projects.

(INSERT FIGURE 2 ABOUT HERE)

Hypotheses $H_{1\ Process}$, $H_{1\ Product}$, $H_{2\ Process}$, $H_{2\ Product}$, $H_{3\ Process}$, and $H_{3\ Product}$ describe ECT's bottom line that confirmation positively relates to satisfaction. Based on the initial model of expectation confirmation by Bhattacherjee (2001), ECT has been used in a variety of studies in IS research (Hossain & Quaddus, 2012). While this theoretical model has been primarily used to explain IS user satisfaction and continuance intentions, several examples suggest

ECT's applicability to context of managing IS projects (e.g., Petter, 2008; Tesch, Jiang, & Klein, 2003). Accordingly, we postulate that high expectations have a negative influence on confirmation, while low expectations have a positive influence on confirmation. We also propose that if client's performance expectations concerning the project are met or exceeded by a perceived performance of the project, satisfaction is increased, otherwise decreased. Therefore, we postulate project performance having a positive influence on confirmation of expectations. Additionally, confirmation has a positive influence on satisfaction. The three hypotheses are specified as follows.

$H_{1\ Process}$: Process expectations are negatively associated with confirmation of these expectations.

$H_{1\ Product}$: Product expectations are negatively associated with confirmation of these expectations.

$H_{2\ Process}$: Process performance is positively associated with confirmation of client expectations.

$H_{2\ Product}$: Product performance is positively associated with confirmation of client expectations.

$H_{3\ Process}$: Confirmation of process expectations is positively associated with process satisfaction.

$H_{3\ Product}$: Confirmation of product expectations is positively associated with product satisfaction.

Although Bhattacherjee (2001) already specified influences concerning initial performance expectations and perceived actual performance in ECT, and therefore also the possibility of change during the usage, these influences are not further investigated in his work. Our line of reasoning takes into account that communication might not moderate or influence expectations but rather directly influence project performance. We assume this relation because moderation of both – expectations during the evaluation of initial

expectations and project performance – suggests an active recalling of memories of communication. With a direct influence of CVC on project performance, we rather suggest an influence on attitudes during the execution of the project. This means that while attitudes are formed and adjusted throughout, people do not actively and precisely recall their expectations and project performance but rather their more abstract and fuzzy attitudes towards the process or product during overall evaluation. Attitudes influence one's decisions and other evaluative actions or responses consciously as well as unconsciously, based on cognitive, affective, and behavioral information if the evaluation is only needed on a general and abstract level, while detailed remembrance of expectations and project performance is triggered only for more specific evaluation (Eagly & Chaiken, 1993, 2007; Fennis & Stroebe, 2010; Zanna & Rempel, 1988). CVC can serve as information on all three levels: it can be cognitively processed and it can trigger affective responses as well as behavioral actions and responses. These reactions might be memorized by altering existing attitudes towards the process or product or by forming new attitudes. Sharma et al. (2008) state that especially in IT environments inadequate communication (i.e., of low quality) might increase risk of failing and is therefore a crucial aspect of project management. Similarly, Walton and McKersie (1965) state that supportive and open communication (i.e., high quality) is beneficial for building trust and reducing misunderstandings. In general, regular and qualified CVC is seen as relevant for IS project success (Pankratz & Loebbecke, 2011). We therefore assume that high quality CVC reduces risks, leading to better performance, improved client-vendor relationship, client's benevolence, and therefore improved project performance. Hypothesis H_4 covers this assumption and addresses CVC's positive influence on project performance, meaning that if the client perceives CVC positively, process and product performance are perceived positively as well.

$H_{4\ Process}$: CVC is positively associated with process performance.

$H_{4\ Product}$: CVC is positively associated with product performance.

Furthermore, CVC might influence satisfaction directly. If communication by the vendor is perceived to be on time, trustworthy, helpful, or of positive quality in general, this might positively influence client's overall satisfaction similarly as it influences attitudes towards the process and product. Another argument for the direct influence of CVC on satisfaction might be the fact that research sees communication as an integral part of a manager's role or responsibility (Mintzberg, 1971). If CVC is perceived negatively, for instance, untimely or untruthful, the project performance might be lowered as well as the client's overall satisfaction. Similarly, as Walton and McKersie (1965) state, CVC is important to build trust, which in turn influences the client's benevolence and the client's overall satisfaction as it improves the client-vendor relationship. Thus, our fifth hypothesis reads as follows.

$H_{5\ Process}$: CVC is positively associated with process satisfaction.

$H_{5\ Product}$: CVC is positively associated with product satisfaction.

We differentiate between two models, one for the process component (henceforth process model) and one for the product component (henceforth product model) of IS projects (e.g., Saarinen & Sääksjärvi, 1992; Wallace, Keil, & Rai, 2004). We thereby account for participants mentioning that they had nuanced perceptions regarding process and product performance.

RESEARCH DESIGN

Data Collection

We set our sample to contain project managers or other executives in charge of IS projects on the client's side. We looked for participants with the following characteristics. First, potential participants had to be working for a client in a client-vendor relationship, that is, the organization consuming the IS. Second, participants needed to have an overview of the project regarding the different stages of planning, development, and usage, but also regarding

budget and schedule. This implied the third characteristic. We aimed for participants who were in charge of a project. All participants were asked to recall the most recently completed project. Table 11 in Appendix C lists all positions or roles occupied by our participants.

We chose a two-fold approach for participant acquisition. First, we used the Hoppenstedt Hochschuldatenbank (http://www.hoppenstedt-hochschuldatenbank.de) by Bisnode (http://www.bisnode.de) to retrieve data of potential participants in private organizations. Hoppenstedt is one of the largest commercial business data providers in Germany. It contains over 300,000 profiles of German companies with information about their size, industry, and contact information, and has been used by recent studies (Benlian & Hess, 2011; Benlian, Hess, & Buxmann, 2009). We extracted a general overview by searching for companies from different branches such as manufacturing, trade, automobile, and services. Next, we checked for contact persons in these organizations, whose job titles or departments were related to IS. We sent an email inviting this person to participate in our study. If no valid email address could be found, we searched for another contact person from this organization. Second, we contacted persons working at government organizations. For this purpose, we randomly selected city administrations on a map to be roughly equally distributed geographically. Additionally, we picked some country councils. We searched online for contact information of persons with matching job descriptions or responsibilities within these administrations. If none was found, this administration was excluded. We preferred to contact administrations by phone as most of them did not provide email addresses online. If either a telephone number or an email address was found, we contacted this person and invited him or her to participate in our study. If no contact information was found, we looked for a different person of this administration and repeated this loop or excluded this administration if no alternative person was found. In both regards, we focused on German organizations since the Hoppenstedt Hochschuldatenbank lists only German companies and contacting German administrations is preferable when being located in Germany.

Regarding the forms of communication studied, our sample includes face-to-face communication as well as remote communication, both asynchronous (e.g., e-mail) and synchronous (e.g., video conferences) forms. In total, 75 complete answers were collected, from which we omitted one. In this case, the respondent stated the project's status to be "in preparation" which cannot lead to valid answers regarding a satisfaction with the actual performance and the communication during the development process. We collected data only from the client's perspective, that is, all construct assessments are as perceived by the client. Appendix A shows descriptive statistics for our sample.

Measurement Scales

Table 1 provides an overview of the applied constructs, the respective items, and according references. For process performance and product performance, we used measures that are typically used in IS research (Keil, Rai, & Liu, 2013; Wallace et al., 2004). We also used the differentiation between process and product, when adapting items for expectations (Bhattacherjee, 2001). Measures for confirmation are adapted from research concerning ECT in the IS domain (Bhattacherjee, 2001). Satisfaction and CVC are measured in accordance to research concerning client-vendor relations (Lee & Kim, 1999).

In line with previous research (Bhattacherjee, 2001; Wallace et al., 2004), the items for expectations (both process and product), project performance (both process and product), and confirmation were assessed on seven-point Likert scales, ranging from 1 ("I strongly disagree") to 7 ("I strongly agree"). Items related to CVC and satisfaction (both process and product) were assessed on seven-point semantic differential scales (cf. Bhattacherjee, 2001; Lee & Kim, 1999). The scales used ranges from 1 to 7 between listed adjectives.

All latent variables were modeled to have reflective indicators, since all items describe the underlying phenomenon and are expected to behave in the same way. We followed the

literature on which the items are based regarding their modeling as reflective indicators[1] (Bhattacherjee, 2001; Lee & Kim, 1999; Wallace et al., 2004).

Additionally, we collected further information about the projects, which we used as control variables in our analysis. This information includes deadline pressure (low, medium, high), novelty of the developed application (an extension to an already existing application, a new generation, or an innovative application), the complexity in regard to required organizational change (low, medium, high), as well as the project's necessity and whether the project was conducted voluntarily. Furthermore, we asked whether the contact to the vendor was direct or via an intermediate, whether the vendor was familiar to the client from previous projects, the level of trust towards the vendor (low, medium, high), and the level of involvement during the project (low, medium, high).

(INSERT TABLE 1 ABOUT HERE)

Data Analysis and Results

In contrast to covariance-based modeling approaches, partial least squares (PLS) path modeling inhibits minimal limitations on sample size and residual distribution (Chin, Marcolin, & Newsted, 2003). While ECT has a strong theory, our holistic model, consisting of the ECT and CVC, does not have a strong theory and can therefore be argued to be exploratory. Due to this explorative approach and our sample size (Hair, Ringle, & Sarstedt, 2011), we applied PLS path modeling by using SmartPLS 3.0 (Ringle, Wende, & Becker, 2015). As we were especially interested in the strength and direction of relationships between

[1] While literature suggests a reflective measurement model, one could argue for a formative modeling of project performance and CVC. Arguments raised by Fornell and Bookstein (1982) on trait characteristics of reflective measures, Rossiter (2002) arguments on reflective measured indicators causing the construct's underlying concept and interchangeability of reflective indicators as proposed by Jarvis, Mackenzie, and Podsakoff (2003) are arguments for a formative modeling of project performance and expectations. While we chose a reflective measurement model, we conducted our analysis with formative measures as well and did not find substantial differences. To be in line with previous research on which our items are based, we chose to rely on the reflective measurement model.

our constructs, we follow the arguments of Calantone, Graham, and Mintu-Wimsatt (1998, p. 28): "The PLS parameter estimates better reveal the strength and direction (i.e., positive vs. negative) of the relationships among variables compared to correlation coefficients". In addition to our interest in strength and direction of relationships, we were interested in prediction and exploratory model validation, for which PLS is suited as well (Birkinshaw, Morrison, & Hulland, 1995; Green & Ryans, 1990; Mahmood, Bagchi, & Ford, 2004). Furthermore, PLS "is more robust with small sample sizes" (Green & Ryans, 1990, p. 53). While our measures are already tested and verified, the relations are not, for which PLS is especially suited (Ainuddin, Beamish, Hulland, & Rouse, 2007). As pointed out before, we aimed to validate our findings with project performance and CVC as formative constructs as well (see footnote 1), for which PLS is better suited than a covariance-based approach (Hair, Sarstedt, Ringle, & Mena, 2012; Reinartz, Haenlein, & Henseler, 2009). Although covariance-based approaches often do not provide more precise results, we validated our results by utilizing a covariance-based approach, which showed similar results.[2] This calculation can only provide weak support for our results, as a sample size of 74 is rather low for a covariance-based SEM. We validated our scales' psychometric properties to measure the constructs and falsify the hypothesized relations as stated above.

Measurement Model

Since our measurement model contains reflective indicators only, we consider the following four reliability and validity criteria: internal consistency, indicator reliability, convergent validity, and discriminant validity.

First, two criteria can be used to evaluate internal consistency. Cronbach's alpha and composite reliability need to exceed 0.700 for each construct (Nunnally, 1978; Werts, Linn, &

[2] The results calculated by AMOS for SPSS can be obtained from the authors. Similarly to our study, others (e.g., Sideridis, Simos, Papanicolaou, & Fletcher, 2014) found that designs with more than 20 items and between 4 and 10 latent variables were sufficiently strong with less than 100 participants.

Jöreskog, 1974). Our two models fulfill both criteria since the respective values are above the recommended threshold (see Table 2 for process model and Table 3 for product model).

Second, indicators are considered reliable if the associated latent construct explains more than half of the indicator's variance (Henseler, Ringle, & Sinkovics, 2009). Indicators are reliable if they have a t-value equal to 1.66 or higher (level of significance 5%) and a loading of 0.700 or higher. The process model passed the criterion of indicator reliability with the lowest loading being 0.742 (CONF2) and lowest t-value being 4.049 (EPROC2). While all indicators of the product model fulfilled the t-value criterion, we removed two indicators (EPROD1 and EPROD5) since they showed a loading below 0.700.

Third, three criteria can be applied to assess convergent validity (Fornell & Larcker, 1981): all item factor loadings should exceed 0.700, composite construct reliabilities should exceed 0.800, and average variance extracted (AVE) should exceed 0.500 for each construct. As Table 4 (process model) and Table 5 (product model) show, standardized item loadings exceed the threshold of 0.700. Additionally, Tables 2 and 3 demonstrate the composite reliabilities of all constructs exceed the required minimum of 0.800. The tables also show that AVE values of all constructs exceed the threshold of 0.500. Thus, convergent validity conditions are met.

Fourth, to confirm discriminant validity latent variables need to explain their indicators' variances to a higher degree than the variances of other latent variables (Fornell & Larcker, 1981). Accordingly, the square root of each construct's AVE needs to exceed the correlations with the other constructs. As can be seen in Table 2 and Table 3, all latent variables in both models fulfill this criterion. Moreover, we evaluated discriminant validity by examining the factor loadings of each indicator. According to Chin (1998), each indicator needs to load higher on the associated construct compared to all other constructs. In our case, discriminant validity is confirmed by factor loadings and cross-loadings (see Tables 4 and 5). In addition to the Fornell-Larcker criterion, Henseler, Ringle, and Sarstedt (2015) propose Heterotrait-

monotrait (HTMT) ratio of correlations as a new criterion to assess discriminant validity. Table 9 and 10 in Appendix C show the calculated HTMT values for both models. The highest HTMT values of 0.793 for the process model and 0.678 for the product model are below a conservative threshold of 0.850 (Henseler et al., 2015). Combining the results from the HTMT criterion and the Fornell-Larcker criterion is seen as a promising approach to assess discriminant validity (Voorhees, Brady, Calantone, & Ramirez, 2015).

(INSERT TABLE 2 ABOUT HERE)

(INSERT TABLE 3 ABOUT HERE)

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(INSERT TABLE 5 ABOUT HERE)

Common Method Bias

Common method bias (CMB) is a potential threat to internal validity, that is, CMB connotes that empirical evidence for a hypothesis is more a matter of research methods applied and less a reflection of actual affairs (Gregor & Klein, 2014; Sharma, Yetton, & Crawford, 2009). While method biases are presumed to be less serious in IS research compared to other disciplines (Malhotra, Kim, & Patil, 2006), we designed our study in a way that reduces the risk of increased correlations due to a single data collection method. In particular, we followed recommendations (Burton-Jones, 2009; Gregor & Klein, 2014) concerning study design (i.e., to reduce the likelihood of CMB) and data evaluation (i.e., to lessen concerns of CMB) as follows. Concerning the former, we needed to collect information for both the dependent and independent variables from the same key informants since we

were interested in the perception of client managers in both regards to assess the relation between their expectations and performance perceptions. However, we avoided the use of question blocks and guaranteed participants anonymity to encourage them to answer honestly. We took no means to link questionnaires to specific organizations, mail accounts, or persons. Additionally, we did not promise rewards for participating in our study. Our only offer concerned a free copy of our study once finished, regardless of participation (for respective recommendations see Lindell & Whitney, 2001; Podsakoff, Mackenzie, Lee, & Podsakoff, 2003). Concerning the latter, we conducted Harmon's single-factor test, following Malhotra et al. (2006). We performed an exploratory factor analysis of all items (Podsakoff et al., 2003). Since none of the resulting factors accounted for a majority of the variance, we assume no substantial CMB to exist. Moreover, we applied the marker-variable technique in a post hoc fashion to check for the correlation between theoretically uncorrelated dimensions (Malhotra et al., 2006). According to Lindell and Whitney (2001), the second-smallest positive correlation between manifest variables can be used as an indicator to assess CMB as it provides an adequate proxy. Considering that the second-smallest correlation between manifest variables in our sample amounts 0.005, it can be argued that CMB is not prevalent (Malhotra et al., 2006) in our study.

Hypotheses Testing

Evaluation of structural models with PLS requires a sample size of at least ten cases per predictor (Chin, 1998). More concretely, the sample size should be at least ten times larger than either the highest number of indicators per scale or the highest number of paths directed at any construct in the structural model (for more information on PLS estimation quality and sample size requirements, see Barclay, Higgins, & Thompson, 1995; Chin, 1998; Chin et al., 2003; Chin & Newsted, 1999; Goodhue, Lewis, & Thompson, 2012; Marcoulides & Saunders, 2006). Since the highest number of indicators per construct is five and the highest

number of paths to any construct is two, our sample (n = 74) is sufficient to adequately calculate the models. In addition, other recent studies rely on rather low sample sizes as well (e.g., Keil et al., 2013). As commonly applied, we evaluate our structural model in terms of path coefficients and explained variance (R^2). Whereas path coefficients represent the strength of relationships between independent and dependent variables, R^2 values indicate the predictive power of the model. We used SmartPLS 3 (Ringle et al., 2015) to calculate path coefficients and applied SmartPLS's bootstrapping (5,000 samples) to retrieve the respective t-values. Figures 3 and 4 show the overall result for the process and product model, respectively. Our models are in line with the recommendation by Falk and Miller (1992), suggesting that for nomological validity endogenous latent constructs should provide an R^2 of at least 0.10 to be adequately judged.

(INSERT FIGURE 3 ABOUT HERE)

(INSERT FIGURE 4 ABOUT HERE)

According to Hair et al. (2011) and Henseler et al. (2009), the R^2 values of satisfaction (0.49 and 0.43) are close to being moderate (the threshold being 0.5). Whereas the value for confirmation in case of the product model is similar (0.43), the value for confirmation in case of the process model is considerably lower (0.20). The R^2 values of project performance (0.13 and 0.10) are rather low. However, concerning factors associated with process and product performance in IS projects (Kendra & Taplin, 2004; Nelson, 2007; Reel, 1999), CVC is only one of many factors and explaining these constructs was not our primary purpose.

Except for one hypothesis (i.e., the association between process expectations and confirmation; see Figure 3 and Table 6), the estimated models corroborate our hypotheses. The path coefficients are supported by the effect sizes as calculated according to Cohen

(1988). Table 6 provides an overview of the respective indices. Finally, we performed post-hoc power analyses for the endogenous constructs in our models. Considering the recommended threshold of 0.8, the respective results show a sufficient power level for confirmation (0.98 and 0.99), project performance (0.92 and 0.81), and client satisfaction (1.00 and 0.99). Only one of our control variables (see 'Measurement Scales') showed a significant effect with process satisfaction or product satisfaction (trust towards the vendor, $p < 0.05$).

(INSERT TABLE 6 ABOUT HERE)

Summary and Discussion

We developed and empirically tested a model of IS project success that is based on ECT and that explicitly considers CVC. The model suggests client satisfaction to be the uppermost criterion that is associated with process performance (i.e., budget and schedule) and product performance (i.e., functional and non-functional requirements). While we differentiate between project success concerning the process and the product, the data from a questionnaire survey with people in charge of IS projects on behalf of clients contracting the projects widely corroborate the hypothesized models (see Table 6). We thus advance the understanding of measuring IS project success, contribute to a better understanding of IS development, and explicitly link a success factor (i.e., the perceived quality of CVC) to success criteria (Siau et al., 2010). While previous studies have mostly dealt with vendors' perspectives, our study uses data collected from project managers on behalf of clients. In the following, we discuss implications of our findings, address the study's limitations, and provide guidance for future research.

Implications for Research

Our study is in line with previous research analyzing the role of process and product for achieving client satisfaction (Basten & Pankratz, 2015). While previous research analyzed the perspective of project managers on behalf of the vendor, we now complement the picture by explicitly taking client perceptions into account. In general, our study contributes to the development of IS project management theory, offering several insights.

First, we found that the perceived quality of CVC has an influence on the client's evaluation process. Our results show that CVC influences the client perceptions of process and product performance. Furthermore, CVC is positively associated with satisfaction concerning the process and the product (see Figures 3 and 4). However, the relevance of CVC for satisfaction concerning the process seems to be more important. Finally, we emphasize that the improvement of project performance or satisfaction might only be partially related to managed perception due to the communication itself. Nevertheless, improved CVC is likely to result in objectively improved process and product performance, as better and more efficient communication (that is, an improvement in communication quality) is likely to lead to fewer misunderstandings and clearer definitions, ultimately resulting in better products and processes (Basten et al., 2016; Petter, 2008; Poston et al., 2010; Sharma et al., 2008; Walton & McKersie, 1965). Our results also support the claim by Lee and Kim (1999) regarding the importance of strengthening communication between client and vendor for building confidence to prevent opportunism in IS projects.

Second, by using ECT and observing the client perceptions of ISD projects, we show that client satisfaction in IS projects can be explained by confirmation of expectations to a large extent. The effect of project performance in the product model is stronger than the effect of project performance in the process model. We presume that clients tend to value the final product higher than the process leading to the product. Accordingly, long-term objectives such as achieving business goals seem to be considered more important than adherence to

budget and schedule as short-term goals. Nevertheless, the perceived process performance has shown to have a positive effect on the confirmation of expectations, therefore still contributing to client satisfaction. And while the final product might be valued higher than the process itself, both are linked to each other, as the process leads to the product and flaws and improvements of the process can rub off onto the product.

Third, expectations towards the process do not affect the confirmation of expectations. The respective hypothesis $H_{1\ Process}$ is the only one that is not supported by our data. In our view, a plausible explanation is the large degree of budget and schedule overruns typically reported in IS projects (e.g., Sonnekus & Labuschagne, 2003). Since overruns are common, expectations might be rather low, thus not affecting the confirmation of expectations in general. Our control variables measuring complexity, novelty, and deadline pressure showed no significant correlation towards satisfaction regarding process or product (see Appendix B).

As regards avenues for future research, we encourage scholars to replicate and extend our study, especially concerning different cultures and contexts. Similarly, an independent observer (e.g., a matched pair survey conducted on both sides, client and vendor) reporting about projects instead of self-administered questionnaires for data gathering would further minimize social desirability bias. As we did not ask specifically for the usage of agile development practices, future research might also investigate the role of communication in agile versus non-agile projects, since agile development practices often rely on a high level of communication and face-to-face meetings (Inayat, Salim, Marczak, Daneva, & Shamshirband, 2015; Khan & Khan, 2013; Sundararajan, Bhasi, & Vijayaraghavan, 2014). As indicated by our results, this might lead to further insights regarding CVC as well as process and product satisfaction. Especially short development cycles, and therefore regular and frequent feedback, might result in an increased importance of CVC and therefore higher impact on satisfaction.

Implications for Practice

Our results indicate strong correlations between client satisfaction and client performance perceptions regarding both the process and the product. While studies concerning ISD project success/failure commonly refer to budget and schedule overruns, our results suggest that process expectations (i.e., time and budget) are less influential compared to product expectations. Accordingly, we suggest that project evaluations should emphasize the product component. Additionally, we question the validity of ISD project failure rates that focus on process performance. A project that does not meet process performance expectations, but manages to satisfy the client due to high product performance might lead to follow-up projects and should thus be considered a success for both client and vendor. However, practitioners should also be aware that the relevance of success criteria can differ depending on project type and context (Pankratz & Basten, 2015). For instance, adherence to schedule is more critical in projects with a fixed deadline (e.g., regulatory requirements that need to be implemented at a specific point in time). In such projects, the relevance of adherence to schedule naturally increases (Pankratz & Basten, 2015); however, meeting a critical deadline is likely to affect client satisfaction as well. Furthermore, practitioners should be aware that a clear distinction between process performance and product performance is not always evident. A recent case study on a failed ISD project suggests that lack of transparent communication (process-related) about fundamental product issues (product-related) contributed to project failure (van Ekris, 2016). Nevertheless, taking client satisfaction explicitly into account will improve project evaluation and project performance.

While the differentiation into long-term and short-term relationships between client and vendor had no effect on client satisfaction in our study, communication quality is seen as an important part of collaboration, especially for long-term relationships (Claycomb & Frankwick, 2010). In offshored and outsourced projects, communication becomes even more important. Research reveals that in distributed ISD projects, communication is crucial for

efficiency and, ultimately, success (Herbsleb & Mockus, 2003). However, research also points out that communication can be harmful – if the ideal level of communication is exceeded. For instance, too much communication might drive the clients away from the company rather than pulling them closer (Godfrey, Seiders, & Voss, 2011). While these findings are observed in the field of marketing, similar effects are possible in IS projects as well – if clients are too busy, scheduling meetings for every step in the process could be time consuming and perceived as annoying and counterproductive (Basten et al., 2016). Following, practitioners should focus on the quality of CVC and not (only) its quantity.

Finally, our study indicates that trust in vendor influences clients' overall satisfaction, which is in line with previous research suggesting that communication and conflict management are important for building trust (Celuch et al., 2011) and ultimately client satisfaction. While trust is thus considered important for successful projects and should be considered by stakeholders on both client and vendor side, clients should not rely on the vendor too extensively. Previous research on failed ISD projects suggests that too much trust in the vendor can be problematic (Pankratz & Basten, 2013). If the client is not engaged at all, vendors are unlikely to develop a system that satisfies the client. In distributed ISD projects, the buyer-supplier-supplier relationships triad (Wu & Choi, 2005; Wu, Choi, & Rungtusanatham, 2010) is important to consider because additional influences and dependencies arise. In such triads, not only the relation between vendor and client is important, but the relationship among vendors needs to be taken into account as well.

Limitations

One limitation of our study is the sample size (n = 74). However, our sample size is above the level required to retrieve statistically significant results. Moreover, our analysis yielded a satisfying level of power and our results seem to be robust despite the exploratory character of our study since the influence of the control variables is insignificant. Moreover,

our sample comprises organizations residing in Germany only. While some of the participants' companies act internationally, the responses stem from the German branches only. This might result in missing or insufficient transferability to other countries and cultures.

Our study might also suffer from social desirability bias. Social desirability is the "tendency on behalf of the subjects to deny socially undesirable traits and claim socially desirable ones, and the tendency to say things which place the speaker in a favourable light" (Nederhof, 1985, p. 264). This bias is likely to occur in studies such as ours, because it is generally more socially desirable to report a successful project compared to the opposite. Nederhof (1985) proposes to use forced-choice items, that is, to utilize items in which participants have to choose between two approximately similar attractive items of different topics. While Nederhof already mentions this method's downsides such as an increased complexity of creating matching items and individual differences in attitudes and therefore preferences, we were not able to apply this approach in our study due to clear and judgmental scale of performance measures such as budget and schedule. Furthermore, Nederhof suggests postulating questions which are neutral concerning social desirability. Similar to forced-choice items, we tried to minimize the social desirability emerging from our questions. However, due to the clear preference of success compared to failure, social desirability is still likely to emerge from questions posted in our questionnaire. Self-administered questionnaires did not always actively reduce social desirability bias, but it is likely that anonymous and self-administered questionnaires have less distortion. Since our questionnaire was both anonymous and online available at any place and any time, we suggest that our way of data collection reduces the influence of social desirability bias.

As our study was based on self-administered questionnaires from the client perspective only, deviations between reported and actual ATP might occur. However, we believe that the discrepancy between actual ATP and client perceptions of it should be minimal, if at all

present, for two reasons. First, the ATP measures are said to be objective (Joosten et al., 2014; Karlsen, Andersen, Birkely, & Ødegård, 2005), especially regarding keeping the budget and schedule measures (which is one of the reasons for ATP's popularity as success criteria in the first place). Second, the client should not be tempted lying about plans being met because meeting them is vendors' responsibility.

CONCLUSION

With our study, we advance the understanding of expectations, communication, and client satisfaction IS projects in the following ways. First, based on ECT, we have analyzed how CVC relates to project performance and satisfaction concerning the development process as well as the developed product on behalf of clients in IS projects. Increased communication quality is likely to improve client perceptions concerning process and product performance and to increase client satisfaction concerning both dimensions of IS project success. Second, our study is in line with research considering client satisfaction the uppermost criterion of IS project success. Our results suggests that both process and product performance are relevant for the confirmation of expectations in IS projects. While this insight has primarily been assessed from the projects managers' perspective on behalf of vendors, our study complements the picture by using data obtained from the managers' counterparts on behalf of the client. Finally, expectations concerning the development process are not relevant for client satisfaction, which we explain by the common overruns of related indices in many IS projects. Future research might dig deeper into the contribution of different communication mediums. To strengthen our findings, future research should attempt to replicate our study in different settings and investigate differences concerning communication mediums by contrasting agile and non-agile development projects.

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APPENDIX A

(INSERT TABLE 7 ABOUT HERE)

APPENDIX B

(INSERT TABLE 8 ABOUT HERE)

APPENDIX C

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FIGURES

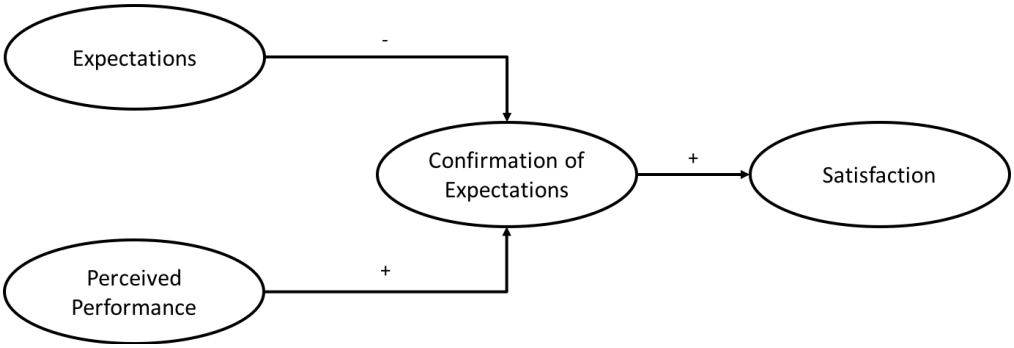

Fig. 1. Expectation Confirmation Theory (Extract, according to Bhattacherjee, 2001)

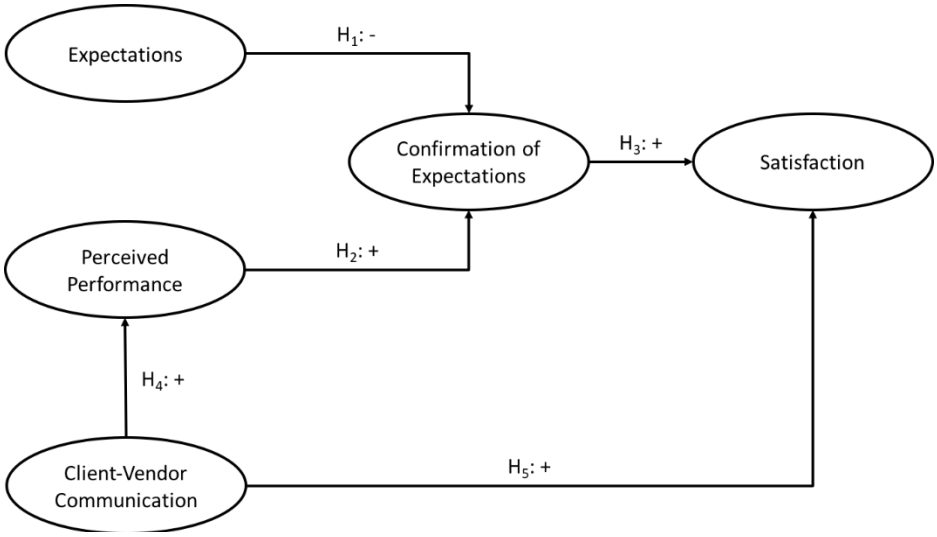

Fig. 2. Proposed Research Model

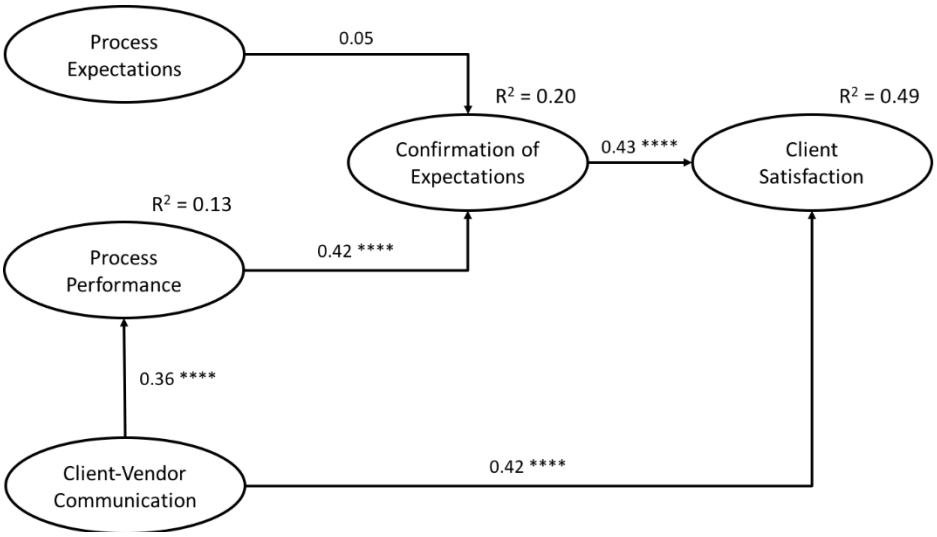

Fig. 3. Estimated Model (Process) of Client Satisfaction (n = 74)
* p < 0.10 ** p < 0.05 *** p < 0.01 **** p < 0.001

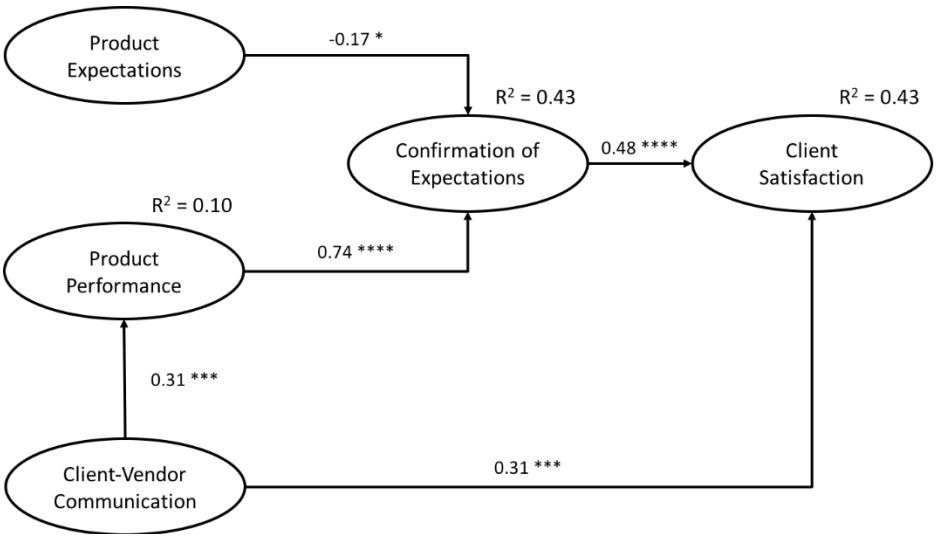

Fig. 4. Estimated Model (Product) of Client Satisfaction (n = 74)
* p < 0.10 ** p < 0.05 *** p < 0.01 **** p < 0.001

TABLES

Table 1

Constructs and Corresponding Items

Construct	Item no.	Item	References
Process expectations	To which extent do you agree/disagree with the following statements concerning the considered project?		Derived from Bhattacherjee (2001) and Wallace et al. (2004)
	EPROC1	I expected the IS project to be completed within budget.	
	EPROC2	I expected the IS project to be completed within schedule.	
Product expectations	To which extent do you agree/disagree with the following statements concerning the considered project?		
	EPROD1	I expected the IS to have the intended functional requirements.	
	EPROD2	I expected the IS to be reliable.	
	EPROD3	I expected the overall quality of the IS to be high.	
	EPROD4	I expected the IS to fulfill users' expectations with respect to the system's response time.	
	EPROD5	I expected the IS to be easy to maintain.	
Process performance	To which extent do you agree/disagree with the following statements concerning the considered project?		Wallace et al. (2004)
	PROC1	The system was completed within budget.	
	PROC2	The system was completed within schedule.	
Product performance	To which extent do you agree/disagree with the following statements concerning the considered project?		Wallace et al. (2004)
	PROD1	The system's intended functional requirements were met.	
	PROD2	The overall quality of the developed application is high.	
	PROD3	The application developed is reliable.	
	PROD4	The system meets user expectations with respect to response time.	
	PROD5	The application is easy to maintain.	
Confirmation	To which extent do you agree/disagree with the following statements concerning the considered project?		Adapted from Bhattacherjee (2001)
	CONF1	My experience with the IS project was better than what I expected.	
	CONF2	The benefit provided by the IS project was better than what I expected.	
	CONF3	Overall, my expectations concerning the IS project were at least confirmed.	
Process satisfaction	Regarding my experience with the IS project concerning the development process (compliance with budget and schedule, communication, dealing with issues, etc.), I feel...		Adapted from Lee and Kim (1999)
	PROCS1	Very satisfied ... Very dissatisfied	
	PROCS2	Very pleased ... Very displeased	
	PROCS3	Very contented ... Very frustrated	
	PROCS4	Absolutely delighted ... Absolutely terrible	
Product satisfaction	Regarding my experience with the IS project concerning the product itself (functional and nonfunctional requirements, expectations in general, etc.), I feel...		
	PRODS1	Very satisfied ... Very dissatisfied	
	PRODS2	Very pleased ... Very displeased	
	PRODS3	Very contented ... Very frustrated	
	PRODS4	Absolutely delighted ... Absolutely terrible	
Client-vendor communication	During the IS project, the manner and methods of communication between our vendor and us were...		Lee and Kim (1999)
	CVC1	Timely ... Untimely	
	CVC2	Accurate ... Inaccurate	
	CVC3	Complete ... Incomplete	
	CVC4	Credible ... Incredible	

Table 2

Scale Properties and Descriptive Statistics (Process Model)

Construct	Cronbach's alpha	Composite reliability	AVE	Inter-construct correlations				
				(1)	(2)	(3)	(4)	(5)
(1) Expectations	0.75	0.87	0.78	**0.88**				
(2) Process performance	0.70	0.87	0.77	0.56	**0.88**			
(3) Confirmation	0.81	0.88	0.72	0.28	0.45	**0.85**		
(4) Process satisfaction	0.92	0.95	0.81	0.03	0.31	0.58	**0.90**	
(5) Client-vendor communication	0.88	0.92	0.73	0.15	0.36	0.36	0.58	**0.85**
Note: Diagonal elements in bold represent the square root of AVE for the respective construct								

Table 3

Scale Properties and Descriptive Statistics (Product Model)

Construct	Cronbach's alpha	Composite reliability	AVE	Inter-construct correlations				
				(1)	(2)	(3)	(4)	(5)
(1) Expectations	0.87	0.92	0.80	**0.89**				
(2) Product performance	0.93	0.94	0.77	0.58	**0.88**			
(3) Confirmation	0.81	0.88	0.71	0.26	0.64	**0.84**		
(4) Product satisfaction	0.94	0.96	0.85	0.13	0.54	0.59	**0.92**	
(5) Client-vendor communication	0.88	0.92	0.73	0.23	0.31	0.36	0.48	**0.85**
Note: Diagonal elements in bold represent the square root of AVE for the respective construct								

Table 4

Factor Loadings (bold) and Cross-loadings (Process Model)

Scale items	Expectations	Process performance	Confirmation	Process satisfaction	Client-vendor communication
EPROC1	**0.966**	0.524	0.313	0.030	0.099
EPROC2	**0.789**	0.486	0.131	0.023	0.235
PROC1	0.631	**0.845**	0.371	0.256	0.245
PROC2	0.383	**0.905**	0.412	0.291	0.377
CONF1	0.199	0.411	**0.922**	0.530	0.337
CONF2	0.190	0.315	**0.742**	0.323	0.338
CONF3	0.319	0.404	**0.870**	0.573	0.273
PROCS1	0.059	0.332	0.523	**0.868**	0.480
PROCS2	-0.012	0.351	0.596	**0.955**	0.585
PROCS3	0.031	0.238	0.507	**0.943**	0.579
PROCS4	0.041	0.194	0.443	**0.831**	0.401
CVC1	0.124	0.326	0.279	0.427	**0.844**
CVC2	0.088	0.241	0.284	0.626	**0.838**
CVC3	0.131	0.320	0.335	0.441	**0.874**
CVC4	0.183	0.365	0.351	0.443	**0.863**

Table 5

Factor Loadings (bold) and Cross-loadings (Product Model)

Scale items	Expectations	Product performance	Confirmation	Product satisfaction	Client-vendor communication
EPROD2	**0.899**	0.568	0.236	0.130	0.206
EPROD3	**0.912**	0.499	0.209	0.068	0.203
EPROD4	**0.866**	0.483	0.242	0.140	0.195
PROD1	0.421	**0.885**	0.510	0.474	0.242
PROD2	0.565	**0.928**	0.632	0.591	0.296
PROD3	0.483	**0.928**	0.602	0.564	0.265
PROD4	0.533	**0.861**	0.600	0.436	0.292
PROD5	0.545	**0.782**	0.435	0.257	0.278
CONF1	0.171	0.500	**0.908**	0.461	0.342
CONF2	0.147	0.276	**0.700**	0.326	0.342
CONF3	0.294	0.713	**0.904**	0.620	0.274
PRODS1	0.109	0.595	0.607	**0.923**	0.398
PRODS2	0.084	0.501	0.528	**0.941**	0.504
PRODS3	0.109	0.454	0.544	**0.949**	0.423
PRODS4	0.178	0.428	0.477	**0.869**	0.448
CVC1	0.138	0.185	0.266	0.326	**0.825**
CVC2	0.026	0.190	0.287	0.478	**0.821**
CVC3	0.241	0.313	0.325	0.379	**0.887**
CVC4	0.339	0.353	0.340	0.439	**0.884**

Table 6

Results for Hypotheses

Hypothesis	Confirmed?	Path	t	p-value	f^2
Process Model					
$H_{1\ Process}$	No	0.05	0.429	0.668	0.003
$H_{2\ Process}$	Yes	0.42	3.721	0.000	0.148
$H_{3\ Process}$	Yes	0.43	3.849	0.000	0.290
$H_{4\ Process}$	Yes	0.36	3.597	0.000	0.149
$H_{5\ Process}$	Yes	0.42	4.494	0.000	0.304
Product Model					
$H_{1\ Product}$	Yes	-0.17	1.683	0.092	0.037
$H_{2\ Product}$	Yes	0.74	7.258	0.000	0.639
$H_{3\ Product}$	Yes	0.48	4.302	0.000	0.337
$H_{4\ Product}$	Yes	0.31	3.163	0.002	0.111
$H_{5\ Product}$	Yes	0.31	3.134	0.002	0.146

Table 7

Sample Description

Participants (n = 74)			
Sex	Female (9.46%)	Male (86.49%)	No response (4.05%)
Experience	17.2 projects (mean)	11.2 years (mean)	
Industry	Public (22.97%)	Private (77.03%)	
Vendor	Internal (35.14%)	External (64.86%)	
Vendor location	Near the client (54.05%)	Located at a different site (45.95%)	
Projects (n = 74)			

Coordination	Direct (95.95%)	Intermediate (4.05%)
First-time contact	Yes (40.54%)	No (59.46%)
Duration (in months)	16.0 (mean)	12 (median)
# Team members	7.8 (mean)	6 (median)

Table 8

Correlation of Control Variables to Satisfaction (n = 74)
* p < 0.10 ** p < 0.05 *** p < 0.01 **** p < 0.001

Control Variable	**Process Satisfaction**	**Product Satisfaction**
Deadline pressure	0.024	0.034
Novelty of the application	0.048	0.089
Complexity of the needed organizational change	- 0.099	- 0.054
Necessity of the project	- 0.159	- 0.219
Direct or indirect contact	- 0.005	0.011
Familiarity of the vendor	0.129	0.227
Trust towards the vendor	0.273 *	0.209
Client involvement during the project	0.081	0.117

Table 9

HTMT Values (Process Model)

Construct	CVC	Expectations	Process performance	Satisfaction
CVC	0.445			
Expectations	0.314	0.232		
Process performance	0.589	0.457	**0.793**	
Satisfaction	0.647	0.622	0.049	0.384

Table 10

HTMT Values (Product Model)

Construct	CVC	Expectations	Product performance	Satisfaction
CVC	0.445			
Expectations	0.291	0.250		
Product performance	**0.678**	0.322	0.632	
Satisfaction	0.634	0.523	0.170	0.605

Table 11

Roles as reported by Participants (n = 74)

Role	**Count (n = 74)**
Project Lead (concerned with everyday management tasks)	58 (78.38%)

Department Contact (project coordination / keeping contact with vendor)	8 (10.81%)
Steering Committee (keeping the project on track)	8 (10.81%)