12-12-2015

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

Phil Diegmann
University of Cologne, diegmann@wiso.uni-koeln.de

Dirk Basten
University of Cologne, basten@wiso.uni-koeln.de

Oleg Pankratz
University of Cologne, pankratz@wiso.uni-koeln.de

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

Phil Diegmann
University of Cologne
diegmann@wiso.uni-koeln.de

Dirk Basten
University of Cologne
basten@wiso.uni-koeln.de

Oleg Pankratz
University of Cologne
pankratz@wiso.uni-koeln.de

ABSTRACT

Divergences between perception and measurement of information system (IS) project success are phenomena known as successful failures or failed successes. Such projects either satisfy stakeholder expectations or are completed according to their plans, but do not succeed in both terms. Based on expectation-confirmation theory, we advance the understanding of project success by observing the role of client-vendor communication regarding the interaction of client expectations, perceptions, and satisfaction. By means of a quantitative field study with managers of IS projects on the client side, we show that perceptions of product performance are more relevant than perceptions of process performance for meeting client expectations in IS projects. Expectations towards the process (i.e., budget and schedule) are revealed to be considerably less relevant, which is a likely consequence of many projects failing to meet such expectations. An avenue for future research resulting from our study is the investigation of differences concerning communication mediums by contrasting agile and non-agile development projects.

Keywords

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

INTRODUCTION

While companies continue to assess success of information system (IS) projects in terms of adherence to planning (i.e., adherence to budget and schedule, and conformance with requirements; see Collins and Baccarini, 2004, Joosten, Basten and Mellis, 2014, Thomas and Fernández, 2008), managers of such projects should also strive to satisfy the client contracting the project (Project Management Institute, 2008, p. 9). The unsettled question of how to measure IS project success is also reflected in IS research and might require new theory (Barclay and 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 and Sääksjärvi, 1992, Thomas and 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). This view is opposed by assessing project success in terms of stakeholder perceptions (Nelson, 2005), which are supposed to be influenced by performance-unrelated factors. In this context, the Expectation-Confirmation Theory (ECT) is an adequate means for a theoretical explanation of satisfaction (Bhattacherjee, 2001). In IS projects, this theory corresponds to client satisfaction with the project, depending on the degree to which initial expectations are confirmed by final perceptions. Since we presume client satisfaction to depend on the confirmation of expectations, the vendor should manage client expectations by keeping the client well informed about a project's state at any time (Project Management Institute, 2008, p. 190). We thus consider the communication between client and vendor (henceforth client-vendor communication or CVC) to be a performance-unrelated factor influencing client satisfaction in IS projects. For instance, if the vendor communicates and justifies reasons for deviations from a project's plan in a credible, complete, and comprehensible way, the client might be satisfied despite budget and schedule overruns (Gray, 2001). We claim CVC to be performance-unrelated since it only has an indirect influence on performance, as opposed to a direct one (e.g., the influence of an increased workforce). As previous research reveals the importance of communication for performance and satisfaction (Garnett, Marlowe and Pandey, 2008,

Pettit, Goris and Vaught, 1997), we extend the ECT by explicitly considering CVC. Accordingly, 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 perceived performance and satisfaction in IS projects?

We answer these RQs by developing and testing a research model based on ECT. We explicitly consider the client perspective since previous research has mainly relied on data gathered from vendors. Our findings indicate that expectations towards the process are not relevant for client satisfaction. Moreover, our study confirms the distinction between process performance and product performance and reveals the latter to be more important for client satisfaction in IS projects. Our results thus advance theory concerning IS project success and provide helpful guidance for managers of IS projects.

This paper proceeds as follows. Next, we reflect upon prior research on IS project success, ECT, and CVC. We then argue for our hypotheses and develop our research model. Subsequently, we explain our research design. We continue by describing our data analysis and results. We then discuss our findings, followed by a short conclusion.

THEORETICAL BACKGROUND AND RELATED WORK

Measuring Information System Project Success

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 (Agarwal and Rathod, 2006, e.g., Baker, Murphy and Fisher, 1988, Barclay and Osei-Bryson, 2009, Cuellar, 2010, Wateridge, 1998, Yetton, Martin, Sharma and Johnston, 2000). Ika (2009) provides a comprehensive overview of research concerning (IS) project success over the past decades.

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

Empirical research provides extensive evidence for projects failing to meet traditional criteria and nevertheless being considered successful or satisfying traditional criteria but being perceived as failures (Baker et al., 1988, Ika, 2009, Pinto and Slevin, 1988). In this context, many researchers emphasize (IS) project success to be a matter of perspective (Jugdev and Müller, 2005, Shenhar et al., 1997). Nelson (2005) equals (IS) project success to stakeholder satisfaction. As client satisfaction is crucial for contractor's reputation and decisions about follow-up projects (Anderson, Fornell and Lehmann, 1994, Anderson and Sullivan, 1993), we suggest client satisfaction to be the uppermost criterion, which can only be achieved 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 adherence to planning and client satisfaction measured in terms of subjective performance perceptions.

Expectation-Confirmation Theory

A framework centering on stakeholder 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 inconsistent and 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 perceived 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 increased discomfort resulting from lower satisfaction. While they focus on expectations regarding one's own performance rather than performance of others, following research applied ECT to consumer satisfaction (Engel, Kollat and Blackwell, 1968, Howard and 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. The author states that continuance intention is based on user satisfaction, which is influenced by the satisfaction of users' a priori expectations and the users' a posteriori perceived performance of the product or service.

Following ECT, higher expectations have a negative influence on confirmation since they are more difficult to fulfill. A positive relation is found for perceived performance. The higher product or service performance is perceived, the more likely expectations are fulfilled or even exceeded, that is, the higher the level of confirmation will be. In sum, confirmation is influenced positively if users' a priori expectations are met or exceeded by a posteriori perceived performance, and influenced negatively if the perceived performance is below a priori 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 Communication

In this study, we consider the communication between client and vendor, including intra-organizational communication. Different departments may exchange goods or services on request and therefore act in a client-vendor relationship. Communication is an integral part of software development, especially in IT outsourcing, as communication helps to define needs and reduces misunderstandings (Pettit et al., 1997, Poston, Simon and Jain, 2010, Sharma, Apoorva, Madireddy and Jain, 2008). If the vendor communicates and justifies reasons for deviations from the project plan in a credible, complete, and comprehensible way, the client might be satisfied with the overall project despite budget and schedule overruns (Gray, 2001). Similarly, Mintzberg (1971) observes that communication is an integral part of managerial work.

Pettit et al. (1997) have shown that intra-organizational CVC is seen as a predictor for job satisfaction and job performance. In general, more complete and adequate communication is seen as beneficial for building trust and reducing misunderstandings (Walton and McKersie, 1965). 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. This leads to the assumption that CVC wields influence not only on satisfaction within an organization but probably in general between any client and vendor. Putting this into context of ECT, we presume that CVC influences the process outlined by ECT.

RESEARCH MODEL AND HYPOTHESES

Figure 1 illustrates our hypothesized research model, which is based on the work of Bhattacherjee (2001) and extended by CVC (Lee and Kim, 1999). In the following, we argue for the respective hypotheses in the context of IS projects.

Hypotheses H_1, H_2, and H_3 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 and 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 and 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 a priori expectations are met or exceeded by a posteriori perceived performance, satisfaction is increased, otherwise decreased. Therefore, we postulate perceived performance to have a positive influence on confirmation of expectations, which in turn has a positive influence on satisfaction. The three hypotheses are specified as follows.

H_1: Client expectations are negatively associated with confirmation of these expectations.

H_2: Perceived performance is positively associated with confirmation of client expectations.

H_3: Confirmation of client expectations is positively associated with client satisfaction.

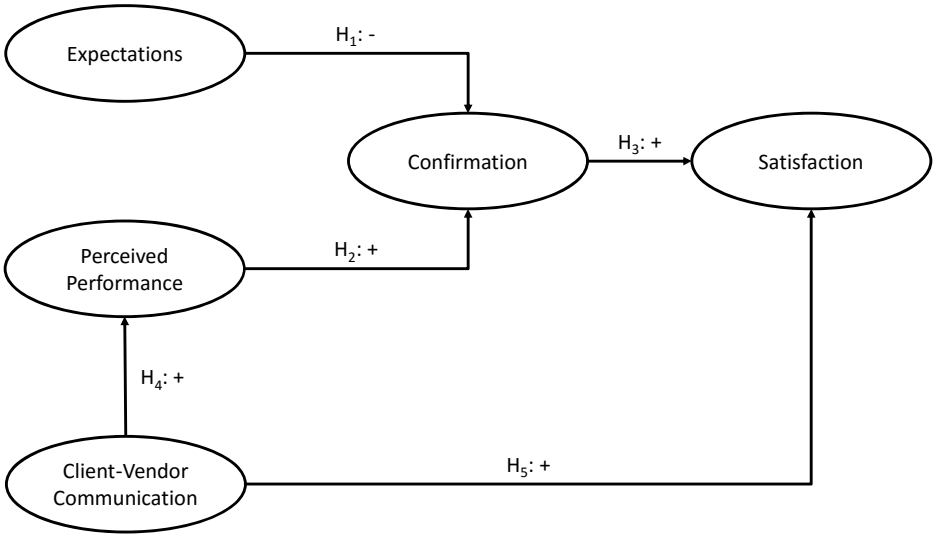

Figure 1. Proposed Research Model

Although Bhattacherjee (2001) already specified a priori (expectations) and a posteriori (perceived performance) influences in ECT, and therefore also the possibility of change during the usage, these influences are not further investigated in his work. In our line of reasoning, we take into account that communication might not moderate or influence expectations but rather directly influence perceived performance. We presume this relation since a moderation of the expectations during the evaluation of a priori expectations and a posteriori perceived performance would suggest an active recalling of concrete communication instances. With a direct influence of CVC on perceived performance, we rather suggest an influence on attitudes during the execution of a project. This means that while attitudes are formed and adjusted throughout, people do not actively and precisely recall their expectations and perceived performance but rather their more abstract and fuzzy attitudes towards the process or product during evaluation. Attitudes influence one's decisions, evaluative actions, and responses consciously as well as unconsciously, based on cognitive, affective, and behavioral information (Eagly and Chaiken, 1993, Eagly and Chaiken, 2007, Zanna and Rempel, 1988). CVC can serve as information on all three levels: it can be cognitively processed and trigger affective responses as well as behavioral actions. These reactions might be memorized by altering existing attitudes towards the process or product or by forming new attitudes. Hypothesis H_4 covers this assumption and addresses CVC's positive influence on perceived performance, meaning that if the client perceives CVC positively, process performance is perceived more positively as well.

H_4: CVC is positively associated with perceived performance.

Furthermore, CVC might influence satisfaction directly. Mintzberg (1971) sees communication as an integral part of a manager's role or responsibility. If communication by the vendor is perceived on time, trustworthy, helpful, or positive in general, this might positively influence client's overall satisfaction similarly as it influences attitudes towards the process and product. If CVC is perceived negatively, for instance, as not being timely or truthful, perceived performance might be lowered as well as the client's overall satisfaction. Thus, our fifth hypothesis reads as follows.

H_5: CVC is positively associated with client satisfaction.

While the hypotheses are formulated concerning IS project success in general, we differentiate in the following between two models, one for the process (henceforth process model) and one for the product component (henceforth product model) of IS projects (e.g., Saarinen and Sääksjärvi, 1992, Wallace, Keil and Rai, 2004). We thereby also 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 in charge of a project. Altogether, we were looking for project managers, CIOs, or similar positions.

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 and Hess, 2011, Benlian, Hess and Buxmann, 2009, Hörisch, Johnson and Schaltegger, 2014, Rockmann, Weeger and Gewald, 2015). 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 these persons to participate. If no valid email address could be found, we searched for another contact person from the respective organization. Second, we contacted persons working at government organizations. For this purpose, we randomly selected city administrations to be roughly equally distributed geographically. Additionally, we picked several country councils. We searched online for contact information of persons with matching job descriptions or responsibilities. If none was found, this administration was excluded. We preferred to contact administrations by phone as most did not provide email addresses. If either a telephone number or an email address was found, we contacted this person and invited him or her to participate. If no contact information was found, we looked for a different person of this administration and repeated this loop or excluded this administration. In both regards, we focused on German organizations since the Hoppenstedt Hochschuldatenbank lists only German companies. 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 posteriori satisfaction and the communication during the development process. Appendix A shows detailed descriptive statistics.

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 and 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). We decided to measure confirmation with regard to the overall project, that is, the items cover the project in general (i.e., product and process) and can thus be used for both models. Satisfaction and CVC are measured in accordance to research concerning client-vendor relations (Lee and Kim, 1999).

In line with previous research (Bhattacherjee, 2001, Wallace et al., 2004), the items for expectations (both process and product), perceived 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 and Kim, 1999). The scales used ranges from one 1 to 7 between listed adjectives. These adjectives were chosen to match descriptions from previous literature, that is, we chose timeliness as a proxy for frequency of communication and credibility, accuracy, and completeness of communication as a proxy for openness.

We collected further information about the projects, which we used as control variables. This information includes deadline pressure, novelty of the developed application, the complexity with regard to required organizational change, as well as the project's necessity, meaning whether the project was conducted voluntarily. Furthermore, we asked whether the contact to the vendor was direct or via an intermediate, whether the client was familiar with the vendor, for the level of trust towards the vendor, and for the level of client involvement. We did not ask specifically for the usage of agile development methods as usage and interpretation of agile development is rather indistinct and

many hybrid development practices of agile and non-agile development philosophies exist (Inayat, Salim, Marczak, Daneva and Shamshirband, 2015, Williams, 2012).

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 (Bhattacherjee, 2001, Lee and Kim, 1999, Wallace et al., 2004).

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...		Adapted from Lee and Kim (1999)
	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 1. Constructs and Corresponding Items

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 and Newsted, 2003). Due to our sample size and our explorative approach (Hair, Ringle and Sarstedt, 2011), we applied PLS path modeling by using SmartPLS 3.0 (Ringle, Wende and Becker, 2015). 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 and 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 and 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 and 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 and 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 Tables 2 and 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 factors. In our case, corroborate discriminant validity is confirmed by factor loadings and cross-loadings (see Tables 4 and 5).

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) Perceived 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) Client 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 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	0.87	0.92	0.80	**0.89**				
(2) Perceived 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) Client 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 3. Scale Properties and Descriptive Statistics (Product Model)

Scale items	**Expectations**	**Perceived performance**	**Confirmation**	**Client 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 4. Factor Loadings (bold) and Cross-loadings (Process Model)

Scale items	**Expectations**	**Perceived performance**	**Confirmation**	**Client 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 5. Factor Loadings (bold) and Cross-loadings (Product Model)

Common Method Variance

Since our study uses data from a self-report questionnaire, common method variance (CMV) might influence our results. We designed our study in a way that reduces the risk of this bias. We guaranteed anonymity to encourage honest answers and did not promise rewards for participation. Our only offer concerned a free copy of our study once finished, regardless of participation (for respective recommendations see Lindell and Whitney, 2001, Podsakoff, Mackenzie, Lee and Podsakoff, 2003). 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 presume no substantial CMV to exist. According to Lindell and Whitney (2001), the second-smallest positive correlation between all items can be used as an indicator to assess CMV. The second-smallest positive correlation in our data is 0.006, which indicates that CMV is not prevalent in our study (Malhotra, Kim and Patil, 2006).

Hypotheses Testing

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 2 and 3 show the overall result for the process and product model, respectively. Our models are in line with the recommendation by Falk and Miller (1992) that for nomological validity endogenous latent constructs should provide an R^2 of at least 0.10 to be adequately judged.

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 perceived performance (0.13 and 0.10) are rather low. However, concerning factors associated with process and product performance in IS projects (Kendra and Taplin, 2004, Nelson, 2007, Reel, 1999), CVC is only one of many factors and explaining these constructs was not our primary purpose.

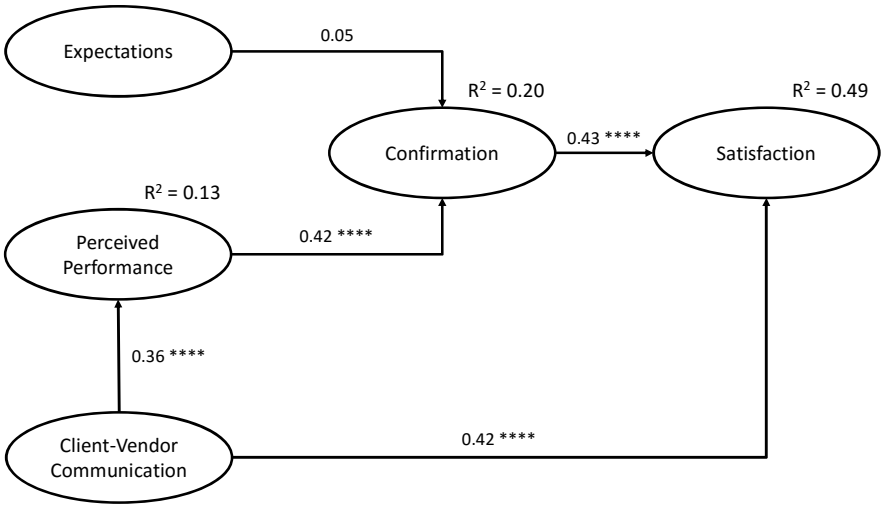

Figure 2. Estimated Model (Process) of Client Satisfaction (n = 74)
* p < 0.10 ** p < 0.05 *** p < 0.01 **** p < 0.001

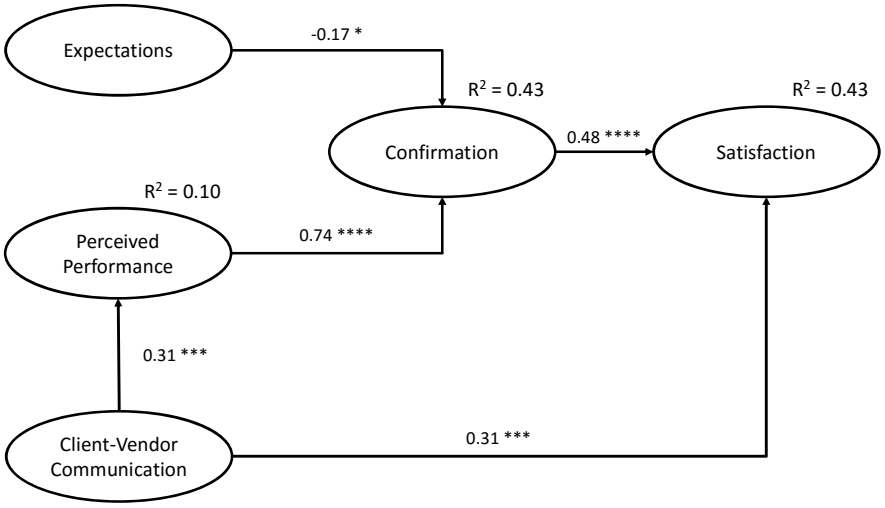

Figure 3. Estimated Model (Product) of Client Satisfaction (n = 74)
* p < 0.10 ** p < 0.05 *** p < 0.01 **** p < 0.001

Except for one hypothesis (i.e., the association between process expectations and confirmation; see Figure 2 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), perceived performance (0.92 and 0.81), and client satisfaction (1.00 and 0.99). None of our control variables (see 'Measurement Scales') showed a significant effect with process satisfaction or product satisfaction.

Hypothesis	Confirmed?	Path coefficient	t statistic	p-value	f^2
Process Model					
H_1	No	0.05	0.429	0.668	0.003
H_2	Yes	0.42	3.721	0.000	0.148
H_3	Yes	0.43	3.849	0.000	0.290
H_4	Yes	0.36	3.597	0.000	0.149
H_5	Yes	0.42	4.494	0.000	0.304
Product Model					
H_1	Yes	-0.17	1.683	0.092	0.037
H_2	Yes	0.74	7.258	0.000	0.639
H_3	Yes	0.48	4.302	0.000	0.337
H_4	Yes	0.31	3.163	0.002	0.111
H_5	Yes	0.31	3.134	0.002	0.146

Table 6. Results for Hypotheses

DISCUSSION

We developed and empirically tested a model of IS project success that is based on ECT and explicitly considers CVC. The model suggests client satisfaction to be the uppermost criterion, which 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 and IS development and explicitly link a success factor (CVC) to success criteria (Siau, Long and Ling, 2010). This study confirms our previous research suggesting that the product is more important than the process for client satisfaction in IS projects (Basten and Pankratz, 2015). While previous research analyzed the perspective of project managers on behalf of the contractor, we now complement the picture by explicitly taking client perceptions into account.

First, by using ECT, we show that client satisfaction in IS projects can be explained by confirmation of expectations to a large extent. The effect of perceived performance concerning the product is in this context stronger than the effect of perceived performance concerning the process. As regards their satisfaction concerning IS projects, clients thus tend to value the final product higher than the process leading to the product. Accordingly, long-term objectives such as achieving business goals are considered more important than adherence to budget and schedule as short-term goals. Second, expectations towards the process do not affect the confirmation of expectations. The respective hypothesis is the only one that is not supported by our data. A possible explanation is the large degree of budget and schedule overruns typically reported in IS projects (e.g., Sonnekus and 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). Third, we found that 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 perceived performance or satisfaction might be only partially related to managed perceptions. Nevertheless, improved CVC is likely to result in objectively improved process and product performance because better and more efficient communication is likely to lead to fewer misunderstandings and clearer definitions, ultimately resulting in better products and processes (Petter, 2008, Poston et al., 2010, Sharma et al., 2008, Stavrou, Pankratz and Basten, 2014, Walton and McKersie, 1965).

Regarding limitations of our study, one is the sample size (n = 74). However, it is above the level required to retrieve statistically significant results. Moreover, our analysis yielded a satisfying level of power, and the insignificant influence of the control variables indicate a robustness of our results despite the exploratory character of our study. Furthermore, our sample comprises organizations residing in Germany only. While some of the participants' companies act internationally, all responses stem from German branches. We thus encourage future research to replicate and extend our study, especially for different cultures and contexts.

Our study might also suffer from social desirability bias (SDB) since 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. We were not able to utilize this approach in our study due to clear and judgmental scale of performance measures such as budget and schedule. Furthermore, Nederhof suggests postulating questions that are neutral concerning social desirability. Similar to forced-choice items, we tried to minimize the SDB emerging from our questions. However, due to the clear preferability of success over failure, SDB is still likely to emerge from questions posted in our questionnaire. Self-administered questionnaires did not always actively reduce SDB, 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 SDB.

As we did not ask specifically for the usage of agile development practices, future research might investigate the role of communication in agile versus non-agile projects. Agile development practices often rely on a high level of communication and face-to-face meetings (Inayat et al., 2015, Khan and Khan, 2013, Sundararajan, Bhasi and Vijayaraghavan, 2014). Especially short development cycles, and therefore regular and frequent feedback, might result in an increased importance of CVC and therefore higher impact on satisfaction.

CONCLUSION

We advance the understanding of expectations, communication, and client satisfaction in IS projects. First, we have analyzed how CVC relates to perceived performance and satisfaction concerning the development process as well as the developed product on behalf of clients in IS projects. Communication 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 model suggests that product performance is more important (compared to process performance) for the confirmation of client 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 ordinariness of 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 of communication mediums by contrasting agile and non-agile development projects.

REFERENCES

Agarwal, N. and Rathod, U. (2006) Defining 'success' for software projects: An exploratory revelation, *International journal of project management,* 24, 4, 358-370.

Anderson, E. W., Fornell, C. and Lehmann, D. R. (1994) Customer satisfaction, market share, and profitability: Findings from sweden, *Journal of Marketing,* 58, 3, 53–66.

Anderson, E. W. and Sullivan, M. W. (1993) The antecedents and consequences of customer satisfaction for firms, *Marketing Science,* 12, 2, 125–143.

Aronson, E. and Carlsmith, J. M. (1962) Performance expectancy as a determinant of actual performance., *The Journal of Abnormal and Social Psychology,* 65, 3, 178 - 182.

Baker, B. N., Murphy, D. C. and Fisher, D. (1988) Factors affecting project success, in David I. Cleland & William R. King (eds.) Project management handbook, John Wiley & Sons, New York, 902–919.

Barclay, C. and Osei-Bryson, K.-M. (2009) Determining the contribution of is projects: An approach to measure performance, in Ralph H. Sprague (ed.) Proceedings of the 42nd Annual Hawaii International Conference on System Sciences, Piscataway, 1–10.

Basten, D. and Pankratz, O. (2015) Customer satisfaction in is projects: Assessing the role of process and product performance, *Communications of the Association for Information Systems (CAIS),* 37, Article 22, 430-447.

Benlian, A. and Hess, T. (2011) Opportunities and risks of software-as-a-service: Findings from a survey of it executives, *Decision Support Systems,* 52, 1, 232-246.

Benlian, A., Hess, T. and Buxmann, P. (2009) Drivers of saas-adoption – an empirical study of different application types, *Business & Information Systems Engineering,* 1, 5, 357-369.

Bhattacherjee, A. (2001) Understanding information systems continuance: An expectation-confirmation model, *MIS Quarterly,* 25, 3, 351–370.

Chin, W. W. (1998) The partial least squares approach to structural equation modeling, in George A. Marcoulides (ed.) *Modern methods for business research*, Erlbaum, Mahwah, 295–358.

Chin, W. W., Marcolin, B. L. and Newsted, P. R. (2003) A partial least squares latent modeling approach for measuring interaction effects. Results from a monte carlo simulation study and an electronic-mail emotion / adoption study, *Information Systems Research,* 14, 2, 189–217.

Cohen, J. W. (1988) Statistical power analysis for the behavioral sciences*,* Erlbaum, Hillsdale.

Collins, A. and Baccarini, D. (2004) Project success - a survey, *Journal of Construction Research,* 5, 2, 211–231.

Cuellar, M. (2010) Assessing project success: moving beyond the triple constraint, in A. I. S. Special Interest Group on Information Technology Project Management (ed.) International Research Workshop on IT Project Management, AIS Electronic Library, 19–28.

Dvir, D., Lipovetsky, S., Shenhar, A. J. and Tishler, A. (1998) In search of project classification: A non-universal approach to project success factors, *Research Policy,* 27, 9, 915–935.

Eagly, A. H. and Chaiken, S. (1993) The psychology of attitudes*,* Harcourt Brace Jovanovich College Publishers, Fort Worth.

Eagly, A. H. and Chaiken, S. (2007) The advantages of an inclusive definition of attitude, *Social Cognition,* 25, 5, 582-602.

Engel, J. F., Kollat, D. T. and Blackwell, R. D. (1968) Consumer behavior*,* Holt and Rinehart and Winston, New York.

Falk, R. F. and Miller, N. B. (1992) A primer for soft modeling*,* University of Akron Press, Akron, Ohio.

Festinger, L. (1957) A theory of cognitive dissonance.*,* Stanford University Press, Stanford.

Fornell, C. and Larcker, D. F. (1981) Evaluating structural equation models with unobservable variables and measurement error, *Journal of Marketing Research,* 18, 1, 39–50.

Garnett, J. L., Marlowe, J. and Pandey, S. K. (2008) Penetrating the performance predicament: Communication as a mediator or moderator of organizational culture's impact on public organizational performance, *Public Administration Review,* 68, 2, 266–281.

Glass, R. L. (1999) Evolving a new theory of project success, *Communications of the ACM,* 42, 11, 17–19.

Gray, R. J. (2001) Organisational climate and project success, *International Journal of Project Management,* 19, 2, 103–109.

Hair, J. F., Ringle, C. M. and Sarstedt, M. (2011) Pls-sem: Indeed a silver bullet, *The Journal of Marketing Theory and Practice,* 19, 2, 139–152.

Harmon-Jones, E., Harmon-Jones, C. and Levy, N. (2015) An action-based model of cognitive-dissonance processes., *Current Directions in Psychological Science,* 24, 3, 184 - 189.

Henseler, J., Ringle, C. M. and Sinkovics, R. R. (2009) The use of partial least squares path modeling in international marketing, *Advances in International Marketing,* 20, IV, 277–319.

Hörisch, J., Johnson, M. P. and Schaltegger, S. (2014) Implementation of sustainability management and company size: A knowledge-based view, *Business Strategy and the Environment*, 1-15.

Hossain, M. A. and Quaddus, M. (2012) Expectation–confirmation theory in information system research: A review and analysis, in Yogesh Kumar Dwivedi, Michael R. Wade & Scott L. Schneberger (eds.) *Information systems theory. Explaining and predicting our digital society*, Springer, New York, 441–469.

Howard, J. A. and Sheth, J. N. (1969) The theory of buyer behavior*,* Wiley,

Ika, L. A. (2009) Project success as a topic in project management journals, *Project Management Journal,* 40, 4, 6–19.

Inayat, I., Salim, S. S., Marczak, S., Daneva, M. and Shamshirband, S. (2015) A systematic literature review on agile requirements engineering practices and challenges, *Computers in Human Behavior,* 51, Part B, 915 - 929.

Joosten, D., Basten, D. and Mellis, W. (2014) Measurement of information system project success in german organizations, *International Journal of Information Technology Project Management,* 5, 3, 1–20.

Jugdev, K. and Müller, R. (2005) A retrospective look at our evolving understanding of project success, *Project Management Journal,* 36, 4, 19–31.

Keil, M., Rai, A. and Liu, S. (2013) How user risk and requirements risk moderate the effects of formal and informal control on the process performance of it projects, *European Journal of Information Systems,* 22, 6, 650–672.

Kendra, K. and Taplin, L. J. (2004) Project success: A cultural framework, *Project Management Journal,* 35, 1, 30–45.

Khan, A. W. and Khan, S. U. (2013) Critical success factors for offshore software outsourcing contract management from vendors' perspective: An exploratory study using a systematic literature review, *IET software,* 7, 6, 327-338.

Lee, J.-N. and Kim, Y.-G. (1999) Effect of partnership quality on is outsourcing success: Conceptual framework and empirical validation, *Journal of Management Information Systems,* 15, 4, 29–61.

Lindell, M. K. and Whitney, D. J. (2001) Accounting for common method variance in cross-sectional research designs, *Journal of Applied Psychology,* 86, 1, 114–121.

Malhotra, N. K., Kim, S. S. and Patil, A. (2006) Common method variance in is research: a comparison of alternative approaches and a reanalysis of past research, *Management Science,* 52, 12, 1865–1883.

Mintzberg, H. (1971) Managerial work: Analysis from observation, *Management science,* 18, 2, S. B-97-B-110.

Nederhof, A. J. (1985) Methods of coping with social desirability bias: A review, *European Journal of Social Psychology,* 15, 3, 263-280.

Nelson, R. (2007) It project management: Infamous failures, classic mistakes, and best practices, *MIS Quarterly Executive,* 6, 2, 67–78.

Nelson, R. R. (2005) Project retrospectives: Evaluating project success, failure, and everything in between, *MIS Quarterly Executive,* 4, 3, 361-372.

Nunnally, J. C. (1978) Psychometric theory*,* McGraw-Hill, New York.

Oliver, R. L. (1980) A cognitive model for the antecedents and consequences of satisfaction, *Journal of Marketing Research,* 17, 4, 460-469.

Petter, S. (2008) Managing user expectations on software projects: Lessons from the trenches, *International Journal of Project Management,* 26, 7, 700–712.

Pettit, J. D., Goris, J. R. and Vaught, B. C. (1997) An examination of organizational communication as a moderator of the relationship between job performance and job satisfaction, *Journal of Business Communication,* 34, 1, 81-98.

Pinto, J. K. and Slevin, D. P. (1988) Project success: Definitions and measurement techniques, *Project Management Journal,* 19, 1, 67-72.

Podsakoff, P. M., Mackenzie, S. B., Lee, J.-Y. and Podsakoff, N. P. (2003) Common method biases in behavioral research: A critical review of the literature and recommended remedies, *Journal of Applied Psychology,* 88, 5, 879–903.

Poston, R. S., Simon, J. C. and Jain, R. (2010) Client communication practices in managing relationships with offshore vendors of software testing services, *Communications of the Association for Information Systems,* 27, 9, 129-148.

Project Management Institute (2008) A guide to the project management body of knowledge (pmbok® guide)*,* Project Management Institute, Newton Square, PA.

Reel, J. S. (1999) Critical success factors in software projects, *IEEE Software,* 16, 3, 18–23.

Ringle, C. M., Wende, S. and Becker, J.-M. (2015) Smartpls 3*,* SmartPLS, Hamburg. Retrieved from http://www.smartpls.com.

Rockmann, R., Weeger, A. and Gewald, H. (2015) It capabilities and organizational utilization of public cloud computing, *ECIS 2015 Completed Research Papers,* Paper 148, 1-19.

Saarinen, T. and Sääksjärvi, M. (1992) Process and product success in information systems development, *Journal of Strategic Information Systems,* 1, 5, 266–275.

Sharma, R., Apoorva, S. R., Madireddy, V. and Jain, V. (2008) Best practices for communication between client and vendor in it outsourcing projects, *Journal of Information, Information Technology & Organizations,* 3, 60 - 93.

Shenhar, A., Levy, O. and Dvir, D. (1997) Mapping the dimensions of project success, *Project Management Journal,* 28, 2, 5-13.

Shenhar, A. J., Dvir, D., Levy, O. and Maltz, A. C. (2001) Project success: A multidimensional strategic concept, *Long range planning,* 34, 6, 699-725.

Siau, K., Long, Y. and Ling, M. (2010) Toward a unified model of information systems development success, *Journal of Database Management,* 21, 1, 80–101.

Sonnekus, R. and Labuschagne, L. (2003) The prosperus report 2003: It project management maturity versus project success in south africa.

Stavrou, G., Pankratz, O. and Basten, D. (2014) Increasing customer satisfaction – how to manage expectations in the process of developing information systems, in A. I. S. Special Interest Group for Information Technology Project Management (ed.) *International research workshop on it project management*, 14–27.

Sundararajan, S., Bhasi, M. and Vijayaraghavan, P. K. (2014) Case study on risk management practice in large offshore-outsourced agile software projects, *IET Software,* 8, 6, 245-257.

Tesch, D., Jiang, J. J. and Klein, G. (2003) The impact of information system personnel skill discrepancies on stakeholder satisfaction, *Decision Sciences,* 34, 1, 107–129.

Thomas, G. and Fernández, W. (2008) Success in it projects: A matter of definition, *International Journal of Project Management,* 26, 7, 733–742.

Wallace, L., Keil, M. and Rai, A. (2004) How software project risk affects project performance: An investigation of the dimensions of risk and an exploratory model, *Decision Sciences,* 35, 2, 289-321.

Walton, R. E. and Mckersie, R. B. (1965) A behavioral theory of labor negotiations. An analysis of a social interaction system*,* McGraw-Hill, New York.

Wateridge, J. (1998) How can is/it projects be measured for success?, *International Journal of Project Management,* 16, 1, 59–63.

Werts, C. E., Linn, R. L. and Jöreskog, K. G. (1974) Intraclass reliability estimates: Testing structural assumptions, *Educational and Psychological Measurement,* 34, 1, 25–33.

Williams, L. (2012) What agile teams think of agile principles., *Communications of the ACM,* 55, 4, 71 - 76.

Yetton, P., Martin, A., Sharma, R. and Johnston, K. (2000) A model of information systems development project performance, *Information Systems Journal,* 10, 4, 263–289.

Zanna, M. P. and Rempel, J. K. (1988) Attitudes: A new look at an old concept, in D. Bar-Tal A. W. Kruglanski (ed.) *The social psychology of knowledge*, Editions de la Maison des Sciences de l'Homme, Paris, France, 315-334.

APPENDIX A

The majority (51.35%) held the role as project lead. Other participants referred to their role as project coordinator (10.81%), project contact in a specific department (10.81%), principal (9.46%), controller (6.76%), member of a steering committee (5.41%), or user (5.41%). Further statistics can be found in Table 7.

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 7. Sample Description

APPENDIX B

Control Variable	**Satisfaction regarding the Process**	**Satisfaction regarding the Product**
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 Inclusion during the Project	0.081	0.117

Table 8. Correlation of Control Variables to Satisfaction (n = 74)

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$