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Master Thesis im Fach Information Systems

A Quantitative Field Study on Information System Projects and the Moderating Role of Communication in Expectation-Confirmation Theory

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Contents

Index of Abbreviations

AVE	Average Variance Extracted
CDT	Theory of Cognitive Dissonance
CMS	Content Management System
CMV	Common Method Variance
CONF	Confirmation
CRM	Customer Relationship Management (System)
CVC	Client-Vendor-Communication
ECT	Expectation Confirmation Theory
EPROC	Expectations regarding the Process
EPROD	Expectations regarding the Product
ERP	Enterprise Resource Planning (System)
HTMT	Heterotrait-Monotrait Ratio
HSFT	Harman's Single Factor Test
IS	Information System(s)
ISP(s)	Information System Project(s)
M	Mean
Mdn	Median
N	Sample size
p	Probability
PPROC	Perceived Process Performance
PPROD	Perceived Product Performance
R^2	Coefficient of Determination
$\bar{R}^2$	Adjusted Coefficient of Determination
SAT	(Client) Satisfaction
SD	Standard Deviation, or σ
SDB	Social Desirability Bias

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1. Introduction

1.1 Problem Statement

Measuring success and failure of information system projects (ISPs) as of today is traditionally often equated with budget and schedule adherence, as well as fulfilment of requirements.[1] Wateridge states, that "time, cost and user specification [are seen] as success criteria".[2] In contrast to traditional measurement methods, recent research proposed different measures, such as stakeholder satisfaction.[3] Such subjective measures are in contrast to objective measures like budget adherence. Following the arguments presented by Basten and Pankratz,[4] research has not yet found consensus regarding a clear definition of ISP success.[5] Having no clear definitions how to measure success of past ISPs results in difficulties to assess success of future projects. Inaccurate assessment of future ISPs' success results in suboptimal economic decisions, such as investments and ultimately harms the organisation.

While research has investigated measures of success of ISPs for decades,[6] ISPs are sometimes considered successful although not meeting budget or schedule.[7] Nelson (2005) differentiates into *"successful failures"*[8] for projects which are perceived successful despite not meeting formal criteria of success and *"failed successes"*[9] for projects which are perceived failures while meeting formal criteria. Basten and Pankratz refer to this measure of success as *"project performance"*.[10] In these cases, subjectives measurement differs from traditional, objective measurement. This idea of success being a subjective

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1 Cf. e.g. Joosten et al. (2014), Ika (2009), Thomas, Fernández (2008), Pinto, Slevin (1988).

2 Wateridge (1998), p. 59.

3 Basten et al. (2011), See.

4 See Basten, Pankratz (2012), p. 3.

5 Cf. Barclay, Osei-Bryson (2009), Agarwal, Rathod (2006), Nelson (2005), Yetton et al. (2000).

6 See exemplarily Baker et al. (1988), Wateridge (1998), Procaccino et al. (2005), Cuellar (2010).

7 See Ika (2009), Baker et al. (1988), Pinto, Slevin (1988).

8 Nelson (2005), p. 366.

9 Nelson (2005), p. 366.

10 Basten, Pankratz (2012), p. 3.

perception is correlated to Myers' hermeneutical view.[11] Nelson sees the subjective perception of success or failure of stakeholders as part of the overall evaluation.[12] Basten and Pankratz refer to this as *"stakeholder satisfaction"*.[13]

A theoretical framework centering around stakeholder satisfaction is *Expectation Confirmation Theory (ECT)*.[14] Introduced by Bhattacherjee in 2001, it is based on the idea that customer satisfaction is explained by the level of confirmation of customer expectations. In particular, Bhattacherjee states, that confirmation is achieved, if expectations are met or exceeded by perceived product performance. If the expectations are lower than the perceived product performance, this results in even higher confirmation and therefore higher customer satisfaction. If expectations are higher than the perceived product performance, confirmation is reduced and therefore customer satisfaction is reduced as well.

Basten and Pankratz propose an extension to the mentioned ECT.[15] ECT currently does not take into account, that expectations might be subject to change. Most notably, communication might alter expectations due to new information which are communicated to the client and therefore change his or her expectations regarding the final product or service. Basten and Pankratz did not yet study the influence of communication on ECT empirically, but proposed a questionnaire to do so.[16] This work will be based on Basten and Pankratz' questionnaire as well as their revised ECT model.

1.2 Objectives

Our work is based on the suggestion of Basten and Pankratz to provide empirical validation for their theory. Therefore, our main objective for this work is to answer the question,

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11 See Myers (1995).

12 See Nelson (2005), p. 363.

13 Basten, Pankratz (2012), p. 3.

14 See for this paragraph Bhattacherjee (2001), pp. 353-355.

15 See for this paragraph Basten, Pankratz (2012), p. 5.

16 See Basten, Pankratz (2012), pp. 5-6.

how the process of influencing expectations at ISPs via communication works. We[17] aim to evaluate the model of Basten and Pankratz, that communication moderates the effect of expectations on the confirmation which mediates the stakeholder's satisfaction. To answer this superior objective, we further need to explain the ideas of ECT by Bhattacherjee and the revision proposed by Basten and Pankratz.

To provide empirical evidence for the proposed model, we need to compile items for the moderating role of communication on the influence of expectations on the confirmation. We aim to base our questionnaire on the one proposed by Basten and Pankratz[18] and add additional items to further deepen the understanding of communication's role in the ECT. Our first sub-objective therefore is to assure measurability of the proposed model. To achieve measurability, we need to compile items for the questionnaire to be used.

Furthermore, we need to pull a matching sample. We need to clarify, which roles participants should occupy and what characterises our targeted sample. Based upon the data retrieved during data collection, we need to test the model and confirm or reject the proposed model and advance with modifications and additions to the proposed model.

Based on the data received and the results from our analysis we also aim in deriving suggestions about different types of communication in regard to ECT.

1.3 Structure

This work is structured as follows. In section 2, ECT and the role of client-vendor communication in the context of ECT will be discussed. We will first explain the basis of the ECT as introduced by Bhattacherjee in chapter 2.1. Following in chapter 2.2 we will describe our understanding of communication and especially client-vendor communication for the scope of this study. In chapter 2.3, we will explain the additions, Basten and Pankratz made to the basis ECT, as well as the modifications we applied for this study.

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[17] Although this work is done by a single author, "we" and "our" respectively will be used throughout this thesis.

[18] See Basten, Pankratz (2012), p. 6.

In section 3, we will outline, which hypotheses are drawn from the model presented in the previous chapter. Our hypotheses will describe the relation of different constructs of this study's model.

In the next section, section 4, we will give insight into the research approach applied, giving information about our sample in chapter 4.1 as well as the procedure used to obtain data in chapter 4.2. Furthermore, we will present the items used in our questionnaire representing constructs from our model in chapter 4.3.

This section will be followed by section 5 in which our results will be presented. We will present the statistical data obtained by the questionnaire divided into multiple chapters: First, general results will be presented in chapter 5.1, followed by an introduction into the statistical methods used for further analysis in chapter 5.2. As third chapter of this section, chapter 5.3 will contain our hypotheses tests. Fourth, adjustments to our model will be made and validated and our final model will be checked for common method variance and social desirability bias in chapter 5.5.

Our results will be discussed in section 6. In this section, we will interpret our results and give theoretical implications in chapter 6.1 and practical implications in chapter 6.2. Finally, we will discuss limitations of our study in chapter 6.3.

We will end with drawing a conclusion in section 7 about the study itself, our results and their interpretation. In the appendix, one can find the German questionnaire we handed out.

2. Expectation-Confirmation Theory and the Role of Communication

To give an overview about the theoretical foundation of this study, we will explain the expectation-confirmation theory and it's development. Another important theoretical aspect of this work is client-vendor communication, which theoretical meaning will be presented in this chapter as well. Finally, we will bringt both theoretical concepts together and present current research's thoughts about the influence of client-vendor communication in the context of expectation-confirmation theory.

2.1 Expectation-Confirmation Theory

2.1.1 Development of the Expectation-Confirmation Theory

ECT is based on Festinger's *theory of cognitive dissonance* (CDT).[19] CDT rests upon the idea that information or knowledge can be contradicting one another.[20] Festinger calls these pieces of knowledge cognitions and contradicting cognitions 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 et al. put it: psychological discomfort, depends upon the importance of the cognitions in question. An example provided by Festinger is a smoker who knows about the health-risks related to smoking. While the smoker holds multiple cognitions related, e.g. "I enjoy smoking" and "smoking is unhealthy", these are contradicting each other, meaning they are inconsistent with each other, and therefore cause a cognitive dissonance. While CDT is a very generally applicable theory, it explains the basic concept behind ECT or more generally, between expectations and satisfaction.

Harmon-Jones et al. state, that "cognition is for behavior".[21] They postulate, that basically CDT takes effect, if cognitions with so called "action implications"[22] conflict, because

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19 See Aronson, Carlsmith (1962), p. 178.

20 See for this paragraph Harmon-Jones et al. (2015), p. 184.

21 Harmon-Jones et al. (2015), p. 185.

22 Harmon-Jones et al. (2015), p. 185.

cognition's most important purpose is to guide behaviour.[23] In regard to CDT and ECT this means, that especially those expectations on which one has at least an indirect influence result in more dissatisfaction if they are not met.

From the early literature of consumer behavior, or at least adjacent fields of study, Aronson and Carlsmith were one of the first to apply Festinger's CDT to expectations and satisfaction.[24] The authors have shown, that unmet expectations, or disconfirmation of expectations, lead to an higher amount of discomfort which is similar to less satisfaction. Aronson and Carlsmith used the term "disconfirmation" instead of "confirmation" and inverted the relationships in this context but the idea remains the same. Additionally, Aronson and Carlsmith did focus on expectations regarding one's own performance rather than the expectations regarding other's performance.

Weaver and Brickman continued research by Aronson and Carlsmith and refined their findings by stressing a cumulative effect by multiple disconfirmations.[25] Additionally, they disprove previous research which could not find disconfirmation effects.

Among early adopters of ECT for consumer satisfaction were Engel et al..[26] . Howard and Sheth were also one of the first to link ECT to consumer satisfaction.[27] Oliver extended existing research regarding causes and effects of satisfaction in this context.[28]

2.1.2 Expectation-Confirmation Theory according to Bhattacherjee[29]

Bhattacherjee integrated in 2001 ideas from consumer behavior literature as well as from

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23 See Harmon-Jones et al. (2015), p. 185.

24 See for this and the next three sentences Aronson, Carlsmith (1962), pp. 178, 180-182.

25 See for this and the next sentence Weaver, Brickman (1974).

26 See Engel et al. (1968), pp. 512-515 as cited by 460 Oliver (1980).

27 See Howard, Sheth (1969), pp. 145-150 as cited by 460 Oliver (1980).

28 See Oliver (1980), pp. 460-462, 466-467.

29 If not stated otherwise, this chapter follows Bhattacherjee (2001).

30 See Bhattacherjee (2001), p. 353.

preceding information systems (IS) research into a new model explaining continuous usage of IS. Narrowing the field of study to IS, Bhattacherjee takes ECT to the context of IS-usage. The author states, that the user's intention to continue to use a certain IS is based on the user's satisfaction, which is influenced by the satisfaction of the user's a priori expectations and the user's a posteriori perceived performance of the product or service. Fig. 2-1 illustrates Bhattacherjee's model.

Following ECT, higher expectations have a negative influence on confirmation. This is due to the fact, that higher expectations are more difficult to meet and therefore are more likely to not to be met and finally reduce confirmation. A positive relation can be found for perceived performance: The higher ("more positive") the product's or service's performance is perceived, the more likely expectations are met or even exceeded and the higher the level of confirmation will be.

In the end, confirmation is positive, if the user's expectations are met or exceeded by the a posteriori perceived performance and negative, if the perceived performance is below a priori expectations. The level of confirmation positively influences the user's satisfaction with a higher level of confirmation leading to higher satisfaction and a lower level of confirmation to a lower level of satisfaction. Bhattacherjee states, that additionally to the indirect influence of expectations via confirmation on satisfaction, expectation also has a direct effect on satisfaction as it serves as a baseline for the level of confirmation to be compared with.

The standard ECT observes as outcome repurchase intention, as it's labeled in the model,

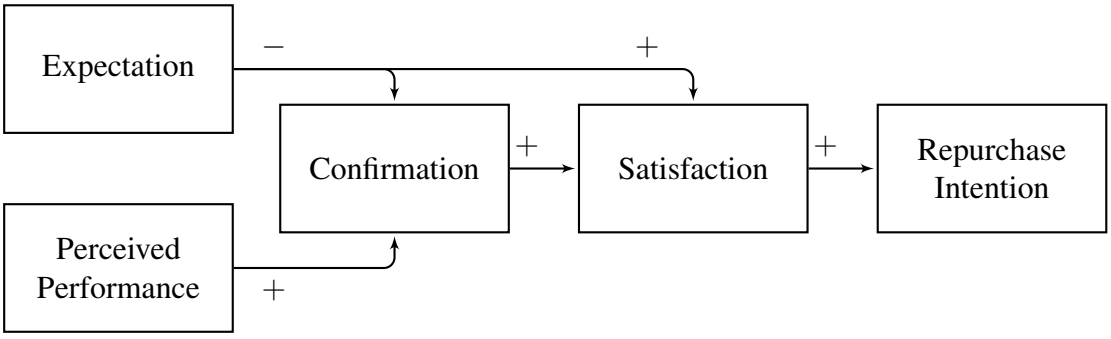

Fig. 2-1: ECT by Bhattacherjee[30]

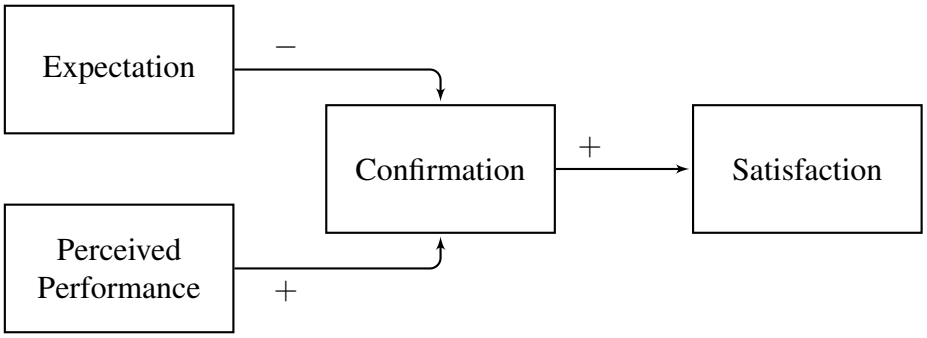

Fig. 2-2: Excerpt of ECT by Bhattacherjee[32]

or "continuance intention"[31] as Bhattacherjee puts it. The user's intention to continue using an IS is only influenced by the user's satisfaction regarding this IS, as Bhattacherjee states.

Our paper focusses on the influence of communication in this presented model. As continuance intention is not influenced by either expectation, nor confirmation directly or indirectly, we will exclude "Repurchase Intention" as it is labeled in the model, to reduce complexity and focus on the model's core. Additionally, we assume the direct effect of expectation on satisfaction to be included in the mediation by confirmation, as confirmation is already the comparison of the perceived performance to the user's expectations as baseline. The extract we are using in the following is illustrated in Fig. 2-2.

2.2 Client-Vendor Communication

We define Client-Vendor Communication (CVC) as basically every communication which is utilized between a client and a vendor. This does not exclude intra-organizational communication. Different departments may exchange goods or services on request and therefore act in a client-vendor relationship, e.g. an IT department and another department utilizing IS. Intra-organizational communication can basically have two forms: horizontal and vertical. Horizontal communication describes communication between different departments, while vertical communication describes communication from superordinate

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[31] Bhattacherjee (2001), p. 355.

[32] See Bhattacherjee (2001), p. 353.

to subordinate.[33] Communication is an integral part of software development, especially in IT outsourcing, as communication helps defining needs and reduces risks of misunderstandings.[34] As Mintzberg observes, communication is an integral part of managerial work and therefore CVC is as well.[35]

Pettit et al. have shown, that intra-organizational CVC is seen as a predictor for job satisfaction and job performance.[36] In general, more open and supportive communication is seen as beneficial for building trust and reducing misunderstandings.[37] Sharma et al. state, that especially in IT-environments inadequate communication might increase the risk of failing and is therefore a crucial aspect of (project) management.[38]

This leads to the assumption, that CVC wields not only influence on satisfaction within an organization but probably in general between any client and vendor. Putting this into context of ECT, we assume CVC to influence the process outlined by ECT. We will further investigate this assumption in chapter 2.3.

2.3 The Role of Communication in Expectation-Confirmation Theory

Although i.e. Bhattacherjee already specified a priori and a posteriori influences in ECT, and therefore also the possibility of change during the usage,[39] these influences are often not addressed in specific.[40] Communication is seen as an integral and important part of managerial work.[41]

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33 See Mintzberg (1971), pp. B1003-104.

34 See Poston et al. (2010), p. 130, Sharma et al. (2008), pp. 61-63, Pettit et al. (1997), p. 81.

35 See Mintzberg (1971), pp. B-100-B102.

36 See Pettit et al. (1997), pp. 81, 90-93, 95.

37 E.g. see Walton, McKersie (1965), pp. 142, 182.

38 See Sharma et al. (2008), p. 62.

39 See Bhattacherjee (2001), pp. 354-355.

40 See Basten, Pankratz (2012), pp. 1-3.

41 See chapter 2.2.

Basten and Pankratz, explicitly see communication, or more specifically client-vendor communication, as an important part of the vendor's task during the project.[42] Basten and Pankratz see communication as an important leverage to level out expectations with perceived performance in case of e.g. budget overruns. Basten and Pankratz argue, that if the vendor manages to explain the overrun in a reasonable way, the client might be satisfied nevertheless. Therefore they argue, that communication does not have a direct influence on confirmation but moderates the influence expectations wield as baseline to which the perceived performance is compared.

Basten and Pankratz' revised model of ECT is illustrated in Fig. 2-3, which is similar to Fig. 2-2 but with an additional moderating effect of client-vendor communication. Following the arguments presented above, Basten and Pankratz state, that communication, or more specifically client-vendor communication, is not only important in the process of evaluating and forming attitudes which in turn lead to (dis-) satisfaction, but also that it moderates the influence of expectations and is able to shift the baseline for comparing perceived performance, rather than influencing the level of confirmation directly.[43]

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42 See for this paragraph Basten, Pankratz (2012), p. 5.

43 See Basten, Pankratz (2012), pp. 5, 7.

44 See Basten, Pankratz (2012), p. 5.

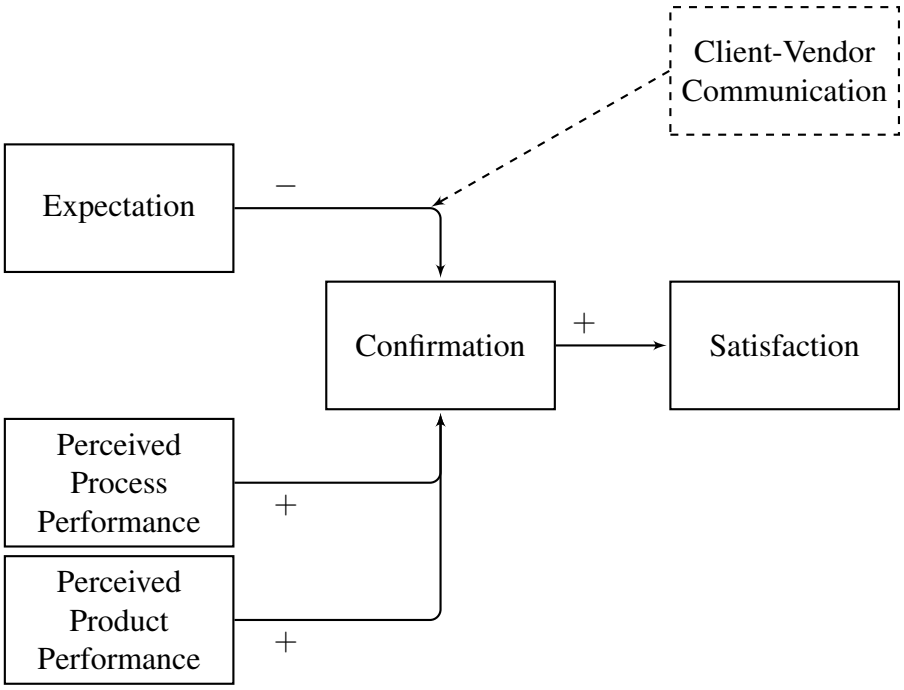

Fig. 2-3: ECT by Basten and Pankratz[44]

3. Hypotheses

Based on the theoretical foundations outlined in the previous chapter 2, we will now give more information about the model used in this study in it's hypotheses.

Basically, our hypotheses are divided into two groups: first, hypotheses related to the already existing and proven ECT. Hypotheses of this group are both H_{1a} and H_{1b}, both H_{2a} and H_{2b} as well as H_3. Second, hypotheses which are either based on previous research but extended or non-reviewed but already existing hypotheses. Only H_4 is part of this group of hypotheses. All hypotheses are outlined in Fig. 3-1 and will be explained in the following paragraphs. Our hypotheses are adapted from basic research on ECT in the context of IS, as ECT does not only play a role for the general success of ISPs, which is a motivator for the study conducted by Bhattacherjee, but also for the measurement and definition of the project's success which is a motivator for the study of Basten and Pankratz.[45]

Hypothesis H_{1a}: Expectations regarding the Process and Confirmation

Hypothesis H_{1a} is based on the assumption from existing ECT such as from Bhattacherjee or Basten and Pankratz, displayed in Fig. 2-2 or Fig. 2-3 respectively.[46] In contrast to their model, we formed a sub-construct of expectations into expectations regarding the process, similar to their proposal for perceived performance.[47] Basten and Pankratz' basic assumption of the negative influence of expectations is retained and applied for expectations regarding the process.

We formed this construct instead of a general expectation construct as we witnessed that expectations regarding the process could differ substantially from those regarding the product. Some of our participants mentioned during invitation that some had quite different expectations regarding different aspects of the project. To cover this circumstance and have more detail for our following analysis, we decided to add this separation. As a

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45 See Bhattacherjee (2001), pp. 351-352, Basten, Pankratz (2012), p. 3.

46 See Basten, Pankratz (2012), pp. 4-5, Bhattacherjee (2001).

47 See for this and the next sentence Basten, Pankratz (2012), pp. 4-5.

consequence, H_{1a} is part of the greater construct of expectations.

Hypothesis H_{1a}***:*** *Expectations regarding the Process are negatively related to Confirmation of Expectations.*

Hypothesis H_{1b}**: Expectations regarding the Product and Confirmation**

Similarly to H_{1a}, H_{1b} is based on the greater construct of expectations but more detailed. As outlined in the paragraph above, we had indicators for a differentiation in expectations. Still, the negative influence of expectations on confirmation are retained for expectations regarding the product from both Bhattacherjee and Basten and Pankratz as well.[48] H_{1b} is the second part of the greater construct of expectations as outlined by Bhattacherjee and Basten and Pankratz.

Hypothesis H_{1b}***:*** *Expectations regarding the Product are negatively related to Confirmation of Expectations.*

Hypothesis H_{2a}**: Perceived Process Performance and Confirmation**

Based on the ECT of Basten and Pankratz, as outlined in Fig. 2-3, we divided the construct of perceived performance into process and product.[49] This assumption is based on the idea that the process of development might be perceived differently than the product and therefore contributes differently to the confirmation of expectations. We retained the construct of perceived process performance and the positive relation to confirmation of expectations.[50] H_{2a} marks the first part of the greater construct of perceived performance as proposed by Bhattacherjee.[51]

Hypothesis H_{2a}***:*** *Perceived Process Performance is positively related to Confirmation of Expectations.*

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48 See for this and the next sentence Basten, Pankratz (2012), pp. 4-5, Bhattacherjee (2001).

49 See for the rest of this paragraph Basten, Pankratz (2012), pp. 4-5.

50 For the positive relation of perceived process performance on confirmation see also Bhattacherjee (2001).

51 See Bhattacherjee (2001).

Hypothesis H_{2b}: Perceived Product Performance and Confirmation

Complementary to H_{2a} and in line with Basten and Pankratz, we retained their construct of perceived product performance and it's positive relation to confirmation of expectations.[52] We want to reflect the division into process and product on both sides, expectations and perceived performance. Therefore, H_{2b} marks the second part of the greater construct of perceived performance. As before for H_{2a}, we retained the basic positive relation of perceived product performance on confirmation, derived from the greater construct of perceived performance as suggested by Bhattacherjee.[53]

***Hypothesis** H_{2b}: Perceived Product Performance is positively related to Confirmation of Expectations.*

Hypothesis H_3: Confirmation and Satisfaction

Each presented ECT has in common, that confirmation of expectation positively relates to satisfaction.[54] We therefore retain this positive relation and form H_3. This hypothesis basically represents the basic idea of ECT: If a priori expectations are met or exceeded by a posteriori perceived performance, satisfaction is increased, otherwise decreased.[55] The a posteriori perceived performance is compared to the a priori expectations, for both process and product and evaluated. Our hypothesis H_3 therefore states, that the client's level of confirmation of expectations, aggregated from hypotheses H_{1a}, H_{1b}, H_{2a} and H_{2b}, predicts the client's level of satisfaction positively, meaning that a higher level of confirmation results in a higher level of satisfaction.

***Hypothesis** H_3: Confirmation of Expectations is positively related to Client Satisfaction.*

Hypothesis H_4: Moderation of Client-Vendor Communication

This extension, based on the proposal by Basten and Pankratz, takes into account, that a priori expectations might be reevaluated due to communication and subsequently be

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52 See Basten, Pankratz (2012), pp. 4-5.

53 Bhattacherjee (2001), See.

54 See Basten, Pankratz (2012), pp. 4-5, Bhattacherjee (2001).

55 See for this and the next sentence Bhattacherjee (2001), p. 353.

weighted less.[56] In general, as outlined in chapters 2.2 and 2.3, communication is an important factor of influence for expectations, especially in interaction with confirmation of expectations.[57] We infer, that client-vendor communication which is perceived positive by the client, mitigates the negative influence of expectations regarding the process on confirmation. On the other hand, negatively perceived communication might increase the negative effect of expectations regarding the process on confirmation. Our hypothesis H_4 represents this concept of influence.

Hypothesis H_4***:*** *Client-Vendor Communication moderates the Influence of Expectations regarding the Process on Confirmation of Expectations.*

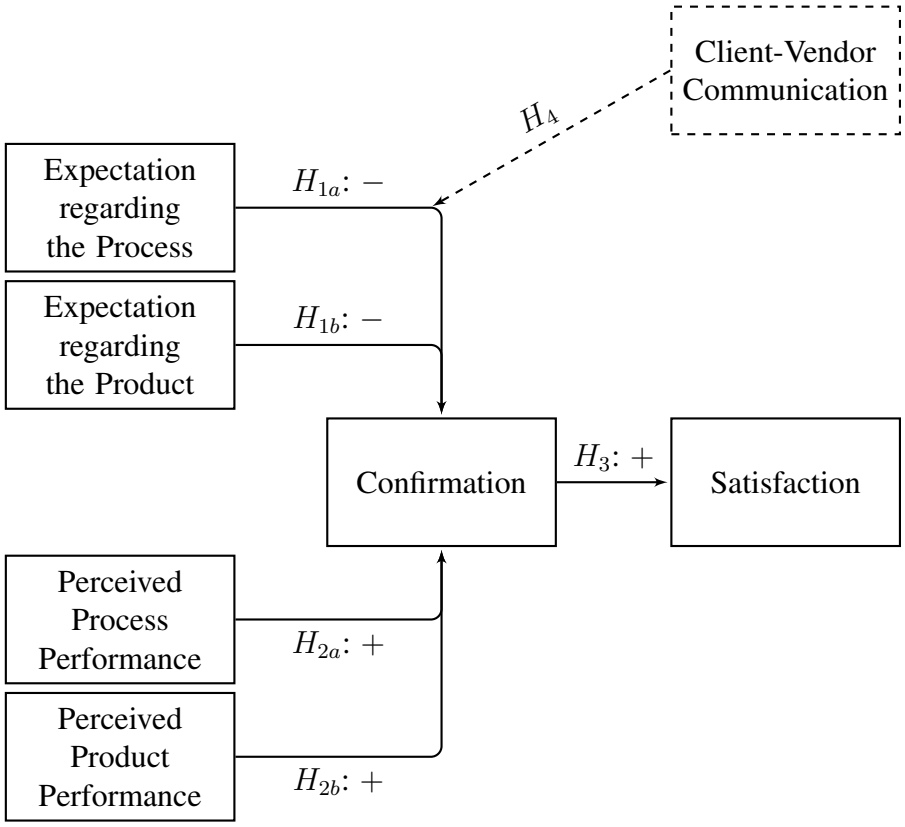

Fig. 3-1: Hypotheses for this Study

[56] See Basten, Pankratz (2012), pp. 4-5.

[57] See Basten, Pankratz (2012), p. 5, Sharma et al. (2008), p. 62, Walton, McKersie (1965), pp. 142, 182.

4. Research Approach

In this chapter we will give an overview of the sample we are targeting for our survey and the actual data acquisition. We will outline, how we obtained contact information for possible participants and how we proceeded to invite participants to our study. Furthermore, we present an extract of the questionnaire utilized and explain how the different items form constructs and on which theoretical backgrounds each construct is based.

4.1 Sample

Due to the fact, that our study is targeted on ISPs, we set our sample to contain project managers or other executive in charge of the project on the client's side. We will refer to client as the IS' consumer, even though the client might be the principal in some cases. All persons contacted which are not working at government organizations were extracted from Hoppenstedt Hochschuldatenbank[58] by Bisnode.[59] More on this process as well as the database itself is stated in chapter 4.2. In addition to these contacts, we tried to contact persons working at government organizations via phone. We focused on German companies because of two main reasons: First, Hoppenstedt Hochschuldatenbank lists only German companies and it is a comprehensive database. Second, as being based in Germany, contacting only German or German speaking companies eases the creation of the questionnaire as well as contacting companies and organizations in general.

For our study we looked for participants with the following characteristics: First, they had to be working for the client in a client-vendor relationship, meaning the consumer of 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 implies the third characteristic: We aimed for participants who were responsible for a project. Taking these characteristics together, we were looking for project managers or CIOs or similar positions. More details on the selection of participants is highlighted both

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[58] See http://www.hoppenstedt-hochschuldatenbank.de.

[59] See http://www.bisnode.de.

in chapters 4.2.1 and 4.2.2.

4.2 Procedure

4.2.1 Contact Data Acquisition

As mentioned before in chapter 4.1, most of all approached organizations and persons were extracted from Hoppenstedt Hochschuldatenbank[60] by Bisnode.[61] We queried this database in two approaches. First, we extracted a general overview by searching for companies from very different branches, such as manufacturing industry, trade, automobile industry or services. For a complete overview of all included branches as well as their corresponding code and an exemplary IS, see Tab. 4-1. These branches are based on a classification of economic sectors by the Statistisches Bundesamt[62] , published in 2008.[63] We chose different branches to increase the representability of the data acquired but tried to choose only branches, which utilize IS and probably had ISPs recently. Information regarding how we contacted possible participants will be outlined in chapter 4.2.2.

Hoppenstedt Hochschuldatenbank does include some public agencies and government organizations but these were mostly outdated information and only very few at all. Therefore, we decided to contact public agencies or local governments directly. We chose some randomly but roughly equally distributed cities, districts and states from a map and tried to contact them via their website. More information regarding this process will be outlined in chapter 4.2.2.

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60 See http://www.hoppenstedt-hochschuldatenbank.de.

61 See http://www.bisnode.de.

62 Institution of the German government charged with statistical analyses, see https://www.destatis.de.

63 See https://www.destatis.de/DE/Methoden/Klassifikationen/GueterWirtschaftklassifikationen/Content75/KlassifikationWZ08.html, extracted on July, 7th, 2015.

64 See https://www.destatis.de/DE/Methoden/Klassifikationen/GueterWirtschaftklassifikationen/Content75/KlassifikationWZ08.html, extracted on July, 7th, 2015.

Code	Name	Example IS
C	Manufacturing Industry	Enterprise Resource Planning (ERP)
G	Automobile Industry	Customer Relationship Management (CRM)
H	Traffic & Logistics	Run Optimization
J	Information & Communication	CRM
K	Finance & Insurance	can production
M	Technical & Scientific Services	Content Management System (CMS)
N	Other Economic Services	CRM
O	Public Agencies & Governments	CMS
Q	Health & Social Services	CMS
S	Other Services	ERP

Tab. 4-1: Branches included for this study (in correspondence to WZ 2008[64])

4.2.2 Invitation Process

Our contact process is illustrated in Fig. 4-1. First, we checked for any organization, if it is privately owned or run by government or at least a public agency. For private companies, we randomly selected companies of which we checked if their branch and size in terms of revenue and number of employees actually matches our query and if we could image them to have ISPs. Next, we checked for a contact person in this record whose job title or department were correlated to IS, ISPs or similar. In detail, we checked if his or her title or department contained IT, EDV[65] , IS, Information, Technik[66] , Daten[67] , CTO, CKO or CIO. If we found a matching contact, we checked if a valid mail address is in our data. If so, we sent an e-mail with an invitation to our study to this person and waited for a response. No further contact was made with this organization. If no valid mail address could be found, we searched for another person to contact from this organization. If the organization is not of a branch we included in our study, no persons with matching job descriptions could be found or no person with a valid e-mail address was found, this organisation was excluded from our study and further interaction. The above described

65 German abbreviation for any form of computerized or computer-aided work.

66 German for "technology".

67 German for "data".

behavior matches the upper half of Fig. 4-1.

Public agencies or governments were approached different by us. Because only very few were listed in Hoppenstedt Hochschuldatenbank, and often did not have accurate information regarding job descriptions and contact information, we decided to contact public agencies and governments directly via phone, if possible. Therefore, as we outlined in Fig. 4-1, we picked city administrations randomly on a map to be roughly equally distributed geographically. Additionally, we picked some country councils. Of these administrations, 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 call administrations as most of them did not provide mail addresses online. If either a telephone number or an e-mail 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. This process is illustrated in the lower half of Fig. 4-1.

4.3 Utilized Questionnaire and Constructs

Our questionnaire is based mainly on the one proposed by Basten and Pankratz.[68] The items used by Basten and Pankratz are based on english literature. Since we decided to contact only German or German speaking companies, all items had to be translated. To receive a high quality of translation, two fellow researchers were asked to check our translations.

Tab. 4-2 states all English measurement items used as indicators for the ECT as proposed by Basten and Pankratz.[69] The first column indicates which latent variable is constructed by the individual measurement items, which English translations are found in the second column. The German translation used in the questionnaire can be found in Appendix C.

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[68] See Basten, Pankratz (2012), p. 6.

[69] See Basten, Pankratz (2012), p. 6.

Every item is based on previous research. Our questionnaire is close to the one of Basten and Pankratz, but some items were extended. Compared to Basten and Pankratz, we added explicit items for expectation regarding the process as well as the performance, while Basten and Pankratz only asked for the overall expectation of success. For these items we used the ones proposed by Wallace et al. and used by Basten and Pankratz for perceived performance.[70] We did this for two reasons: First, we wanted to take a closer look on the relationship between process and product. Second, we wanted to have the same division into perceived process performance and perceived product performance for expectations regarding the process and expectations regarding the product. This idea is based on the suggestions by Wallace et al..[71] Similarly, we divided Basten and Pankratz' generally observed client satisfaction into satisfaction regarding the process and satisfaction regarding the product. In the following, we will refer to expectations regarding the process as EPROC, to expectations regarding the product as EPROD, to the perceived process performance as PPROC and to the perceived product performance as PPROD. Client-vendor communication will be referred to as CVC and to confirmation as CONF. Finally, we will refer to client satisfaction as SAT.

Our analysis will be based on a partial least squares regression (PLS). PLS basically has two types of indicators: reflective and formative.[72] Reflective indicators of a latent variable "all measure the same underlying phenomenon".[73] Additionally, all reflective indicators should respond the same way (increase or decrease), if their underlying phenomenon changes.[74] Formative indicators on the other hand are assumed to cause the latent variable and are not directly describing the same underlying phenomenon.[75] The latent variable is rather seen as an effect than a cause.[76] More information about our analysis will be given in 5.4.

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70 Cf. Wallace et al. (2004), pp. 320-321, Basten, Pankratz (2012), p. 6.

71 See Wallace et al. (2004).

72 See Chin (1998), pp. 305-308.

73 Chin (1998), p. 305.

74 See Chin (1998), p. 305.

75 See Chin (1998), pp. 303, 306.

76 See Chin (1998), p. 306.

All latent variables were modeled to have reflective indicators, as all items actually 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.[77]

The items for EPROC, EPROD, PPROC, PPROD as well as CONF were answered on a seven-point Likert scale, ranging from one ("I strongly disagree") to seven ("I strongly agree") as also utilised in previous research.[78] Items related to CVC as well as SAT were answered on a five-point semantic differential scale as proposed by the related literature.[79] The used scale ranges from one to five between listed adjectives.

Construct	**Measurement Item**	**Based upon**
Expectation regarding the Process (EPROC)	I expected the IS project to be within budget.	Wallace et al. (2004)
	I expected the IS project to be within schedule.	
Expectation regarding the Product (EPROD)	I expected the IS project to be having the intended functional requirements.	Wallace et al. (2004)
	I expected the IS project's overall quality to be high.	
	I expected the IS project to be reliable.	
	I expected the IS project to be fulfilling the user's expectations in regard to the system's response time behavior.	
	I expected the IS project's maintainability to be good.	

Tab. 4-2: Utilized Questionnaire including references of the specific items

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

78 See Wallace et al. (2004), p. 319, Bhattacherjee (2001), p. 359.

79 See Lee, Kim (1999), p. 40, Bhattacherjee (2001), p. 359.

Construct	**Measurement Item**	**Based upon**
Perceived Process Performance (PPROC)	The system was completed within budget.	Wallace et al. (2004)
	The system was completed within schedule.	
Perceived Product Performance (PPROD)	The system's intended functional requirements are met.	Wallace et al. (2004)
	The overall quality of the developed application is high.	
	The application developed is reliable.	
	The system meets user expectations with respect to response time.	
	The application is easy to maintain.	
Confirmation (CONF)	My experience with the IS project was better than what I expected.	Bhattacherjee (2001)
	The benefit provided by the IS project was better than what I expected.	
	Overall, my expectations concerning the IS project were at least confirmed.	
Client-Vendor Communication (CVC)	During the IS project, the manner and methods of communication between us and our vendor were... • Timely ... Untimely • Accurate ... Inaccurate • Complete ... Incomplete • Credible ... Incredible	Lee and Kim (1999)

Tab. 4-2: Utilized Questionnaire including references of the specific items (continued)

Construct	Measurement Item	Based upon
Client Satisfaction (SAT)	Regarding my experience with the IS project in regard to the development process (compliance with budget and schedule, communication, dealing with issues, etc.), I feel... • Very satisfied ... Very dissatisfied • Very pleased ... Very displeased • Very contended ... Very frustrated • Absolute delighted ... Absolute terrible	Lee and Kim (1999)
	Regarding my experience with the IS project in regard to the product itself (functional and non-functional requirements, expectations in general, etc.), I feel... • Very satisfied ... Very dissatisfied • Very pleased ... Very displeased • Very contended ... Very frustrated • Absolute delighted ... Absolute terrible	

Tab. 4-2: Utilized Questionnaire including references of the specific items (continued)

In addition to the items proposed by Basten and Pankratz, we added items to measure the utilization of different mediums of communication, namely Face-to-Face meetings, Video Conferencing, Voice-Only (e.g. via telephone) and Text-Only (e.g. via e-mails). Sharma et al. have shown, that especially for IT-outsourcing projects effective communication is crucial.[80] The authors have observed, that preferences for and effectiveness of commu-

[80] See Sharma et al. (2008), pp. 77, 85-86.

nication mediums vary, depending on different activities, but that different mediums are generally preferred over others or are more effective than others.[81] Therefore, we asked the participants to rate their usage frequency of the different mediums.

Halilovic and Cicic studied the influences on continuance intention of IS usage.[82] They based their study on a modified ECT.[83] One of the results of their study is that the conditions of support are directly influencing significantly both satisfaction and continuance intention.[84] Therefore, we asked the participants to rate on a five-point Likert scale both the availability of support and their competency.

Furthermore, we asked the participants for general data, such as size of their organization in terms of employees and revenue, the organization's branch and the participants experience and education. Moreover, we asked for background information about the kind of project and the relationship between the client and the vendor.

As control variables, we collected information regarding deadline pressure (high, medium, low), novelty of the developed application (an extension to an already existing application, a new generation or an innovative application), the complexity in regard to organisational change needed from high over medium to low, the project's necessity, if it was voluntarily or not, whether the contact to the vendor was direct or via an intermediate, if the vendor was prominent from previous projects or not, the level of inclusion during the project (low, medium or high level) and the level of trust towards the vendor (low, medium or high). We did not ask specifically for the usage of agile development methods as the usage and interpretation of agile development is rather indistinct and many hybrid development practices of both agile and non-agile development philosophies.[85]

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81 See Sharma et al. (2008), pp. 80-83.

82 See Halilovic, Cicic (2013).

83 See Halilovic, Cicic (2013), pp. 360-362.

84 See Halilovic, Cicic (2013), pp. 366-367.

85 Cf. exemplary Inayat et al. (2015), Williams (2012).

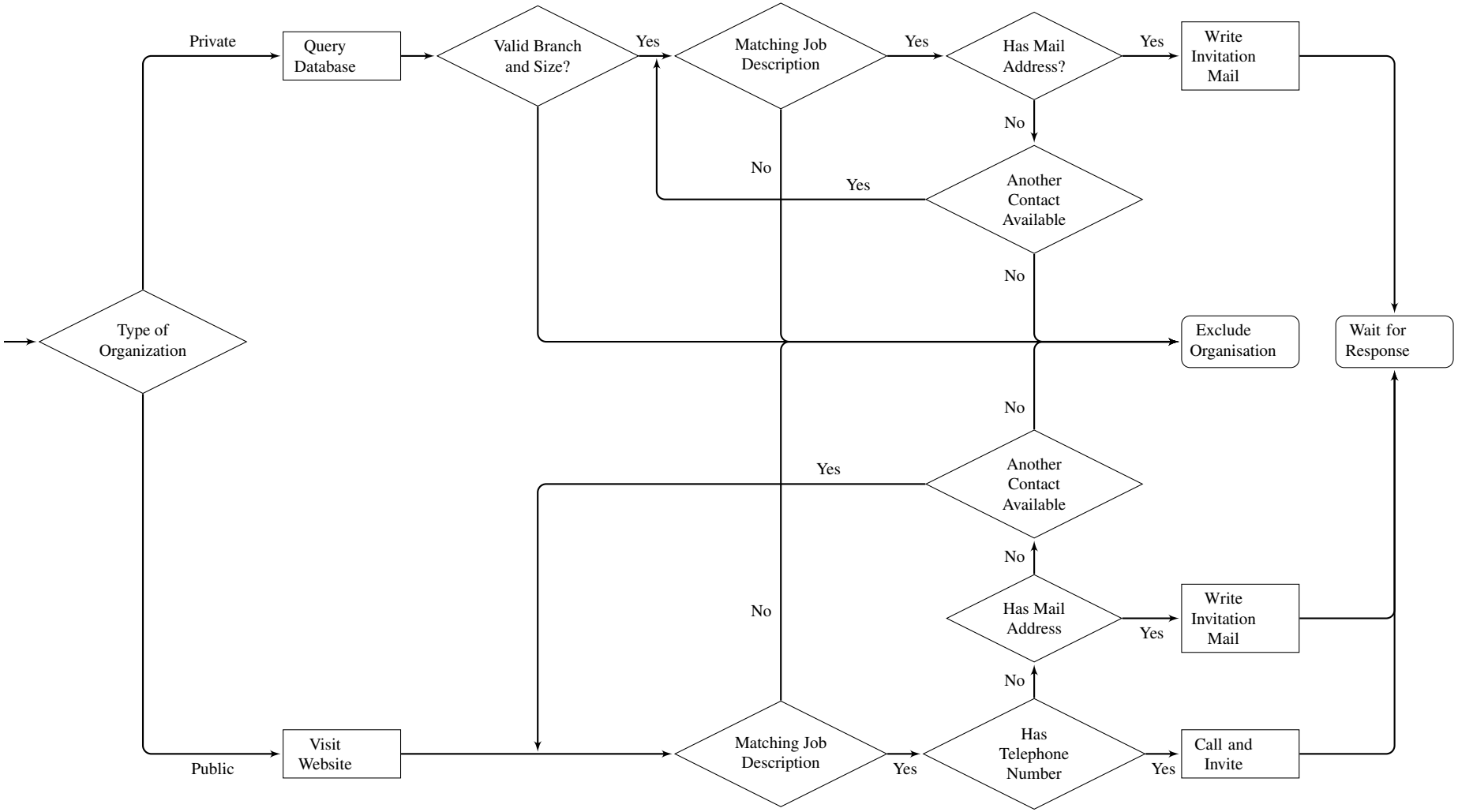

Fig. 4-1: Research Approach - Contact Process

5. Data Analysis and Results

This chapter will present results obtained from our survey. First, we will present results such as distribution of professions or experience. Next, we give a short introduction to partial least squares regression (PLS), the statistical method on which our further analysis will be based upon. Following, we will first test our hypotheses and develop the final model based on the insights gained. Finally, we will validate our model and test for common method variance and the influence of the social desirability bias.

5.1 General Results

In total, from 3,500 contacted persons, 75 complete answers were collected, from which 74 were valid. One answer was excluded as the project's status was stated to be "in preparation" which therefore cannot lead to exact answers regarding a posteriori satisfaction and the communication during the process. In general, the low response rate from 2.14% can be explained by different arguments. First, many of the provided information from the Hoppenstedt Hochschuldatenbank was outdate or inaccurate, so in some cases, people were no longer working for the specific company or organization due to different reasons, or were working in different departments so they were not able to participate in our study. In other cases, the information from the Hoppenstedt Hochschuldatenbank about the person was inaccurate and the person did not come in touch with IS.

Participants of our study had on average experienced 17.20 projects in software development (ranging between zero and 300, $SD = 36.80$) and on average 11.19 years practice (ranging between zero and 35, $SD = 9.10$). Detailed information about the count of projects stated to be experienced by participants is illustrated in Fig. 5-1. Fig. 5-2 illustrates the count of years of experience stated by participants. Seven participants stated that they are female (9.46%), 64 male (86.49%) and three did not answer this question (4.05%). No participant stated to be working as freelancer, three stated that they are self-employed and three stated that they are civil servants (4.05% each) while the majority of 68 (91.89%) stated to be employed. Nevertheless, 17 (22.97%) stated to be working at a civil company or organisation and 57 (77.03%) worked on private companies.

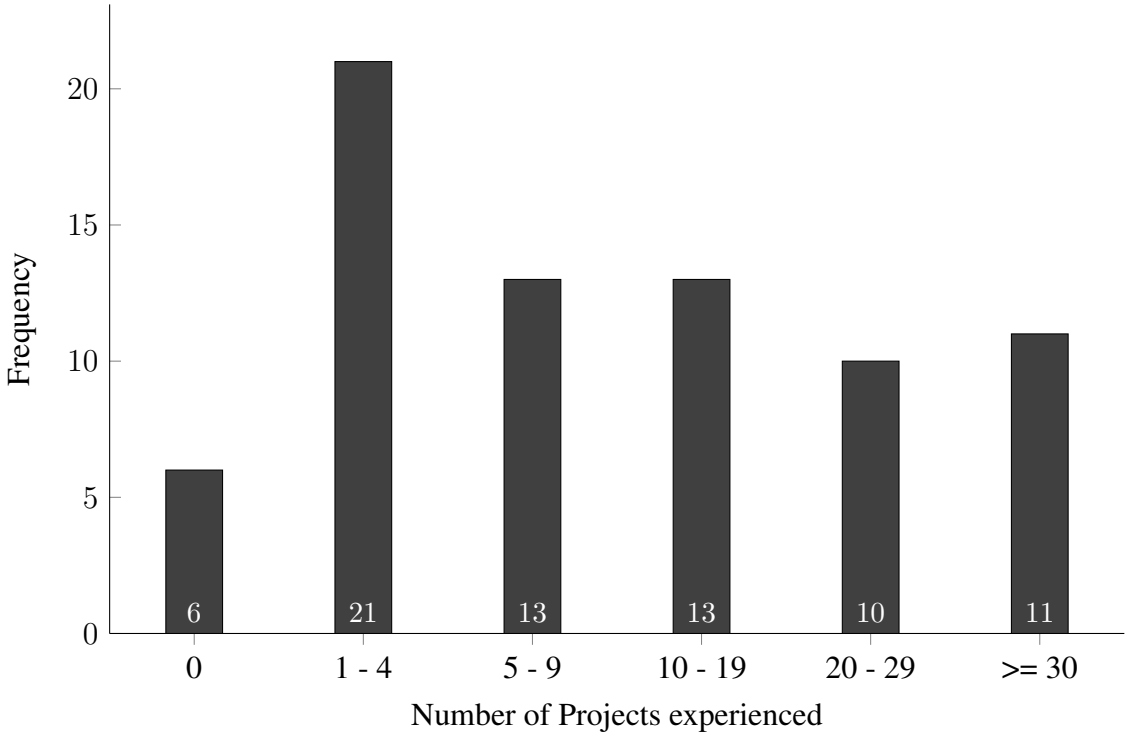

Fig. 5-1: Number of Projects experienced by Participants

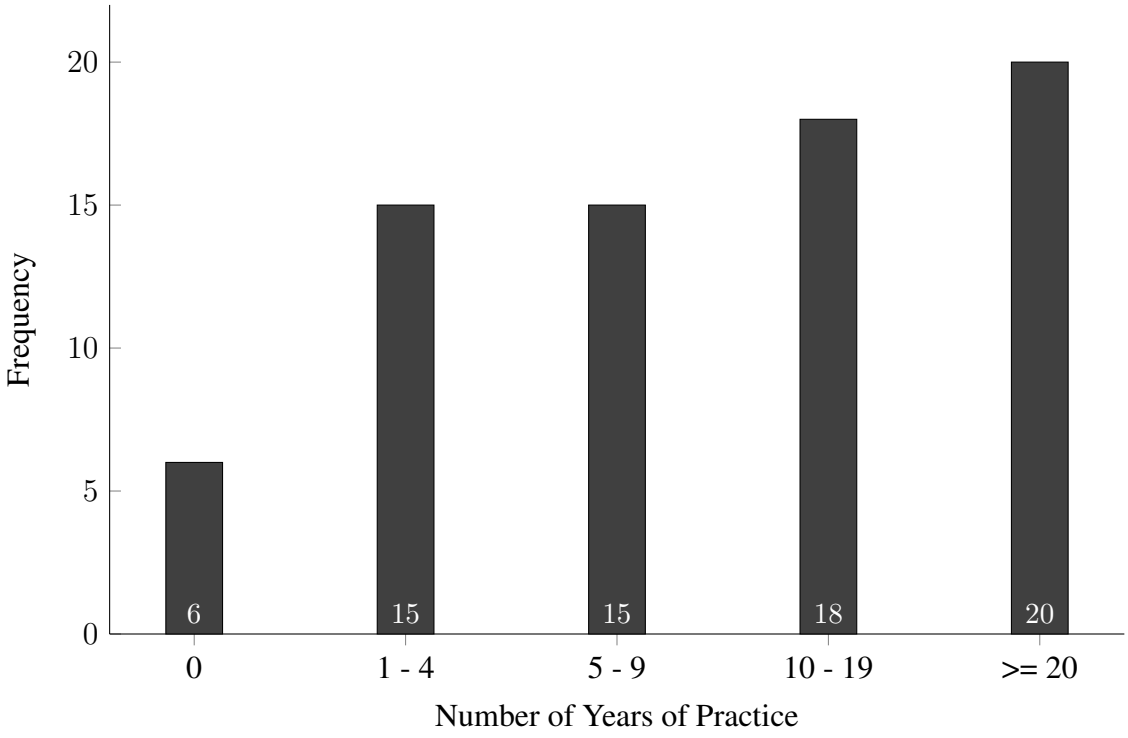

Fig. 5-2: Years of Practice of Participants

We listed all mentioned educational qualifications in Tab. A-1. An extract is illustrated in Tab. 5-1. A more detailed overview can be found in Appendix A. 14 of all participants (18.92%) stated only to own a diploma without further information about special qualifications such as engineer or economist. Next up, 11 participants (14.86%) stated to be graduate engineer, graduated from a university. In this context, only two participants (2.70%) mentioned to be graduated as engineer from a college. Similarly, seven participants (9.46%) stated to be graduated as business economist from a university, and only two (2.70%) from a college. A received doctoral or PhD title was stated six times (8.11%). General college graduation was stated by five participants (6.76%). A general university graduation was mentioned by four participants (5.41%). Although the majority of all participants had a college or university degree[86] , other qualifications were reported as well: Five participants (6.76%) each mentioned to be either business economist without graduation or having a formal education as craftsman or technician.

Educational Qualification	**Count**	**Percentage**
Diploma / Master's Degree	37	50.00%
Apprenticeship	9	12.16%
Diploma / Master's Degree (College)	8	10.81%
Doctoral / PhD	6	8.11%
Bachelor's Degree	5	6.76%
Abitur[87]	3	4.05%
Mittlere Reife[88]	3	4.05%
None	1	1.35%

Tab. 5-1: Extract of Educational Qualifications reported by Participants

Tab. 5-2 list an extract and aggregation of the most mentioned fields of study. A list of all mentioned fields can be found in Appendix B. Of the total 74 valid participants, 22 participants (29.73%) had economics, controlling or a related field of study as major field of study during education. 21 (28.38%) were mainly trained on information and communi-

86 See Tab. A-1.

88 German: general qualification for university entrance.

88 Second school leaving certificate.

cation technology or similar. 13 of 74 participants (17.57%) were trained in a mixed field of study, such as engineering management, information systems management or mathematical economics. Four participants had social sciences or similar fields of study as their major field of study. In general, different and distinct fields were mentioned by participants, e.g. building engineering, engineering, (food) chemistry, city cleaning, geography, (molecular) biology, pharmacy, political sciences, precision engineering, process engineering, psychology and wood technology.

Field of Study	**Count**	**Percentage**
(Business) Economics & Administration	22	29.73%
Computer Science & Technology	21	28.38%
Information Systems / Engineering Management	13	17.57%
Engineering	8	10.81%
Social Sciences	4	5.41%
Other	6	8.11%

Tab. 5-2: Extract of Fields of Study reported by Participants

Different roles in the project of interest were reported. Because of similar meaning, we aggregated most of the named roles.[89] We listed an extract of most common roles in Tab. 5-3. The majority of 38 roles (51.35%) were coded to be associated with the project lead or project leadership. Eight (10.81%) were coded to be involved with project coordination and eight (10.81%) were coded to be contacts for this project in a specific department. Seven roles were coded to be a principal (9.46%), meaning more personal influence than, e.g. people in a steering committee. Five participants' roles (6.76%) stated to be involved in controlling and or management and were therefore coded as management. This includes positions such as CIOs. Four participants (5.41%) were coded steering committee and four as (end) user(5.41%). Two uncommon roles within this dataset shall be reported here: one participant described his or her role in the project as "Key-User" (coded as "end-user") and one participant stated to be "SCRUM Product Owner" (coded as "project lead").

[89] E.g. we aggregated "project lead" and "head of project" into "project lead".

Role	Count	Percentage
Project Leader (-ship)	38	51.35%
Project Coordinator	8	10.81%
Departement Contact	8	10.81%
Principal	7	9.46%
Management	5	6.76%
Steering Committee	4	5.41%
(End) User	4	5.41%

Tab. 5-3: Extract of Roles reported by Participants

Regarding their organization's branch, many different branches were mentioned by participants. Automotive, or construction companies were mentioned as well as financial consulting or food production, trading companies as well as chemical industries, aerospace as well as medical or pharmaceutical companies, transit as well as public agencies and government organizations, telecommunication, insurances and general services.

Participant's organizations had on average $2,728.34$ employees ($N = 73$, $Mdn = 250.00$, $SD = 1,3394.15$), ranging between one (self-employed) and $108,000$). One participant (1.45%) did not report his or her organization's number of employees. A detailed listing of the reported number of employees can be found in Fig. 5-3. Regarding the organizations' revenue, 12 participants (16.22%) did not report their organization's revenue. This has probably three reasons: First, in non-profit organizations, such as governments or administrations, no revenue is present. Second, eight participants mentioned amounts of or below $1,000$ €. This might be due to the fact, that they assumed in contrast to the question that we asked for amounts in thousands or hundred of thousands of Euro. Third, probably not every employee knows his or her organization's revenue. Additionally, two participants (2.70%) reported an revenue of exactly 0.00 €. This might be due to the fact, that public agencies or governments do not have a revenue, rather a budget. From those organizations of which we received revenues, the average revenue of all valid reported revenues is $1,759,232,830.19$ € ($N = 53$, $Mdn = 25,000,000.00$, $SD = 10,114,169,850.23$), ranging between $140,000$ € and $80,000,000,000$ €. Detailed information about the re-

ported revenues can be found in Fig. 5-4.

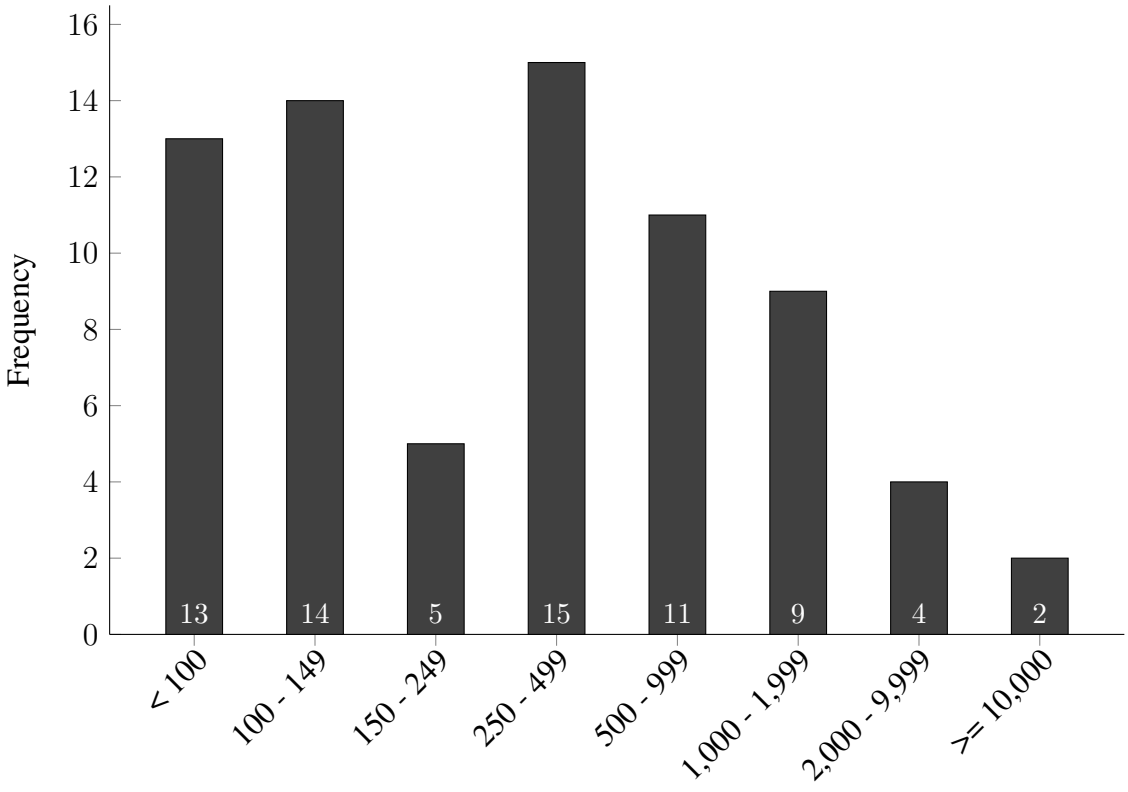

Fig. 5-3: Number of Employees reported by Participants

As stated at the beginning of this chapter, one of the initial 75 complete answers was stated to describe a project which is still "in planning" and was therefore excluded. Of the remaining 74 projects, 45 (60.81%) were stated to be finished and 29 (39.19%) were stated to still be active.

Projects described by participants in this study started between 2006 and 2015 and ended between 2008 and 2016[90] . Projects' start year mean is 2013 ($M = 2012.93$, $SD = 1.67$) and ended year mean is 2015 ($M = 2014.26$, $SD = 1.35$). The average duration of projects reported is 16.04 months ($Mdn = 12.00$, $SD = 13.45$), ranging between 2 and 84 months. For more details on the reported duration of projects, see Fig. 5-5. It is interesting to note, that some spikes can be observed for three months (quarter of a year), six

[90] Although this date is at the time of data collection in the future, those datasets were included because these projects had already made progress and meaningful statements about success or failure and the communication so far can be made.

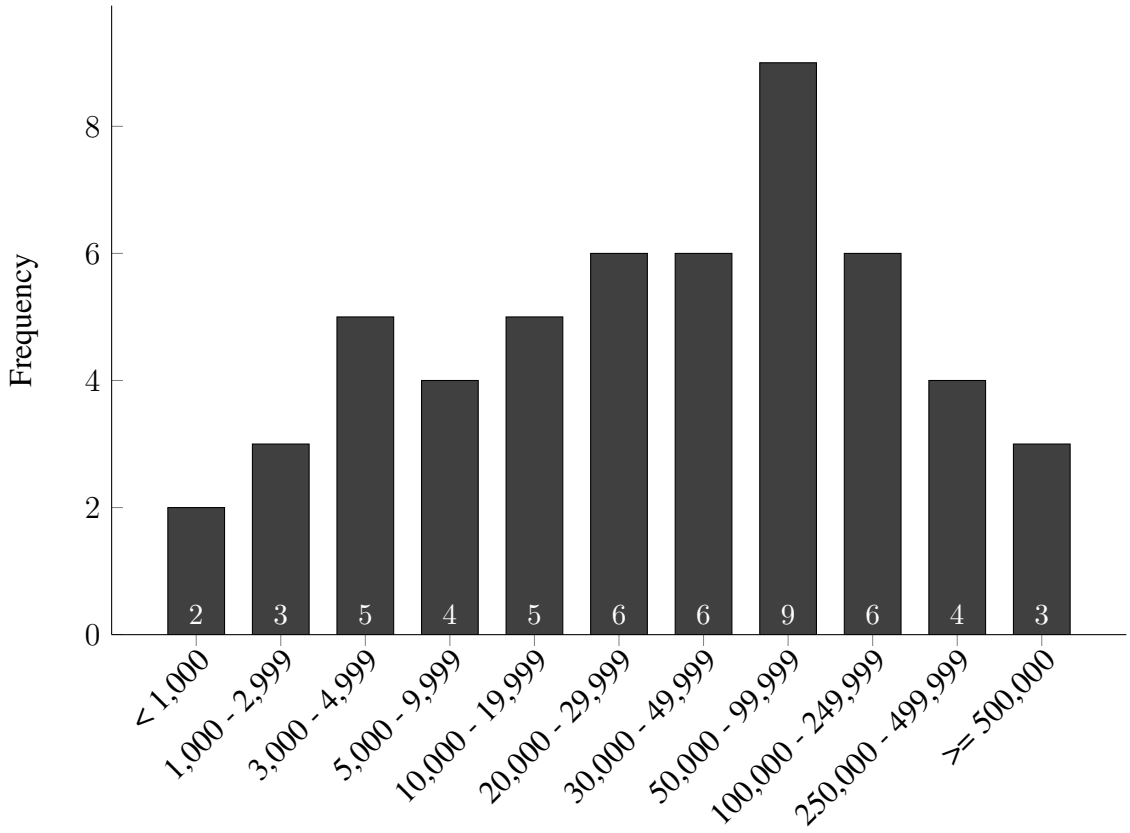

Fig. 5-4: Revenue (in thousands of Euros) reported by Participants

months (half a year), 12 months (one year), 18 months (one and a half year), 24 months (two years) and 36 months (three years). These seem to be related to the initially planned schedule, those projects mentioned with an "odd" duration might have over- or underrun their schedule or had to be finished at an exact date.

Of all projects reported, 31 (41.89%) were reported to be successful, 41 (55.41%) to be successful but with issues and 2 (2.70%) to have failed but partly successful. No projects were reported to have failed completely. This results in an average rating of 1.61 ($Mdn = 2.00$, $SD = .54$) with a range from one equaling successful to 4 equaling failed. The success of projects was correlated with their complexity ($.36$, $p < .001$). 22 projects (29.73%) were negotiated to be fixed price, 21 (28.38%) to be compensatory and 31 (41.89%) to be mixed. Nine of all projects (12.16%) were part of a larger project and 65 (87.84%) were stand-alone projects. Regarding the urgency, 15 projects (20.27%) were reported to have an unconditional deadline, e.g. because of laws, 22 (29.73%) to have a deadline important to remain competitive, and 37 (50.00%) were reported to have

no critical deadline. 6 of the 74 projects in question (8.11%) were stated to be mandatory to the organization, while 68 (91.89%) were implemented voluntarily. This results in an average rating of 1.08 ($Mdn = 1.00$, $SD = .28$). 40 projects (54.05%) were described as an extension to an already existing product or service, 23 (31.08%) as a new generation in a family of products and 11 (14.86%) as innovation. We asked participants to rate the project's complexity in regard to the size of organizational changes necessary on a scale from one (only minor changes or none) to three (high level of changes). Nine projects (12.16%) were stated to have only a low level of changes, 28 (37.84%) to have a medium level of changes and 37 (50.00%) to have a high level of changes necessary. This results in a medium level of changes of 2.38 ($Mdn = 2.50$, $SD = .70$).

26 projects (35.14%) were given to intra-organizational vendors and 48 (64.86%) to external vendors. Of these vendors, 40 (54.05%) were stated to reside near the client and 34 (45.95%) to be at a different site. While 71 projects (95.95%) were coordinated directly between client and vendor, three (4.05%) were coordinated over an intermediate. 30 projects (40.54%) were first-time contacts between client and vendor, while in 44 cases (59.46%) client and vendor knew each other before. First-time contacts were negatively correlated to the vendor's residence ($-.40$, $p < .001$), meaning that first-time contacts were more likely not to be situated near the client.

Teams formed for these reported projects varied in size. The average team consists of 7.82 people ($Mdn = 5.50$, $SD = 6.38$). The number of team members ranges from one to 35. Fig. 5-6 illustrates all stated team sizes.

Regarding usage of communication mediums, we asked participants to rate the frequency of usage of Face-to-Face Meetings, Video Conferences, Voice-Only Calls and Text Messaging on a five-point Likert scale, ranging from 1 (never) to 5 (very often). 50 participants (67.57%) reported to never use Video Conferences. In general, Video Conferences were used only seldom ($M = 1.61$, $Mdn = 1.00$, $SD = 1.02$). Face-to-Face ($M = 3.69$, $Mdn = 4.00$, $SD = 1.10$), Voice-Only Calls ($M = 3.51$, $Mdn = 4.00$, $SD = 1.14$) and Text Messaging ($M = 3.76$, $Mdn = 4.00$, $SD = 1.13$) did only slightly differ from each other. For more information about the usage frequency of communication mediums, see

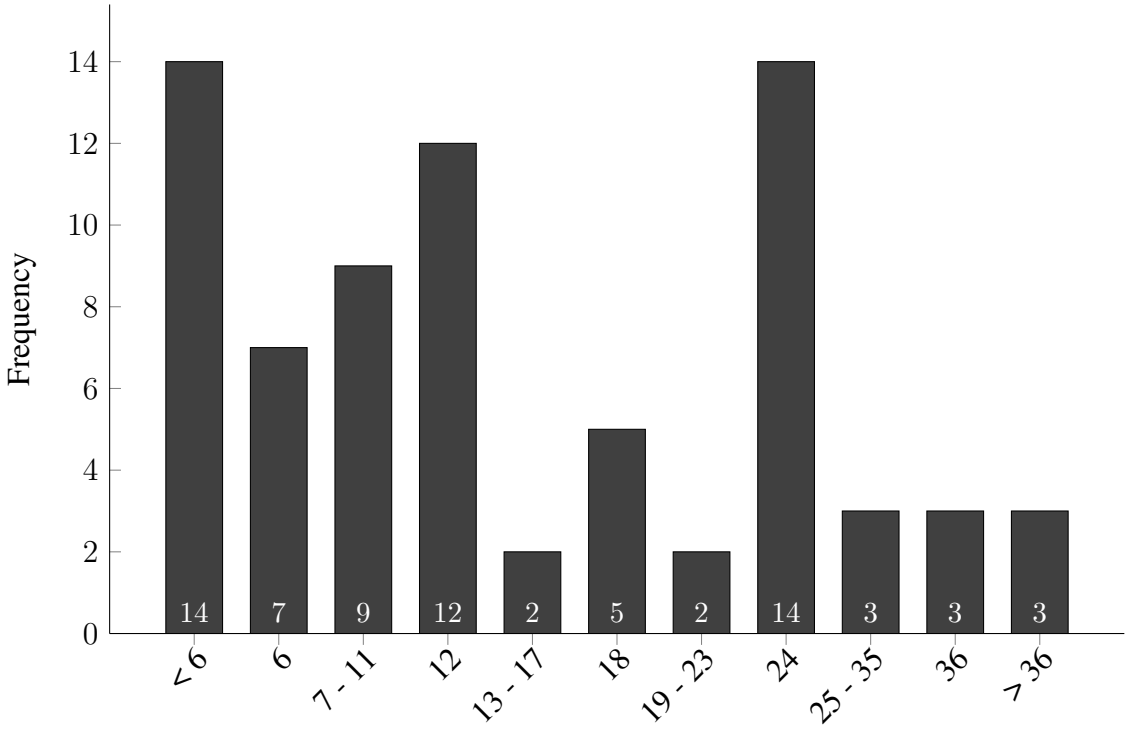

Fig. 5-5: Duration of Projects in Months

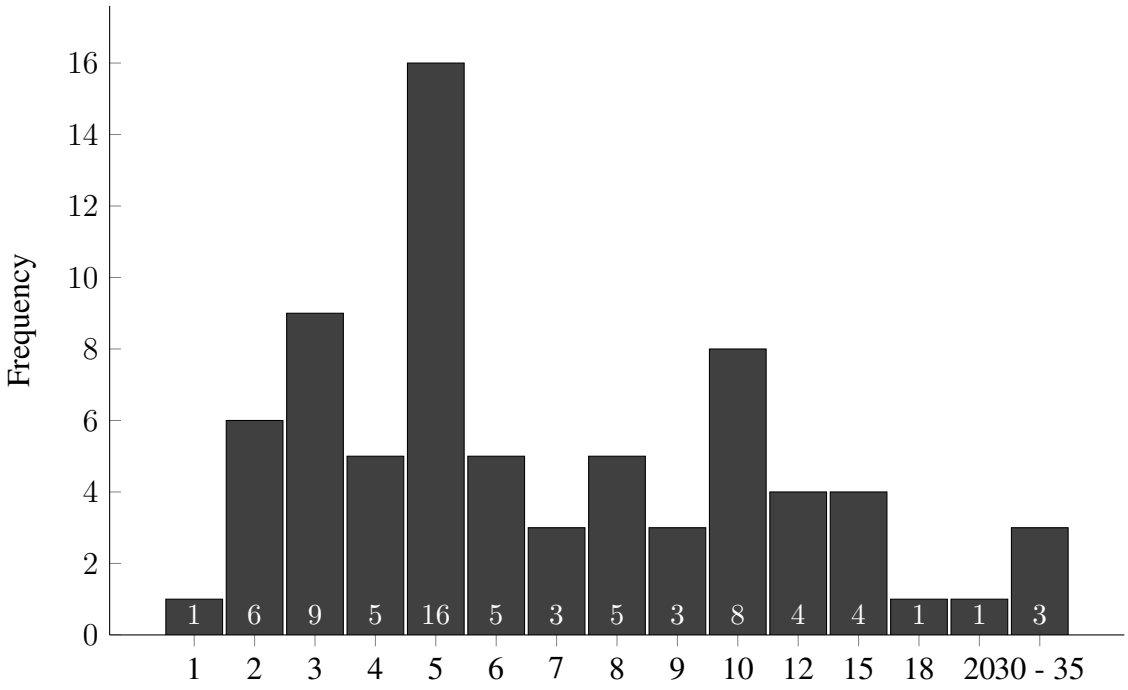

Fig. 5-6: Number of Team Members in Projects

Fig. 5-7. Significant correlation between these mediums was found only for Text-Only and Voice-Only, which were correlated with $.45$ ($p < .001$). Voice-only and Video Conferencing were weakly correlated at $.26$ ($p < .05$). A linear regression analysis between the usage of mediums and timeliness of communication revealed no significant influence ($R^2 = .10$, $\bar{R}^2 = .04$, $p = .14$). The same holds true for the influence on perceived completeness of communication ($R^2 = .12$, $\bar{R}^2 = .07$, $p = .06$), the influence on perceived correctness of communication ($R^2 = .04$, $\bar{R}^2 = -.01$, $p = .53$) and the influence on perceived trustworthiness ($R^2 = .07$, $\bar{R}^2 = .02$, $p = .26$). The urgency of the deadline is correlated with Video Conferences ($.46$, $p = .00$), Voice Calls ($.26$, $p < .05$) and Text Messaging ($.33$, $p < .001$), but not with Face-to-Face communication ($.13$, $p = .28$). Face-to-Face communication is correlated to the locality of the vendor ($.35$, $p < .001$) as well as the client's prominence of the the vendor from previous projects ($-.35$, $p < .001$). It is also correlated with the having an inner-organizational (internal) or external vendor ($.25$, $p < .05$) and the level of inclusion during development ($-.28$, $p < .05$).

We asked participants to rate the competency and reachability of support teams both on separate seven-point Likert scales, ranging from 1 (not or hardly competent or reachable) to 7 (very competent or easy reachable). Participants rated support teams to be competent ($M = 5.18$, $Mdn = 6.00$, $SD = 1.73$) and easily reachable ($M = 4.72$, $Mdn = 5.00$, $SD = 1.64$). Both were strongly correlated at $.77$ ($p < .001$). A linear regression regarding the explanatory value of both items did not reveal any significances ($R^2 = .03$, $\bar{R}^2 = -.00$, $p = .41$).

The level of innovation of the project was also weakly related to both type of project (part of a larger project vs a project on it's own, $.25$, $p < .05$) as well as critical deadline ($-.24$, $p < .05$). The type of project is also correlated to the choice of internal vs external vendor ($.33$, $p < .001$).

On a scale from one (low) to three (high), participants were asked to report both the level of integration of their organization during planning, governance and controlling of the the project as well as their trust towards the vendor. Trust was rated slightly higher ($M = 2.58$, $Mdn = 3.00$, $SD = 0.52$) than integration ($M = 2.35$, $Mdn = 2.00$,

$SD = .65$). Only one participant (1.35%) reported a low level of trust towards the vendor, while seven participants (9.46%) reported only a low level of integration.

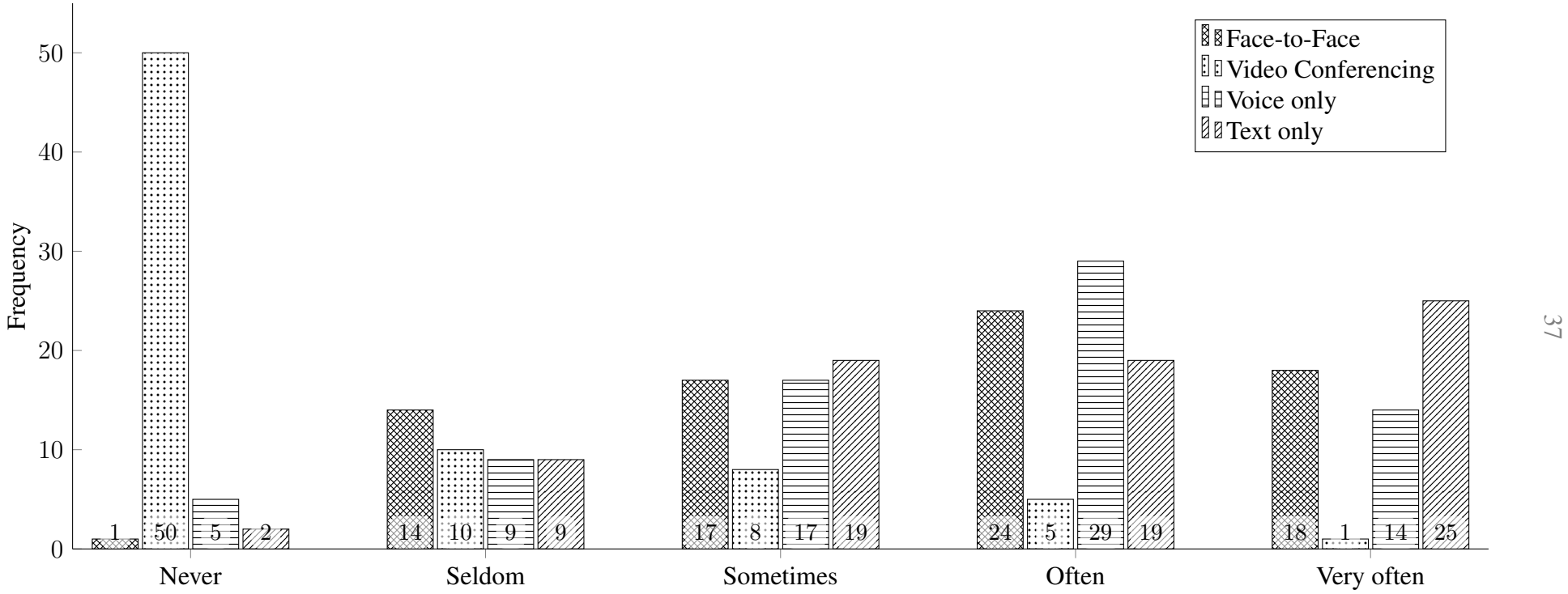

Fig. 5-7: Usage of Communication Mediums

5.2 Introduction to PLS

For the following statistical analyses, we utilized the partial least squares regression (PLS). PLS is based on structural equitation modeling[91] and was introduced by Wold in 1977 and extend in the following years.[92] PLS is receiving popularity among researches. Vinzi et al. describes it as a "statistical approach for modeling complex multivariable relationships among observed and latent variables".[93] PLS' name already hints at it's basic principle: the usage of the least squares estimation procedure. Both reflective and formative latent constructs can be used for modeling.[94]

Because of the partly exploratory character in regard of the influences of communication observed in this study, PLS is seen as an appropriate method.[95] Taking in mind the rather small sample size acquired, PLS' low limitations regarding sample size eased our analysis compared to other statistical methods.[96] Furthermore, covariance-based structural equitation modelling approaches, such as AMOS for SPSS, are less appropriate because our theory is not strong and elaborated and further testing and confirmation are not our primary goals.[97] Instead, we are looking for other characteristics of PLS described by Hair et al.: maximizing explained variance and evaluating our data quality on the basis of our measurement model's characteristics.[98] For PLS calculations, we used SmartPLS version 3.0,[99] a well known tool for structural equation modeling, specialised on PLS. PLS basically represents the model as graph with latent variables, the observed variables, as nodes and directed paths as relations between nodes. Additionally to the latent variables, PLS' graph takes their indicators, the observed variable's items, into account. As shortly outlined in 4.3, indicators of latent variables can be reflective (the latent variable

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91 See Chin (1998), p. 298.

92 See Wold (1982) as cited by 298 Chin (1998).

93 Vinzi et al. (2010), p. 2.

94 See Newkirk, Lederer (2006), p. 386.

95 See Chin (2010), p. 660, Hair et al. (2011), p. 140.

96 See Chin (1998), p. 295, Newkirk, Lederer (2006), p. 386, Hair et al. (2013), p. 19.

97 See Hair et al. (2011), p. 143.

98 See Hair et al. (2011), p. 140.

99 Ringle et al. (2015).

represents the indicators' underlying phenomenon) or formative (the indicators are the latent variable's cause).

To calculate the minimum sample size, we refer to Chin.[100] They state, that the larger of two options shall be used for calculation: a) the largest number of formative indicators for a single latent variable or b) the number of independent latent variables impacting a single other latent variable. In our study, case a) with five formative indicators is used as calculation base. Chin suggests to multiply this base with ten to achieve the minimum sample size needed to safely calculate the model. This results in a minimum sample size of fifty which our sample with 74 participants exceeds. It is therefore safe to run the calculation using PLS.

For analyzing our hypothesized model as outlined in chapter 2.3, we ran a bootstrapping algorithm on this model to figure out, which items and latent variables could be retained and which had to be removed. Bootstrapping is a method used to test coefficients for their significance.[101] In general, bootstrapping means that subsamples are drawn from the original sample, resulting in a large number of additional samples. These samples are naturally no real observations but rather randomly (re-) drawn observations from the original sample because each time an observation is drawn, it is returned to the original sample. This results in an increased number of observations in the bootstrapped sample with possibly observations which were never drawn and such which were drawn multiple times. Hair et al. suggest a bootstrap sample size of $5,000$ samples.

5.3 Hypothesis Tests

In this chapter, we will test our hypotheses postulated in chapter 3. We started the process of hypotheses testing by replicating our model as shown in Fig. 2-3 in chapter 2.3 in SmartPLS.

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[100] See for this paragraph Chin (1998), pp. 311-312.

[101] See for this and the next four sentences Hair et al. (2013), pp. 130, 132.

A bootstrapping run in SmartPLS with $10,000$ samples was used to calculate p-values and t-test values to interpret significances. First, we looked at the expectations regarding the process as well as the product. For the path coefficients, EPROC has a positive loading ($.10$), while EPROD has a negative loading ($-.09$). Looking at t-values and p-values reveals, that neither EPROC ($t = 1.30$, $p = .19$), nor EPROD ($t = 1.20$, $p = .23$) had significant influence on CONF. Therefore, both hypotheses H_{1a} and H_{1b} cannot be confirmed.

Next, we looked at the perceived performance to test hypotheses H_{2a} and H_{2b}. While both PPROC ($.06$) and PPROD ($.64$) have a positive loading, only PPROD found to be significant ($t = 5.14$, $p < .001$) and PPROC was not significant ($t = .82$, $p = .41$). From this analysis, hypothesis H_{2a} has to be rejected, while hypothesis H_{2b} can be approved.

For the basic assumption of ECT that CONF positively influences SAT, we can report that in our study, CONF influences SAT positively ($.67$) and significantly ($t = 9.02$, $p < .001$). Therefore, hypothesis H_3 can be approved as well.

Finally, hypothesis H_4 had to be tested. For the moderating influence of CVC on the relation of EPROC on CONF we can report a positive ($.02$), but insignificant ($t = .22$, $p = .82$) effect. This results in a rejected hypothesis H_4.

Fig. 5-8 outlines all hypotheses and their test results. Because of the missing significance of the moderating effect of CVC and failed hypotheses we did no further validation of this model. Instead, we will develop a new model based on our data. This exploratory model development will be outlined in chapter 5.4.

5.4 New Model Development and Confirmation

In this section, we will develop an improved model based on the insights gained in the previous analysis. We will first explore, which influences are most significant in which configuration and re-test our hypotheses. Furthermore, we will validate the most matching model against various measures of validity and reliability.

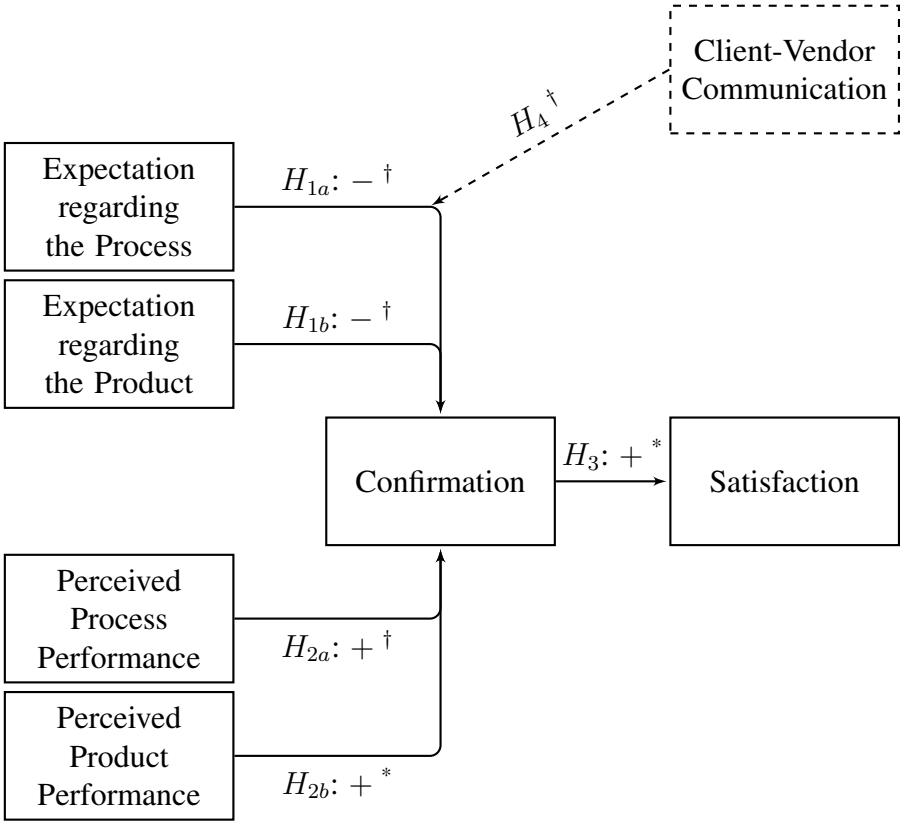

Fig. 5-8: Hypotheses Test Results for this Study
(†: rejected, *: approved)

New Model Development

As seen in the previous chapter, some of our hypotheses could not be confirmed. Especially our main hypothesis H_4, which describes the moderating role of CVC in ECT, had to be rejected. Therefore, we decided to develop a new model based on our data.

With these new insights, we disposed the moderating effect of CVC on the influence of EPROC on CONF and investigated the possible direct effect of CVC on CONF. While neither EPROC (.09, $t = 1.29$, $p = .20$), nor EPROD ($-.09$, $t = 1.21$, $p = .23$), nor PPROC (.06, $t = .83$, $p = .41$) were found to be significant, a direct influence of CVC on CONF was found to be weakly significant (.19, $t = 2.01$, $p < .05$). The effect of PPROD on CONF was also found to be significant (.64, $t = 5.19$, $p < .001$) as well as CONF on SAT (.67, $t = 8.82$, $p < .001$).

As expectations still appeared to be insignificant in our sample, we left both EPROC and EPROD out for our further analysis. Instead, we decided to investigate the direct influence of CVC on CONF but also on PPROC and PPROD in more detail.

Interestingly, neither CVC's influence on CONF (.14, $t = 1.60$, $p = .11$), nor PPROC's influence on CONF (1.77, $t = 1.44$, $p = .15$) were significant after the adjustments were made and a new bootstrapping was performed. CVC's influence on PPROC was highly significant (.37, $t = 3.78$, $p < .001$), it's influence on PPROD less so but still significant (.32, $t = 3.27$, $p < .010$). CONF's effect on SAT was still highly significant (.58, $t = 6.20$, $p < .001$), as well as PPROD's effect on SAT (.51, $t = 3.68$, $p < .001$). Running another bootstrapping but without a direct influence of CVC on CONF resulted in an improved p-value for the influence of PPROC on CONF (.23, $t = 2.06$, $p = .04$) and PPROD on CONF (.57, $t = 4.96$, $p < .001$). The significance of CVC's influence on PPROC decreased slightly and became only weakly significant (.36, $t = 2.56$, $p < .050$). Having instead no direct influence of CVC on CONF but on SAT resulted in more significant relations: CONF influences SAT significantly (.42, $t = 3.27$, $p < .010$). The influence of CVC on PPROD (.32, $t = 2.29$, $p < .050$) remained significant. The freshly added relation of CVC on SAT was also highly significant (.47, $t = 40.3$, $p < .001$). The bootstrapping result of our final model is outlined in Fig. 5-9.

Hypothesis Testing

While hypotheses H_{1a}, H_{1b} and H_4 are no longer present in our final model, we cannot test them. But hypotheses H_{2a}, H_{2b} and H_3 are still present and will therefore be tested against our new model. As no expectations are included in this model, no substitute hypotheses will be formed for hypotheses H_{1a} and H_{1b}. Hypothesis H_4 will be split into three substitutes: Hypothesis H_{4a} will be defined as CVC having a positive relation to PPROC, H_{4b} as CVC having a positive relation to PPROD and finally, H_{4c} will be defined to have a positive relation to SAT.

As seen above, PPROC has a positive (.23) and significant effect on CONF ($t = 2.06$, $p < .05$). Therefore, hypothesis H_{2a} can be approved in our final model. PPROD has a positive (.57) and significant ($t = 4.95$, $p < .001$) influence on CONF as well, why we

can approve hypothesis H_{2b} as well.

The positive (.42) and significant ($t = 3.20$, $p < .010$) relation of CONF to SAT remains. Therefore, we can still approve hypothesis H_3.

Regarding the substitute hypotheses H_{4a}, H_{4b} and H_{4c}, we can report the following: CVC has a positive (.36) and significant ($t = 2.56$, $p < .05$) influence on PPROC, which supports hypothesis H_{4a}. Similarly, CVC has a positive (.32) and significant ($t = 2.31$, $p < .05$) effect on PPROD, which approves hypothesis H_{4b}. Furthermore, CVC shows a positive (.47) and significant ($t = 3.96$, $p < .001$) relation to SAT. This supports hypothesis H_{4c}.

The above paragraphs have shown, that with our new model more of the initial hypotheses can be supported than with our initial model. Additionally, substitute hypotheses for hypothesis H_4, our main objective to be observed, can be confirmed. Only hypotheses H_{1a} and H_{1b}, related to expectations cannot be confirmed with our new model. Nevertheless, the overall performance of this new model has increased, as not only more interactions were found to be significant, also more hypotheses could be confirmed.

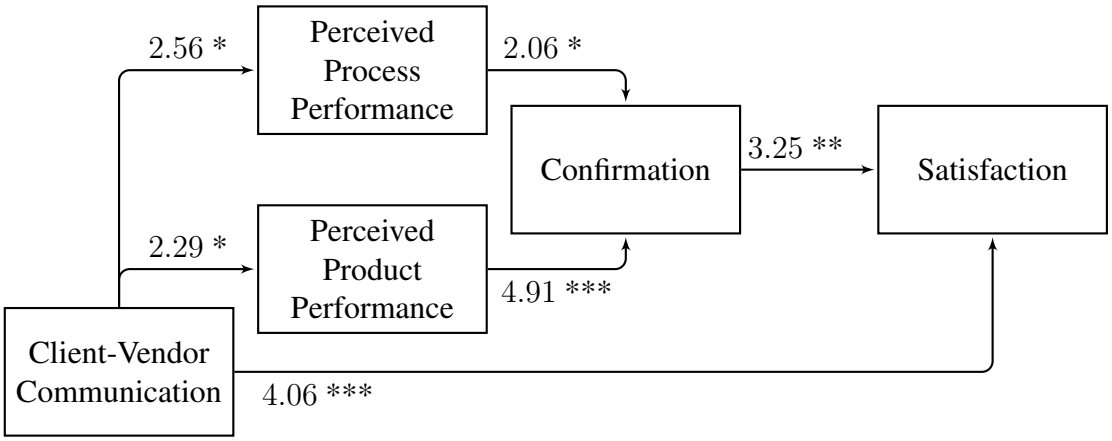

Fig. 5-9: Bootstrapping of Interactions as found
($N = 74$, $10,000$ samples, *: $p < 0.050$, **: $p < .010$, ***: $p < .001$)

Model Validation

As described in chapter 4.3, our model is mostly based on formative indicators, but

as CONF is based on reflective indicators, our model is therefore a so called Mode C model.[102] The process of model validation is not alike for all constructs, but differs regarding their type of indicators.

The values used for all validity checks were acquired by a bootstrap calculation with $10,000$ samples by SmartPLS. We further analyzed validity and reliability for our model's constructs. To make sure to have a model based on data which is accurate,[103] consistent[104] and repeatable,[105] we measured it's reliability. To furthermore make sure to have a model which measures the effects it should measure, we analyzed it's validity.[106]

For reflective indicators, such as CONF in our model, research proposes a fourfold validity check:[107] first, internal validity has to be checked. Second, indicator reliability has to be appropriate. Third, convergent validity should be present. Finally, discriminant validity should be given. Henseler et al. propose a replacement for this measure of discriminant validity: Heterotrait-Monotrait (HTMT) Ratio.[108] For this study we will also utilize their measure, because it is both conveniently accessible from SmartPLS. Henseler et al. propose a threshold of $.90$ for discriminant validity but mention, that other literature uses $.85$.[109] A general overview specifically for SmartPLS can be found on the SmartPLS website.[110]

For internal validity, meaning if several items of the same construct have similar values, composite reliability and Cronbach's alpha are reviewed. The threshold is $.70$ for both

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102 See Chin (1998), p. 308.

103 See Kerlinger, Lee (1964), p. 430.

104 See Black, Champion (1976), pp. 232-234.

105 See Lehner (1998), p. 130.

106 See Kerlinger, Lee (1964), p. 430, Black, Champion (1976), pp. 232-234.

107 See e.g. Henseler et al. (2009), pp. 298-300.

108 See Henseler et al. (2015).

109 See Henseler et al. (2015), p. 121.

110 See http://www.smartpls.com/documentation/discriminant-validity-assessment, accessed on July 25, 2015.

indicators,[111] which has to be exceeded. Therefore internal consistency is given for the only reflective measure, CONF. CONF's composite reliability is .88 and it's Cronbach's alpha is .81 and therefore above the threshold of .70. The Cronbach's alpha values of CVC (.88), PPROC (.70), PPROD (.93) and SAT (.92) are above the threshold as well. Regarding composite reliability, CVC (.92), PPROC (.87), PPROD (.95) and SAT (.95) are above .70 as well. Internal validity is therefore given for all constructs.

Investigating the construct's indicator reliability, we checked, if the constructs explains more than .50 of the indicator's variance.[112] For checking the indicator reliability, we compared the smallest squared factor loadings to the threshold of .50 (half of the variance). The smallest squared factor loading was found for an item associated wit CONF. This item's squared indicator factor loading is .51 which is above .50 and indicator reliability is present for CONF. Therefore, indicator reliability is given for all constructs.

To assess convergent validity, average variance extracted (AVE) should be above .50 and the composite reliabilities should exceed .80.[113] The AVE of CONF is .71 and it's composite reliability is .88 and therefore convergent validity is given. As all other constructs' AVE is higher than CONF's AVE and all other constructs composite reliabilities are higher than CONF's composite reliability, we conclude, that convergent validity is given for all constructs.

For discriminant validity to be given, the square root of AVE must be greater than each construct's correlation value.[114] The lowest square root of an AVE in our model is CONF's AVE square root of .85. Tab. 5-4 shows all latent variables' correlations and the AVE's square root in bold font. The highest correlation of any latent variable to any other latent variable is CONF to PPROD at a value of .64, which is below CONF's AVE square root of .85. Therefore, discriminant validity is confirmed.

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111 See Werts et al. (1974), p. 32.

112 See Henseler et al. (2009), p. 300.

113 See Chin (1998), p. 321, Fornell, Larcker (1981), p. 46.

114 See Fornell, Larcker (1981), pp. 41, 46.

	CONF	CVC	PPROC	PPROD	SAT
CONF	**.85**				
CVC	.36	**.86**			
PPROC	.45	.37	**.88**		
PPROD	.64	.30	.42	**.91**	
SAT	.59	.57	.31	.41	**.90**

Tab. 5-4: Correlation values of Latent Variables. Square root of AVE in bold font.

As mentioned before, we also checked for HTMT. We listed the results of the HTMT calculation in Tab. 5-5. As all HTMT values are below threshold of .90, discriminant validity has been established between all reflective constructs.

Additionally, we collected data for control variables, as outlined in chapter 4.3. We tested the influence of the control variables on satisfaction twofold: first, we ran an analysis in a minimal version of our model in SmartPLS. This means, that only the control variables and SAT were present. None of the control variables had a significant influence on SAT. But we had to exclude the item for direct or indirect contact to the vendor as well as the project's necessity measurement item because both resulted in a Singular Matrix Problem error message by SmartPLS. This error message is probably thrown by SmartPLS, if at least one of the following conditions is met: if a variable has zero variance, if extreme collinearity is present, meaning that a correlation of 1.00 is given, or if the sample size is too small. None of the variables used in our model has zero variance or an extreme collinearity. Therefore we conclude that possibly our sample size is too small to calculate

	CONF	CVC	PPROC	PPROD	SAT
CONF	–				
CVC	.45	–			
PPROC	.59	.46	–		
PPROD	68	.32	.52	–	
SAT	.65	.62	.38	.44	–

Tab. 5-5: Heterotrait-Monotrait Ratio of Correlations

the influence of these two excluded items on SAT. We also investigated their influence without any additional control variables but the results remained the same. Second, we ran an analysis in our final model and added our control variables. As both the direct or indirect contact item and the necessity item resulted in a Singular Matrix Problem error message, we excluded both again. Still, all control variables remained insignificant. Third, we ran a linear regression of the control variables on SAT with SPSS[115] . All control variables remained insignificant as well. We conclude, that all control variables are not influencing our model and can therefore be excluded from further interpretation.

5.5 Common Method Variance and Social Desirability Bias

Richardson et al. claim common method variance's (CMV) traditional concept to be defined as a "systematic error variance shared among variables measured with and introduced as a function of the same method and/or source".[116] As our study is based on a self-report questionnaire, CMV might very well play an important role and be influencing our results. Therefore, we tried to minimize the risk of CMV distorting our results.

We guaranteed all participants anonymity to encourage them to answer honestly. No measures were taken to link questionnaires to specific organizations, mail accounts or persons. Additionally, no rewards were promised for partaking in our study. The only offer we made was to receive a free copy of our study once finished, regardless of participation. This approach is in line with recommendations from e.g. Podsakoff et al., Lindell and Whitney or Chang et al..[117]

Richardson et al. compared different methods of detecting and correcting CMV.[118] Their main finding for authors of scientific research is, that they "recommend the CFA [Confirmatory Factor Analysis] marker technique be used only as a means for providing evi-

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115 See http://www.ibm.com/software/analytics/spss/.

116 Richardson et al. (2009), p. 2.

117 See Podsakoff et al. (2003), pp. 897-900, Lindell, Whitney (2001), pp. 117-118, Chang et al. (2010), p. 180.

118 Richardson et al. (2009), See.

dence about the presence of CMV and only when researchers can be reasonably confident they have used an ideal marker".[119] The work by Richardson et al. has been utilized and reviewed by other literature as well.[120] While Richardson et al. did not explicitly test Harman's Single Factor Test (HSFT), they stated that this is "subsumed in the unmeasured latent method construct [ULMC] approach",[121] which is stated not to be as useful as other methods in correcting CMV, but at least be able to detect CMV, if present.[122] Additionally, Harman's Single Factor Test is claimed to be one of the widest used.[123] HSFT's basic assumption is that if a substantial amount of common method variance is present, either a single factor is extracted from the factor analysis or that one factor will account for the majority of the covariance among the measures.[124]

To check for CMV, we now performed a factor analysis utilizing SPSS, as basis for HSFT. We extracted the indicator with the highest percentage of variance. With a value of 38.11% being below the majority of covariance (meaning 50.00%), we are likely to not to be influenced by CMV.

Social desirability bias (SDB) describes the phenomenon that people are likely to "deny socially undesirable traits and claim socially desirable ones, and the tendency to say things which place the speaker in a favourable light".[125] This bias is likely to have occurred in our self-report survey, as it is generally more socially desirable to report of a successful project than to report of an unsuccessful one.

Nederhof proposes to use forced-choice items, meaning to utilize items in which participants have to choose, between two approximately similar attractive items of different

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119 Richardson et al. (2009), p. 34.

120 See Williams et al. (2010).

121 Richardson et al. (2009), p. 37.

122 See Richardson et al. (2009), pp. 31, 33, 37.

123 See Podsakoff et al. (2003), p. 889.

124 See Podsakoff et al. (2003), p. 889.

125 Nederhof (1985), p. 264.

topics.[126] And while Nederhof already mentions this methods downsides such as an increased complexity of creating matching items and individual differences in attitudes and therefore preferences, 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 to postulate questions, which are neutral in regard to social desirability.[127] Similarly to forced-choice items, we tried to minimize the social desirability emerging from our questions, but due to the clear preferability of success over failure, social desirability is still likely to emerge from questions posted in our questionnaire.

Self-administered questionnaires did not always actively reduce SDB, but Nederhof state, that it is likely that anonymous and self-administered questionnaires have less distortion of SDB.[128] As our questionnaire was both anonymous and online available at any place and any time, we suggest, that this method of data acquisition might reduces the influence of SDB in the case of our study.

Other measures proposed by Nederhof were not applicable for our study. Concluding our analysis regarding SDB, we assume SDB to at least slightly influence our results but that measures have been taken to minimize this influence.

In the following chapter, we will discuss the results presented above. We will explain our decisions made and we will outline possible reasons for the partly unexpected results. Furthermore, we will discuss limitations of our study.

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126 See for this and the next sentence Nederhof (1985), p. 270.

127 See Nederhof (1985), p. 271.

128 See Nederhof (1985), p. 272.

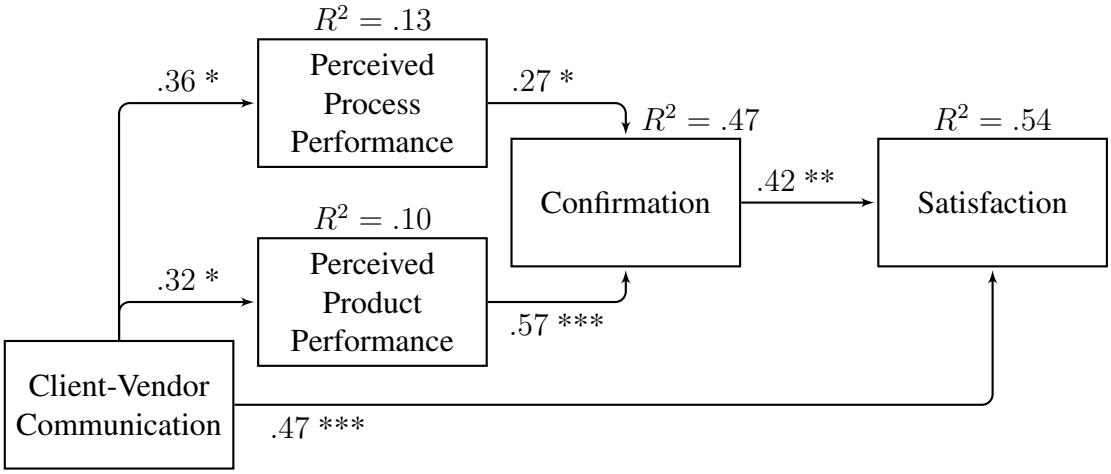

Fig. 5-10: Path-Coefficients of Interactions as found
($N = 74, 10,000$ samples, *: $p < 0.050$, **: $p < .010$, ***: $p < .001$)

6. Discussion

Referring to our research objectives, outlined in chapter 1.2, we aimed in providing empirical evidence for the proposal of Basten and Pankratz regarding the moderating role of client-vendor communication in expectation-confirmation theory. To answer this question, we outlined the basis of their theory, the expectation-confirmation theory and the modifications suggested by Basten and Pankratz. Furthermore, we expanded the initial questionnaire by Basten and Pankratz to cover influences of both mediums of communication and means of support.

Having prepared the theoretical basis, we conducted our study and collected data via questionnaires. The statistical analysis is described and illustrated in chapter 5. Although our initial hypotheses could only be confirmed partially, we succeeded in providing a statistically significant model. While this model differs from the one expected at first, it still is conclusive. Following, we will discuss the implications for theoretical and practical application of our findings as well as the limitations of our study.

6.1 Theoretical Implications

As pointed out above and in chapter 5, our initial hypotheses were mostly rejected. One might argue that despite the sufficient sample size for utilizing PLS, the sample size is still small and therefore likely to fall for anomalies in distribution.

The small sample size of $N = 74$ could explain, why, despite having been already proven, hypotheses H_{1a} and H_{1b} could not be confirmed and therefore why expectations did not have any significant influence in our model. The same argument can be produced for hypothesis H_{2a}, the effect of PPROC on CONF. In regard to our sample, future research might want to replicate our findings with a larger and more diverse sample, possibly from different cultures.

While perceived product performance does have a significant effect on confirmation, one might differently and propose a differentiation in perception between product and process:

Basten and Pankratz state that customers are likely to valuate the final product higher than the process leading to the product.[129] They claim that following previous research, "success is a matter of perception"[130] and assume that "process performance is subordinate to product performance",[131] as the product itself incorporates the long-term objective of achieving business goals, while adherence to budget and schedule are short-term goals and therefore less important.[132] Basten and Pankratz also include "process transparency" as an important influence on perceived performance and CVC is a subset of process transparency.[133] While Basten and Pankratz demonstrated a significant influence of PPROC on SAT, which we did not, they did not measure the influence of PPROC and PPROD via the proxy CONF. They have also shown a negative moderating influence of PPROD on the influence of PPROC on SAT.[134] This leads to the assumption, that the higher the PPROD, the less important the PPROC gets.

Furthermore, one might think of a mixed reason: While customers might weight the process less than the product during the process of evaluating confirmation of expectations, the process is less significant in the first place and a small sample size and it's liability for anomalies could result in an insignificant effect of perceived process performance on confirmation. We see need for future research to further investigate the actual interdependence of PPROC and PPROD, especially in the context of ECT and customer satisfaction.

Regarding our failed main hypothesis H_4, the moderating role of client-vendor communication on the effect of expectations regarding the process on confirmation of expectations, we would argue differently. We see our study as evidence, that client-vendor communication acts differently from what was expected and theoretically grounded by previous research. As seen in our statistical analysis in chapter 5, CVC influences both PPROC and PPROD, but SAT directly as well. Based on these statistically significant effect, we

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129 Basten, Pankratz (2015), See.

130 Basten, Pankratz (2015), p. 4.

131 Basten, Pankratz (2015), p. 5.

132 See Basten, Pankratz (2015), p. 5.

133 See Basten, Pankratz (2015), pp. 4,6.

134 See for this and the next sentence Basten, Pankratz (2015), pp. 9, 10-11.

argue, that communication is not only able to influence perceived performance, but overall satisfaction as well. In contrast to our initial assumption, CVC does not influence expectations or their relation to CONF, but rather a posteriori perceived performances.

All of this put together results in our final model, outlined in Fig. 6-1. It is not a full-scale ECT modification, as we could not integrate expectations with any significant relation. Similarly, CONF is based on items in our questionnaire asking for the confirmation of expectations, but in Fig. 6-1, perceived performance is not balanced against expectations. Therefore, our model still has room for improvement. Future research could help to clarify, if expectations actual do not play a significant role if CVC is included, or if our assumptions can be confirmed that our sample was insufficient to show a significant influence of expectations on CONF. More on this issue and limitations in general will be discussed in chapter 6.3.

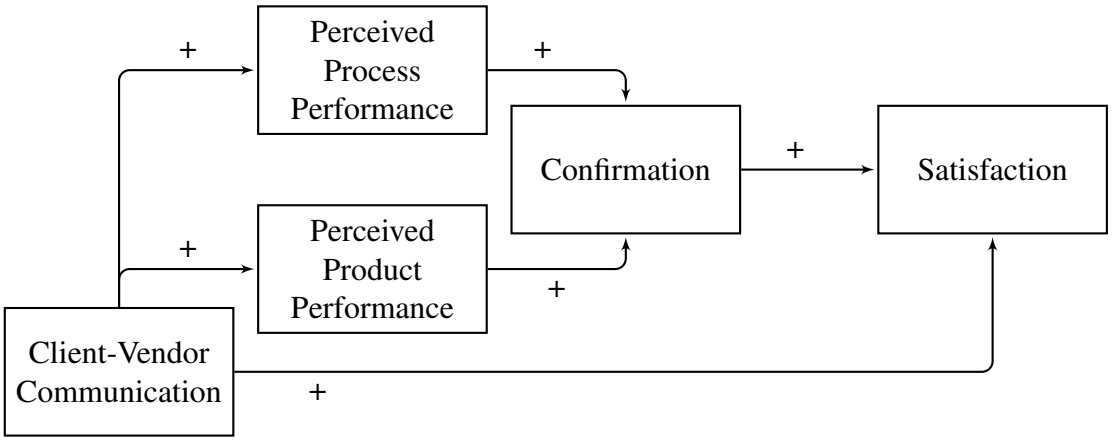

Fig. 6-1: Model as proposed for this study

6.2 Practical Implications

Similar to the theoretical implications mentioned above, practical implications can be derived from our study despite the fact that many of our initial hypotheses could not be confirmed.

Basten and Pankratz state, that "IS project managers should place a stronger emphasis on developing a high-quality product that meets user needs instead of emphasizing ad-

herence to budget and schedule"[135] and that "product performance has a more decisive influence when it comes to achieving customer satisfaction"[136] which can be confirmed by our study. We have shown, that depending on the model, while PPROD had a significant influence on SAT, PPROC often did not. Even in our final model, the influence of PPROD is more significant and higher than the influence of PPROC. Therefore, we imply, that the client's perception of the final product's performance is more important than the perception of the process. Future research might be able to clarify the detailed relations between PPROC and PPROD for practitioners and conclude further implications.

In addition to the findings of Basten and Pankratz, we found that CVC has a special influence in the client's evaluation process. While we were not able to describe perfectly CVC's role in a full-scale ECT, we have shown, that CVC is first of all influencing the client's perception of process and product performance. Furthermore, CVC influences the SAT directly as well. Therefore, CVC plays an important role for improving client's satisfaction and ultimately project success. Possible studies for future research might investigate the exact direct influence of CVC on SAT and it's underlying rationale.

We want to stress that this improvement of perceived performance or satisfaction might be partially only related to managed perception due to the communication itself. Nevertheless, we would like to stress, that improved CVC is likely to result in objectively improved process and product performance, as more, better and more efficient communication is likely to lead to fewer misunderstandings and clearer definitions and results ultimately in better products and processes.[137] Lee and Kim state, that based on their study it is important to strengthen communication between client and vendor and finally building confidence to prevent opportunism in IT outsourcing projects.[138] Our results support their claim and transfer it into basic client-vendor relationships.

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135 Basten, Pankratz (2015), p. 12.

136 Basten, Pankratz (2015), p. 12.

137 Cf. Sharma et al. (2008), Khan, Khan (2013), Petter (2008), Poston et al. (2010), Stavrou et al. (2014), Walton, McKersie (1965).

138 See Lee, Kim (1999), p. 54.

Regarding the usage of communication mediums, we can report, that while video conferencing is used very rarely, it is correlated with pressing deadlines. Similarly are time- or location-independent communication mediums such text- or voice-messages. Also frequent usage of face-to-face meetings hints at a higher level of involvement of the client during the project. Future research might also be interested in investigating the contribution of different mediums of communication, possibly considering different environmental influences, to SAT.

6.3 Limitations

While having discussed the findings and implications for both, theory and practice of this study, we will now have a look at the limitations of this study.

This study' greatest limitation is most likely the acquired sample size. With $N = 74$, we have theoretically the minimum sample size to retrieve statistically significant results, but our sample is still prone to anomalies. As seen in chapter 5.1, we have both, small and large projects and organizations on different measures, such as time, team size, number of employees and revenue. We also had a very differentiated mix of branches and scopes. But this differentiation in combination with the small sample size has the risk of giving only a small level of representativity, which could be addressed by future research.

Furthermore, our study only contacted organizations residing in Germany. Some of our participant's companies are active internationally, but only their German branches were contacted. This might result in missing or insufficient transferability to other countries and cultures. As mentioned beforehand, we would like to encourage future research to replicate and improve our study, especially in regard to different cultures and contexts.

Another aspect we would like to address is that our study was conceptualised and conducted as exploratory study. This means that we did neither target a very specialised and narrow group of participants, nor a very generalizable and representative group of participants. Rather we tried to make a first attempt to investigate the influence of communication in the context of ECT and lay ground for future research. Therefore, our

results might not be suitable to apply to specialised fields, such as large organizational projects in a very specific scope, e.g. military projects, nor might our results be suitable to make generally true and applicable statements for all scopes or different fields of study aside from IS research. Both, aspects of specialised projects as well as a generalisation of our results might be interesting for future research. Especially studies testing our proposed model in special contexts such as military or government-related projects could be conducted by future research.

As outlined in chapter 5.5, self-report studies are likely to be influenced by SDB. As we were asking participants which were involved directly in projects, they are likely to have been influenced by SDB unconsciously in their answers. Nevertheless, we tried to minimize the influence experienced by SDB, as we also described in the before mentioned chapter. Still, having an innocent bystander reporting about projects would have minimized SDB's influence even more. A matched pair survey conducted on both sides, client and vendor, might also very well reduce SDB, while still not completely: Assuming that client as well as vendor are interested in a successful project for an increased probability of subsequent projects, both are likely to fall for SDB and the socially more desirable image of a successful project. A larger future study might take on this idea and replicate our study with a two-sided study, questioning both clients and vendors.

A further limitation, especially for our final model, might be the naming and composition of the CONF construct. While the initial model assumed a ECT as base model, CONF was well defined and was influenced by both expectations and perceived performance indicators. Our final model, in contrast, now has retained CONF as construct. It still serves as a proxy form perceived performance to SAT, but it lacks the other weighting factor: expectations. It might be more meaningful, if CONF was rather called perceived performance. As it is not an arbitrary or virtual construct but based on items representing actual confirmation, we cannot simply rename it. While CONF as construct is still valid, as we actually measured confirmation via it's items, our model lacks the actual influence of expectations to be valid in the narrower sense of ECT. As described above, we cannot be sure of the reason, why expectations did not significantly influence CONF, but assume that it is most likely due to our sample, which could be resolved by a future study.

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, as agile development practices often rely on a high level of communication and face-to-face meetings.[139] As seen in our results, this might lead to further insights regarding CVC and SAT. Especially short development cycles, and therefore regular and frequent feedback might result in an increased importance of CVC and therefore higher impact on SAT.

[139] See exemplary Inayat et al. (2015), p. 920, Sundararajan et al. (2014), p. 249, Khan, Khan (2013), p. 331.

7. Conclusion

In this study, we tried to verify our assumptions regarding the role of communication in the context of ECT. Our assumptions were based on previous literature and aimed at providing further understanding of both the process of evaluating ISPs and the measurement of ISP success. We reasoned for our assumptions on the basis of previous research and described the process of compiling a questionnaire, finding and inviting participants as well as collecting data. Furthermore, we reported and interpreted our findings and build a new model, based on the insight gained during our study. Moreover, our study is based on data acquired from clients rather then vendors, as requested by other literature.[140]

Although our initial model was not confirmed, we were able to gain new insights out of our data and develop a new model. Traditional measurements, such as budget and schedule adherence are not always applicable and client satisfaction is sometimes a better measurement instead. For client satisfaction, CVC plays an important role, not only because it is a way to influence and manipulate people, but because timely, accurate, complete and credible communication also impacts satisfaction as well as perceived performance for both process and product. Furthermore, communication is able to improve the product by reducing misunderstandings. In general, the product is often perceived as more important than the process of development.

Based on the limitations mentioned in the previous chapter, future research could try to reproduce our findings with a larger sample and investigate differences for our model in regard to agile and non-agile development practices.

While this study does not answer all questions related to the role and influence of CVC in ECT, we gained new insights and developed a model which might serve as bases for further research as well as practitioners.

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[140] See exemplary Basten et al. (2011), p. 18.

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Appendix A: Educational Qualifications reported by Participants

Educational Qualification	Count	Percentage
Diploma	14	18.92%
Graduate Engineer	11	14.86%
Graduate Business Economist	7	9.46%
Doctoral / PhD	6	8.11%
Business Economist	5	6.76%
College Degree	5	6.76%
Apprenticeship	4	5.41%
Bachelor's Degree	4	5.41%
University Degree	4	5.41%
Abitur[141]	3	4.05%
Mittlere Reife[142]	3	4.05%
Graduate Engineer (College)	2	2.70%
Associate Professor	1	1.35%
Bachelor Engineer	1	1.35%
Graduate Business Economist (College)	1	1.35%
Master	1	1.35%
Master's Degree	1	1.35%
None	1	1.35%
Σ	74	100.00%

Tab. A-1: Educational Qualifications reported by Participants

Appendix B: Fields of Study reported by Participants

[141] German: general qualification for university entrance.

[142] Second school leaving certificate.

Field of Study	Count	Percentage
Business Economics	10	14.49%
Information Systems Management	5	7.25%
Computer Science	4	5.80%
Economics	3	4.35%
Economy	3	4.35%
Application Development	2	2.90%
EDP / Information Processing	2	2.90%
Electrical Engineering	2	2.90%
Engineering	2	2.90%
Political Sciences	2	2.90%
Technology	2	2.90%
Administration	1	1.45%
Business Mathematics	1	1.45%
Automation	1	1.45%
Building Engineer	1	1.45%
City Cleaning	1	1.45%
Communications Engineering	1	1.45%
Controlling	1	1.45%
Economics & Organizational Studies	1	1.45%
Engineering Management	1	1.45%
Food Chemistry	1	1.45%
Geography	1	1.45%
Graduate Engineer (University) & Business Economist (College)	1	1.45%
Head of Technical Service	1	1.45%
Information Technology	1	1.45%
Information Systems Management & Controlling	1	1.45%
Management Assistant in IT-Systems	1	1.45%
Management Marketing	1	1.45%
Manufacturing Engineering / Logistics	1	1.45%

Tab. B-1: Fields of Study reported by Participants

Field of Study	Count	Percentage
Marketing	1	1.45%
Mathematics	1	1.45%
Materials Science	1	1.45%
Molecular Biology	1	1.45%
Pharmacy	1	1.45%
Precision Engineering	1	1.45%
Process Engineering	1	1.45%
Programming / Coding	1	1.45%
Psychology	1	1.45%
Sales	1	1.45%
Service Management	1	1.45%
Supply Chain	1	1.45%
TGA[143]	1	1.45%
Wood Technology	1	1.45%
Σ	69	100.00%

Tab. B-1: Fields of Study reported by Participants (continued)

Appendix C: Questionnaire (Extract, German)

Construct	Measurement Item (German)	Based upon
Expectation regarding the Process (EPROC)	Ich habe erwartet, dass das vorgegebene Budget eingehalten wird.	Wallace et al. (2004)
	Ich habe erwartet, dass der vorgegebene Zeitplan eingehalten wird.	

Tab. C-1: Utilized Questionnaire (German) including references of the specific items

[143] most probably an abbreviation for "technisch-gewerbliche Ausbildung", German for a dual education in technology and economics.

Construct	**Measurement Item (German)**	**Based upon**
Expectation regarding the Product (EPROD)	Ich habe erwartet, dass das System die (geforderten) funktionalen Anforderungen abdecken wird.	Wallace et al. (2004)
	Ich habe erwartet, dass die Qualität der entwickelten Anwendung insgesamt hoch sein wird.	
	Ich habe erwartet, dass die entwickelte Anwendung zuverlässig sein wird.	
	Ich habe erwartet, dass das System die Erwartungen der Benutzer bzgl. des Antwortzeitverhaltens erfüllen wird.	
	Ich habe erwartet, dass die Anwendung leicht zu warten sein wird.	
Perceived Process Performance (PPROC)	Bei der Entwicklung des Systems wurde das vorgegebene Budget eingehalten.	Wallace et al. (2004)
	Bei der Entwicklung des Systems wurde der vorgegebene Zeitplan eingehalten.	
Perceived Product Performance (PPROD)	Die (geforderten) funktionalen Anforderungen werden durch das System vollständig abgedeckt.	Wallace et al. (2004)
	Insgesamt ist die Qualität der entwickelten Anwendung hoch.	
	Die entwickelte Anwendung ist zuverlässig.	
	Das System erfüllt die Erwartungen der Benutzer bzgl. des Antwortzeitverhaltens.	
	Die Anwendung ist leicht zu warten.	
Confirmation (CONF)	Meine Erfahrungen mit dem Projekt waren besser als ich erwartet hatte.	Bhattacherjee (2001)
	Der Nutzen des Projekts war höher als ich erwartet hatte.	

Tab. C-1: Utilized Questionnaire (German) including references of the specific items (continued)

Construct	Measurement Item (German)	Based upon
	Insgesamt wurden meine Erwartungen an das Projekt mindestens bestätigt.	
Client-Vendor Communication (CVC)	Die Kommunikation zwischen uns und dem Auftragnehmer während des Projektes betrachte ich als • sehr rechtzeitig ... nicht rechtzeitig • vollständig ... unvollständig • sehr korrekt ... inkorrekt • sehr glaubwürdig ... unglaubwürdig	Lee and Kim (1999)
Client Satisfaction (SAT)	In Bezug auf meine Erfahrungen mit dem Entwicklungsprozess (Einhaltung von Budgets, Kommunikation, Umgang mit Problemen, etc.) bin ich • sehr zufrieden ... sehr unzufrieden • sehr erfreut ... sehr verärgert • sehr begeistert ... sehr frustriert • sehr euphorisch ... entsetzt	Lee and Kim (1999)

Tab. C-1: Utilized Questionnaire (German) including references of the specific items (continued)

Construct	Measurement Item (German)	Based upon
	In Bezug auf meine Erfahrungen mit dem Produkt / Service (funktionale und nicht funktionale Anforderungen, Erwartungen allgemein, etc.) bin ich • sehr zufrieden ... sehr unzufrieden • sehr erfreut ... sehr verärgert • sehr begeistert ... sehr frustriert • sehr euphorisch ... entsetzt	

Tab. C-1: Utilized Questionnaire (German) including references of the specific items (continued)

Erklärung

Hiermit versichere ich an Eides Statt, dass ich die vorliegende Arbeit selbstständig und ohne die Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Alle Stellen, die wörtlich oder sinngemäß aus veröffentlichten und nicht veröffentlichten Schriften entnommen wurden, sind als solche kenntlich gemacht. Die Arbeit ist in gleicher oder ähnlicher Form oder auszugsweise im Rahmen einer anderen Prüfung noch nicht vorgelegt worden.

_____

Köln, den 30. September 2015

Lebenslauf

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