

TO UNDERSTAND OR TO BE UNDERSTOOD? A DYADIC ANALYSIS OF PERCEPTUAL CONGRUENCE AND INTERDEPENDENCE BETWEEN CEOs AND CIOS

Completed Research Paper

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Abstract

Despite the importance of a healthy relationship between CEOs and CIOs in organizations for effective business-IT alignment, there is still little understanding about how different facets of perceptual congruence compare between CEOs and CIOs and how perceptual interdependencies affect the quality of collaboration in these relationships. Drawing on social and personal relationship theories, our study examines 102 matched-pair survey responses of CEOs and CIOs using dyadic data analysis. Our findings show that both executives' actual opinions on important business and IT topics are more similar than both perceive them to be. Accordingly, perceptions of each other's attitudes are negatively biased away from their real attitudes. Moreover, our study demonstrates that CIOs' understanding of their CEO plays a pivotal role in predicting the quality of CEO-CIO collaboration, shedding light on the disparate importance of the two directions of interpersonal understanding for the business-IT partnership. Implications for research and practice are discussed.

Keywords: CIO-CEO relationship, social alignment, mutual understanding, agreement, perceptual congruence model, actor-partner interdependence model, perception bias, dyadic data analysis

Introduction

With the rise of information technology (IT) and its ubiquitous utilization, organizations across industries are investing growing resources in information systems and their governance. The »Chief Information Officer« (CIO¹) spearheads an IT organization and is often part of the top management team, especially in companies for which IT plays a strategic role. However, many organizations struggle with the realization of the expected value from their IT investments (Du et al. 2007) and research suggests that the alignment between a firm's business and IT division is a key factor to tackle this challenge (Preston and Karahanna 2009a). Hence, research on the alignment between business and IT has become a focal area for many scholars in the field of management information systems and it remains a top concern for IT practitioners and company executives alike (Luftman et al. 2005).

The alignment of business and IT strategy is viewed from a research perspective to have a social and an intellectual dimension (Reich and Benbasat 1996). Research on the intellectual dimension studies the alignment of strategic plans' content and planning methodologies (Chan et al. 1997; Hirschheim and Sabherwal 2001), whereas research on the social dimension focuses on the people involved in the creation of strategic alignment and their characteristics and actions (Reich and Benbasat 1996). Although "*both dimensions are important to study and [...] necessary for an organization to achieve high levels of alignment*" (Reich and Benbasat 2000, p. 82), publications devoted to the intellectual dimension outnumber those concerned with the social dimension (Chan and Reich 2007a). Thus, authors urge for more attention to be concentrated on the latter (e.g., Tan and Gallupe 2006). This paper follows their plea.

Social interactions between business and IT executives, which are often viewed as the centerpiece of social business-IT alignment, play an essential role in the process of alignment. Henderson (1990) describes the CEO-CIO relationship as a "*partnership of personal relationships and attitudes*" (p. 10). Poor partnerships between the two leaders primarily responsible for aligning business and IT strategies are likely to yield suboptimal outcomes of the alignment process (Tallon and Kraemer 2003). Being unaware of each other's true needs and not reaching agreement due to personal skirmishes are just two examples of difficulties experienced by executives whose interpersonal relationships are poorly developed. These difficulties are often caused by the inability to understand one another's perspectives. Although not unrelated, understanding one another and agreeing with each other are two different aspects of perceptual congruence in social relationships (White 1985).

While social alignment models developed in previous business-IT alignment studies are often built around actual agreement of business and IT leaders (mostly referred to as "shared understanding" or "shared vision"; e.g., Preston and Karahanna 2009b; Reich and Benbasat 2000), only few papers have shed light on the role of understanding one another's perspectives. Even though important insights have emerged from studies focused on agreement, there is still a lack of research examining the ability of CEOs and CIOs to take each other's viewpoints. Indeed, there is only one empirical study (Feeny et al. 1992) that attempts to measure this variable. Furthermore, there is no differentiation between actual agreement and perceived agreement in prior alignment research, although personal relationship researchers (e.g., Acitelli et al. 1993) find significant differences exist between the two and different implications emanate from the two. In this study, we attempt to fill this research gap by addressing the nature and effects of perceptual congruence and interdependence between CEOs and CIOs.

Understanding perceptual congruence and interdependencies in the CEO-CIO relationship can help organizations diagnose and design interactions between CEOs and CIOs, striving to increase the quality of their collaboration and ultimately better leverage information technology as an enabler for business plans. Besides these practical implications, our study also offers several research and theoretical contributions.

First, our study extends existing social alignment literature in IS research by distinguishing between actual agreement, perceived agreement, and understanding. These three types of interpersonal and intrapersonal perceptual congruence, adopted from White's (1985) study on married couples, allow a more comprehensive and integrative examination of self- and other-perception in dyadic relationships.

¹ Similar to other authors (e.g., Grover et al. 1993), we use the term CIO more broadly for a company's most senior IT executive, regardless of the individual's formal job title.

The framework has been used in several other studies on personal relationships (e.g., Acitelli et al. 1993; Kenny and Acitelli 1989) and there are also some business-related studies that compare self- and other-perception in similar manners (e.g., Morgan 1993). In the context of social business-IT alignment, some individual aspects of perceptual congruence have been looked at in isolation (e.g., Benlian 2011, 2013), but White's (1985) full concept has not been applied before in CEO-CIO relationship research.

Second, we employ Kenny's actor-partner interdependence model (APIM: Kenny 1996) to investigate interdependence effects between CEOs and CIOs from the lens of mutual perspective taking. To date, interpersonal effects from mutual understanding on CEO-CIO collaboration quality have not been analyzed. The differentiation between the two directions of interpersonal understanding and the examination of their significance by utilizing the APIM is another unique contribution of our study. It adds a new theoretical perspective of how social alignment is formed between CEOs and CIOs.

We begin this paper by providing a review of the relevant business-IT alignment literature. We then establish the theoretical foundations of the two models integral to this study along with the development of the hypotheses to be tested. Subsequently, our research methodology is described and the results of our study are presented. Lastly, this paper is concluded with a discussion of the findings and the implications thereof.

Theoretical Background

Related Business-IT Alignment Literature

Research on business-IT alignment has become increasingly popular in the past two decades. Chan and Reich (2007b) give a comprehensive overview of business-IT alignment studies up to the year 2007. Their annotated bibliography proves the underrepresentation of research concerned with the social dimension of strategic alignment. Reich and Benbasat (1996) are often quoted as the originators of the distinction between the social and the intellectual dimension of alignment. A relatively small group of researchers has since studied social relations in the context of the business-IT partnership from different angles.

The studies undertaken by Johnson and Lederer (2010) and Kearns and Lederer (2000) contribute fundamentally to social business-IT alignment research as they provide empirical evidence that social alignment between business and IT leaders has a positive effect on the business value of IT. In their analysis of survey data from 202 CEO-CIO pairs, Johnson and Lederer (2010) find that six out of eight alignment dimensions impacted by social interrelation aspects are linked to IT contribution. Kearns and Lederer (2000) use survey data from 107 business and IT executives and prove that personal perceptions of alignment affect the creation of competitive advantage through IT.

There is a range of authors who focus on identifying the social variables and their explanatory factors that lead to strategic alignment. Reich and Benbasat (2000), for example, find that an increased frequency of communication, shared domain knowledge, and successful history of IT implementations enable shared understanding between business and IT leaders, which factors into strategic alignment in the short term. In the long term, only shared domain knowledge among business and IT leaders is found to foster a shared vision for IT and have an impact on long-term alignment. Preston and Karahanna (2009a) identify shared language, shared domain knowledge, CIO educational mechanisms, relational similarities between the CIO and the business leadership team, and organizational arrangements that allow knowledge sharing across domains as antecedents of shared understanding. The executives' level of cross-domain understanding is also a pivotal variable in Luftman et al.'s (1999) five year study conducted to identify enablers and inhibitors of business-IT alignment from the perspective of business executives versus IT executives. Johnson and Lederer (2010), as well, show proof of the positive impact of mutual CEO-CIO understanding on the role of IT on various strategic IT alignment dimensions. In their empirical study on CEO-CIO relationships, Feeny et al. (1992) develop a list of desirable qualities a CEO and a CIO should possess to foster shared understanding and a shared vision. Likewise, Tan and Gallupe (2006) build their cognitive framework around shared understanding between business and IT executives. Uniquely, they use cognitive mapping techniques to measure the level of shared cognition. Preston and Karahanna (2009b) identify five distinct configurations of visioning mechanisms that enable or inhibit the formation of shared vision between business and IT executives.

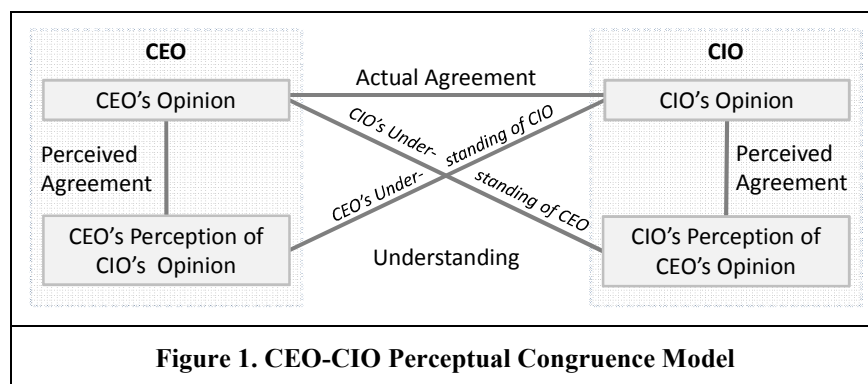
In summary, shared understanding and shared vision are prevalently found to be the central factors in CEO-CIO relationships. Matched pair CEO-CIO surveys and interviews are most frequently used to empirically validate theoretical concepts in this domain. When taking a closer look at how shared understanding and shared vision are measured, one finds that most authors directly compare CEO and CIO responses to the same (or similar) question (e.g., Johnson and Lederer 2010; Preston and Karahanna 2009a, 2009b; Reich and Benbasat 1996, 2000) and interpret the congruence of both as a measure for the level of similarities in their views. Shared understanding tends to be measured by the similarity of responses to questions regarding the present and past, whereas shared vision tends to be measured by the similarity of responses to questions concerning the future. In short, the level of agreement between business and IT leaders is predominantly viewed as the pivotal variable in social business-IT alignment, and it appears in studies mostly as “shared understanding”, “mutual understanding”, “shared vision”, and other synonymously used terms.

Merely Feeny et al. (1992) measure agreement (i.e., similarity of CEO and CIO response) separately from understanding (i.e., ability to predict the other individual’s response). They ask CIOs to predict their CEO’s responses to IT-related questions and compare their predictions for accuracy. Alas, numerical results of their analysis are not provided in their paper and the opposite direction (CEOs’ prediction of their CIO’s responses) is not considered. A distinction between actual agreement and perceived agreement between CEOs and CIOs is not made in any prior studies. This distinction is vital, though, because subtle differences between actual and perceived agreement can considerably impact their partnership, and the CIO’s accurate comprehension of the CEO’s vision for the company is pivotal since it is the CIO who is responsible for the operational implementation of strategic alignment decisions.

In conclusion, the potential of dyadic analysis in social business-IT alignment research has not been fully explored. Although congruity of perceptions between CEOs and CIOs is widely considered a key aspect of their interpersonal relationships, White’s (1995) full concept of perceptual congruence that includes separate measures of actual agreement, perceived agreement, and understanding has not been applied in prior empirical studies. Also, there is no prior research that contrasts the two directions of interpersonal CEO-CIO understanding. Our work attempts to fill these research gaps.

Conceptual Models and Hypotheses Development

In this study, we draw on two theoretical models from social and personal relationship research to examine interpersonal relations between CEOs and CIOs: White’s perceptual congruence model (PCM: White 1985) and Kenny’s actor-partner interdependence model (APIM: Kenny 1996). Other social relations studies from which we adopted these models have yielded important insights with respect to explaining different aspects of dyadic relationships. As CIOs are taking on growing business responsibilities (Weill and Woerner 2013), close interpersonal relationships between them and their business leaders become increasingly important. Our models allow these collaborative business-IT partnerships on top management level to be looked at from angles that have not been researched before, shedding light on previously unexplored aspects of social CEO-CIO relationships.



White's model of perceptual congruence is based on a dyadic setting where self- and other-perception of both dyad members are compared interpersonally as well as intrapersonally. This approach of measuring reciprocal perceptions has been widely used in social psychology (e.g., Acitelli et al. 1993; Laing et al. 1966; Larson 1974; White 1985) to assess, for example, the relationship between husbands and wives or parents and their children and has inspired business-related studies to examine, for example, the congruity of co-workers' perceptions (Morgan 1993).

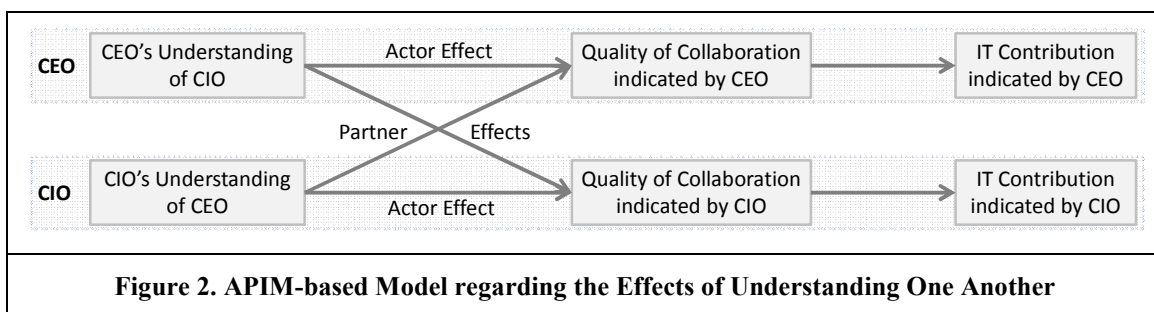
Applied to the social business-IT alignment context, we examine the individual opinions of both members of a dyadic CEO-CIO pair and their perceived opinions of the other person, respectively. Comparing these four variables allows measuring the actual similarity of their opinions (actual agreement), the level of perceived similarity of their opinions (perceived agreement), and their ability to accurately predict the other person's opinion (understanding). Figure 1 depicts this model of perceptual congruence.

Many personal relations researchers (e.g., Byrne and Blaylock 1963; Sillars 1985) have found that individuals tend to perceive other people's perspectives significantly more similar to their own perspectives than they actually are. Multiple studies on husbands and wives have empirically proven this phenomenon (e.g., Acitelli et al. 1993; Levinger and Breedlove 1966) which Ross et al. (1977) call the "false consensus effect". This effect is described as an inclination to overestimate the degree to which one's own behaviors, attitudes, and beliefs are shared by other individuals because of an inner need to believe one fits in with the people around oneself, which boosts one's self-esteem. The CEO-CIO relationship, just like any other closer social relationship, is expected to be subject to the same illusion. Accordingly, we hypothesize that

Hypothesis H1: In the CEO-CIO relationship, perceived agreement is greater than actual agreement.

White (1985) validates in his study of married couples that wives' understanding of their husbands is greater than the husbands' understanding of their wives. He explains this finding with power differentials in their relationships. Albeit this view is certainly outdated in most Western countries today, the wives' more accurate perception of their husbands' opinions in White's study is argued to stem from the fact that "it has always been more important for those of lesser power to understand those with greater power and control" (White 1985, p. 56). Other social relations researchers have found similar differences in understanding where one dyadic partner is thought to possess more power than the other (e.g., Acitelli et al. 1993; Allen and Thompson 1984). We hypothesize that the same holds true for CIOs and their (by the nature of the organizational hierarchy) more powerful CEOs. The CIO's understanding of his or her CEO is an important medium to be effective in supporting the business with adequate IT solutions. As such, we expect that

Hypothesis H2: The CIO's understanding of the CEO is greater than the CEO's understanding of the CIO.



In our second model (depicted in Figure 2), we investigate interdependence effects in the CEO-CIO relationship. The modeling of interpersonal bidirectional effects in dyadic research is described by what is known in social science as the actor-partner interdependence model (Kenny 1996). The intrapersonal effect of one person's causal variable on one's own dependent attribute is referred to as "actor effect" and the interpersonal effect of one person's causal variable on the other individual's dependent attribute is

referred to as “partner effect”.

We specifically relate the executives’ degree of understanding one another’s attitudes to both individuals’ perceived quality of collaboration. Collaboration quality between the two executives is then linked to the extent IT is believed to contribute to the business. Unlike CEO-CIO agreement, the impact of understanding one another (i.e., being able to accurately predict one another’s standpoint) is hardly researched thus far and a distinction between the effects of the CEO’s understanding of the CIO and the CIO’s understanding of the CEO is not made in prior research. The application of White’s perceptual congruence model further allows us to measure both directions of interpersonal understanding separately and feed them into the APIM-based model.

Support for why understanding of one another’s opinions matters comes from social relations research. In the context of marriages, Lewis and Spanier (1979) posit that spouses who have a better understanding for one another are happier, more satisfied, and enjoy higher marital quality. In a professional setting, the same should hold true. Executives who developed the ability to put themselves in each other’s position and accurately view situations from the other perspective collaborate better, resulting from both understanding the other individual’s view and being understood by the other person. Without stating numerical results, Feeny et al. (1992) note that a “*common attribute of [...] CIOs with excellent relationships [is] their remarkable perception of [...] their CEO’s views*” (p. 443).

When deriving hypothesis H2, we quoted Acitelli et al. (1993), Allen and Thompson (1984), and White (1985) who argue that in dyadic social relations where there is thought to be a power differential between partners, “*the person with low power needs to be able to understand and predict the actions of the more powerful partner in order to salvage some modicum of control*” (Acitelli et al. 1993, p. 8). Allen and Thompson (1984) furthermore find a direct linkage between this ability and a couple’s perceived overall satisfaction with their relationship. If we apply these findings from personal relations research to the CEO-CIO relationship where the CEO is (by the nature of the organizational hierarchy) more powerful than the CIO, being understood by the CIO should contribute more to the CEO’s satisfaction than understanding the CIO. Although neither of the three social relations studies quoted above can empirically prove the reverse for the less powerful partner, we hypothesize that CIOs perceive better cooperation with their CEO when they understand the CEO as compared with being understood by their CEO. Taken together, we argue that

Hypothesis H3a: The partner effect on the CEO’s perceived quality of collaboration is stronger than the actor effect from mutual understanding.

Hypothesis H3b: The actor effect on the CIO’s perceived quality of collaboration is stronger than the partner effect from mutual understanding.

If hypotheses H3a and H3b are looked at conjunctly, one can conclude that on the global level, only the CIO’s understanding of the CEO is relevant when explaining the quality of their collaboration from mutual understanding. CIOs need to be good listeners to understand the needs and perspectives of their CEO; being understood by their CEO matters less to them (hypothesis H3b). CEOs, who are in the more powerful role, appreciate CIOs who understand their views; understanding their CIO contributes less to their level of perceived collaboration quality (hypothesis H3a). Therefore, the overall quality of collaboration between CEO and CIO should be better predicted by the CIO’s understanding of the CEO than the CEO’s understanding of the CIO. Allen and Thomson (1984) and Acitelli et al. (1993) argue in a similar manner, but their respective datasets only partially support this hypothesis on the global level. They merely find empirical evidence for a significant impact of the less powerful partner’s understanding of the more powerful partner on the relationship quality perceived by the latter (comparable to our hypothesis H3a). Yet, we suggest that

Hypothesis H3c: Overall, the CIO’s understanding of the CEO contributes more to their aggregated quality of collaboration than does the CEO’s understanding of the CIO.

Finally, we link the quality level of the CEO-CIO collaboration to the business value that IT is believed to contribute. Connecting this subsequent output factor to our APIM-based model is important because it underscores the positive effects on value-add of IT claimed by social alignment. The connection is logical, moreover, since the alignment of business and IT strategies can be assumed to profit from good CEO-CIO collaboration (Johnson and Lederer 2010). If the two executives collaborate well and their collective

decision making yields a high-quality set of business and IT plans, it is ensured that the IT organization's resources are dedicated to high-impact projects which allow a high extent of IT contribution to the organization's overall performance. Consistent with Tallon and Kraemer (2003), collaboration quality directly impacts the executives' awareness of the other's respective future business and IT needs. In line with this reasoning, we hypothesize that

Hypothesis H4a: The CEO's perceived quality of CEO-CIO collaboration positively affects the value IT is presumed to contribute to the business.

Hypothesis H4b: The CIO's perceived quality of CEO-CIO collaboration positively impacts the value IT is presumed to contribute to the business.

Research Methodology

Survey Sample and Procedures

In order to test our hypotheses, we designed a survey that contained a variety of items to measure the components of both our theoretical models. Prior to launching the survey, we tested the survey with a small sample of business and IT leaders.

A total of eight individuals (four senior business leaders and four senior IT leaders) participated in the pretests of the survey. The pretest interviews were conducted in person (with the exception of two phone interviews) and took place in Germany and the U.S. All four IT leaders spearheaded their respective IT organizations and all four business leaders had some form of relationship with the IT organization in their companies. The individuals represented small, medium, and large size firms in various industries. The pretest interviews were conducted primarily to find out if the questions in the perception part of the survey were commensurate, consistently understood, and comprehensively covering relevant topics. As an outcome of the pretest phase, some survey questions were added, others were dismissed, and in some instances the wording of statements was improved.

The survey was then implemented as an online questionnaire. A total of 1,000 CEO-CIO pairs from randomly selected companies in Germany were asked via email for their participation in the study. Their contact information was obtained from the Hoppenstedt firm database, one of the largest commercial business databases in Germany. We queried the database for companies with more than two million Euros in annual revenue before drawing the sample because smaller companies typically do not have their own separate IT organization and hence no individual in the CIO role. CEOs and CIOs received separate emails with instructions and unique match codes. Executives were first contacted on October 9th, 2012 and the survey remained open until December 4th, 2012. In addition to the initial contact, two reminder notes were sent out via email during this period. Special attention was given to incoming responses with no matching response from the other member of the CEO-CIO dyad. Towards the end of the survey period, phone calls were placed in addition to personalized reminder emails to those individuals whose response was missing to complete a dyad pair.

The welcome page of the online questionnaire outlined the purpose of the survey. It also stated that confidentiality and anonymity of the responses were ensured. Participating CEOs and CIOs were instructed to complete their surveys independent from each other. The incoming response data for each dyadic pair were stored as one data entry in the dataset. Keeping the data paired was important for statistical testing, as tests concerning dyadic models like ours need to be based on the response pairs, not on the individual responses, due to non-independence of dyadic data (Yakovleva et al. 2010).

We received responses from 176 of the 1,000 contacted CEO-CIO pairs. Despite individualized reminder efforts, 36 CIO responses came back without a matching CEO response and 14 CEO responses remained without a matching CIO response. Additionally, 24 response pairs had to be dropped from the dataset because of insufficient data quality. The final set of 102 response pairs served as an input to our statistical analysis. The net response rate of 10.2% is comparable to that of similar studies employing matched pair CEO-CIO surveys (e.g., Tallon and Kraemer 2003; Preston and Karahanna 2009a). Appendices A and B describe the demographic and socio-economic characteristics of the survey sample.

Measurement of Variables

The CEO version and the CIO version of the survey contained the exact same items to measure perceptual congruence, quality of collaboration, and the extent of IT contribution (see Table 1). The last section of the survey that asked for demographic and socio-economic information was slightly different depending on the role of the respondent.

Table 1. Survey Items Employed for Measurement of Latent Variables				
Construct	Survey Items	Source		
Quality of Collaboration	Please indicate your level of agreement with the below statements on a 7-point Likert scale, ranging from “strongly disagree” to “strongly agree”. <ul style="list-style-type: none"> • I am highly satisfied with the collaboration between our CEO/CIO* and me • Overall, I maintain an excellent professional relationship with our CEO/CIO* • The collaboration between our CEO/CIO* and me yields best results • Our CEO/CIO* and I speak the same language 	Preston and Karahanna (2009a), Jones et al. (1995)		
IT Contribution	Please indicate the extent IT has contributed to each of the following for your organization on a 7-point Likert scale, ranging from “not at all” to “very great extent”. <ul style="list-style-type: none"> • Profitability • Sales revenues • Market share • Operating efficiency • Customer satisfaction 	Johnson and Lederer (2010)		
Perceptual Congruence Facets				
Actual Agreement	Inter- (<i>actual agreement</i>), intra- (<i>perceived agreement</i>) and cross- (<i>understanding</i>) dyad rating differences of statements about ...	IT Governance Institute (2011), Ness (2005), Rouse (2008), Verville (2012)		
Perceived Agreement	<table border="0"> <tr> <td style="vertical-align: top;"> Business Topics: <ul style="list-style-type: none"> • Business strategy • Market aggressiveness • Business operations • Business decision making </td> <td style="vertical-align: top;"> IT Topics: <ul style="list-style-type: none"> • IT outsourcing • IT governance • IT-related projects • IT flexibility • The IT organization </td> </tr> </table>		Business Topics: <ul style="list-style-type: none"> • Business strategy • Market aggressiveness • Business operations • Business decision making 	IT Topics: <ul style="list-style-type: none"> • IT outsourcing • IT governance • IT-related projects • IT flexibility • The IT organization
Business Topics: <ul style="list-style-type: none"> • Business strategy • Market aggressiveness • Business operations • Business decision making 	IT Topics: <ul style="list-style-type: none"> • IT outsourcing • IT governance • IT-related projects • IT flexibility • The IT organization 			
Understanding				

* Depending on their role, respondents had to rate the quality of collaboration with their respective counterpart.

Quality of collaboration and IT contribution were reflectively measured by four and five survey items, respectively. The respondents were given a seven-point Likert scale (anchored at (1) = Strongly Disagree and (7) = Strongly Agree) to express their level of agreement with the statements that served as indicators for these two latent variables.

Perceptual congruence of CEO and CIO opinions was measured by asking both dyad members to rate their own level of agreement with statements about different business and IT topics as well as the perceived opinion of the other person to those same topics. All statements were to be rated on a seven-point Likert scale. The perception part followed in its fundamentals the techniques developed by Laing et al.’s (1966) interpersonal perception method. We covered a broad range of business and IT topics in order to tap into a variety of areas of potential agreement or disagreement between a company’s chief executive and the head of IT. Exemplary statements were »*In the future, compared to now, we need to gain market share, even if this means sacrificing short-term profitability*« (Business topic area) and »*The implementations of our IT governance principles are effective*« (IT topic area).² The four responses per dyad were then compared interpersonally and intrapersonally to derive the perceptual congruence variables (see Figure 1). Rather than using the absolute difference of two response scores, we followed the approach suggested by Acitelli et al. (1993). The applied numerical congruence scoring technique

² The full catalog of survey statements to be rated can be obtained from the authors upon request.

translated two seven-point Likert scale ratings to a congruence score between one and ten, assigning relatively lower congruence scores when two responses are in opposite sides of the answer spectrum and relatively higher congruence scores when both responses fall in the same side of the spectrum (see Table 2). The perceptual congruence scores of each topic block were reflectively aggregated to the area they belonged to (business/IT), which were then rolled up formatively to global scores.

		<i>Response A</i>							
		Strongly Disagree		Neutral			Strongly Agree		
		1	2	3	4	5	6	7	
<i>Response B</i>	Strongly Disagree	1	10	9	7	5	3	2	1
		2	9	10	9	6	4	3	2
		3	7	9	10	8	5	4	3
	Neutral	4	5	6	8	10	8	6	5
		5	3	4	5	8	10	9	7
		6	2	3	4	6	9	10	9
	Strongly Agree	7	1	2	3	5	7	9	10

Response order bias was assessed by verifying that early and late respondents were not significantly different in their characteristics (Armstrong and Overton 1977). We compared both the CEO and the CIO sample based on their socio-demographics and responses to the principal constructs in the study. T-tests for differences in the means of early (first 50) and late (last 50) respondents showed no significant differences ($p > 0.05$). We also drew on the Hoppenstedt firm database to compare the distributions of demographic and socio-economic characteristics (i.e., company size, annual revenue, and industry) of non-respondents with the distributions we found in our sample. The results showed the demographic and socio-economic variables of the firms had similar distributions in the sample of non-respondents as those in our research sample ($p > 0.05$ for distributions on company size, annual revenue, and industry, respectively). Overall, these findings indicate that a result bias due to non-responses is unlikely in this study.

Measurement Model Tests

We assessed construct reliability and validity separately for the CEO responses and the CIO responses. Table 3 and Table 4 exhibit reliability and validity statistics as well as interconstruct correlations. Partial least squares regression was used for linear model estimations.

Construct	ρ_c	AVE	Range of Loadings	(1)	(2)	(3)	(4)	(5)
(1) Quality of Collaboration	0.954	0.84	0.90 – 0.93	0.92				
(2) IT Contribution	0.963	0.839	0.90 – 0.93	0.88	0.92			
(3) Actual Agreement	0.812	0.684	0.80 – 0.94	0.64	0.63	0.83		
(4) Perceived Agreement	0.921	0.853	0.77 – 0.94	0.65	0.61	0.75	0.92	
(5) Understanding	0.769	0.625	0.69 – 0.90	0.14	0.14	0.03	0.22	0.79

Notes: Diagonal elements are the square root of AVE. All factor loadings are significant at least at the $p < 0.05$ level.

Table 4. Reliability Statistics, Validity Statistics, and Interconstruct Correlations (CIO data; N = 102)

Construct	ρ_c	AVE	Range of Loadings	(1)	(2)	(3)	(4)	(5)
(1) Quality of Collaboration	0.964	0.870	0.92 – 0.94	0.93				
(2) IT Contribution	0.966	0.851	0.91 – 0.93	0.90	0.92			
(3) Actual Agreement	0.812	0.684	0.80 – 0.94	0.64	0.56	0.83		
(4) Perceived Agreement	0.940	0.886	0.77 – 0.97	0.80	0.73	0.78	0.94	
(5) Understanding	0.795	0.660	0.72 – 0.91	0.20	0.21	0.13	0.23	0.81

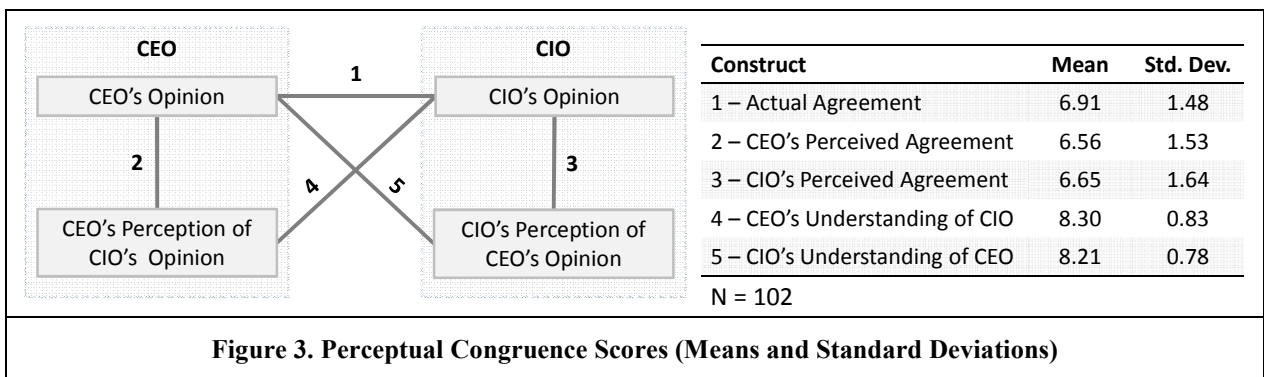
Notes: Diagonal elements are the square root of AVE. All factor loadings are significant at least at the $p < 0.05$ level.

We assessed the psychometric properties of the measurement model results by examining internal consistency, convergent validity, and discriminant validity. The loadings of the measurement items on their respective latent variables were above the threshold value of 0.7 and all were significant ($p < 0.05$). Furthermore, measurement items did not have cross loadings above 0.4 on the unintended constructs and the square roots of AVE were consistently larger than relevant interconstruct correlation coefficients, suggesting discriminant validity (Hair et al. 2006).³ Internal consistency (ρ_c) of all reflective constructs clearly exceeded the threshold of 0.70, implying acceptable reliability (Fornell and Larcker 1981). Convergent validity is considered adequate when the average variance extracted (AVE) is 0.50 or more; this condition was satisfied in all cases.

Results

Hypothesis Tests Related to the Perceptual Congruence Model

Hypotheses H1 and H2 were examined by pairwise comparisons between means. Paired one-tailed t-tests allowed the evaluation of differences in the means between perceptual congruence constructs. T-tests typically yield acceptable results for the purpose of comparing PCM variables (e.g., Acitelli et al. 1993; White 1985). Figure 3 shows sample means and standard deviations of all five dyadic perceptual congruence constructs in the model. High means (up to 10) indicate higher congruence of responses, whereas low means (as low as 1) indicate higher incongruence of responses (see mapping of response scores to perceptual congruence scores in Table 2).



³ The results of an exploratory, principal components factor analysis are omitted here for brevity. They can be obtained from the authors upon request.

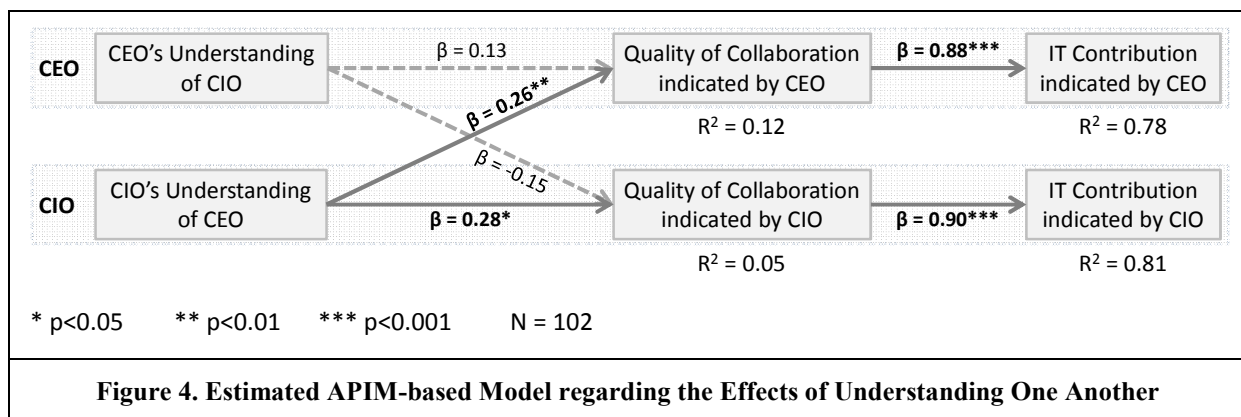
The t-test results for hypothesis H1 presented the first unexpected finding in our study. Not only did the data not support our hypothesis of perceived agreement transcending actual agreement ($p > 0.05$), there was even evidence of the inverse of hypothesis H1. Between CEO and CIO responses, actual agreement was significantly greater than perceived agreement in our sample. This was the case for the CEO's perceived agreement compared to actual agreement (means of 6.56 and 6.91; $p < 0.001$) as well as for the CIO's perceived agreement compared to actual agreement (means of 6.65 and 6.91; $p < 0.01$). Unlike in marital relationships, there was no evidence whatsoever for the "false consensus effect" (Ross et al. 1977). Quite the contrary: The opinions of CEOs and CIOs in our sample were more similar than both perceived them to be. This observation was no different when evaluating the responses to business topics and IT topics independently.

To test hypothesis H2, we compared the level of understanding of one another that CEO and CIO each possess. The results showed an insignificant difference between the means of the CEO's understanding of the CIO and the CIO's understanding of the CEO on the global level (means of 8.30 and 8.21; $p > 0.05$). Therefore, hypothesis H2 had to be rejected.

However, separate t-tests for the two topic areas' understanding scores showed statistically significant differences. In our sample, the CIOs were better able to predict their CEO's responses to statements on business topics than the CEOs were able to predict their CIO's responses to the same (means of 8.45 and 7.85; $p < 0.001$). For IT topics, the reverse case was significant: CEOs understood their CIO better than CIOs understood their CEO (means of 8.56 and 8.16; $p < 0.001$). Accordingly, CEOs had a greater level of understanding of their CIO on IT topics than on business topics (means of 8.56 and 7.85; $p < 0.001$) and CIOs had a greater level of understanding of their CEO on business topics compared to IT topics (means of 8.45 and 8.16; $p < 0.001$). These post hoc findings are picked up later in the discussion part of this paper.

Hypothesis Tests Related to the APIM-based Model

In our APIM-based model, we hypothesized differences in the strengths of actor effects and partner effects that connect mutual understanding of CEO and CIO with their individually perceived quality of collaboration. Linkages from collaboration quality to the extent of IT contribution extended the model. We used WarpPLS (Kock 2010), a structural equation modeling (SEM) tool, to test the APIM-based model.⁴



The SEM-based estimation of the effects exhibited results that supported our hypotheses. The effects we hypothesized as stronger were significant, while the effects hypothesized as weaker were not significant on an alpha level of 0.05 (see Figure 4). Thus, hypotheses H3a and H3b were accepted. Chi-squared tests to compare the size of two parameters within the APIM, as proposed by Cook and Kenny (2005), confirmed the significance of the differences between the magnitudes of actor and partner effects as hypothesized ($\chi^2_{CEO} (N = 102, df = 1) = 4.93, p < 0.05$; $\chi^2_{CIO} (N = 102, df = 1) = 5.34, p < 0.05$).

⁴ The use of SmartPLS 2.0 produced the same results.

The CEO's perceived quality of collaboration was significantly affected only by how well he or she was understood by the CIO (partner effect, $\beta = 0.26$, $p < 0.01$) and the CIO's perceived quality of collaboration was significantly affected only by how well he or she understood the CEO (actor effect, $\beta = 0.28$, $p < 0.05$). In other words, the satisfaction of the CEOs in our sample was dependent upon them being understood, while the CIOs were more satisfied with the cooperation when they better understand the views of the CEO. Our empirical study showed that the CIO's understanding of the CEO is the pivotal factor in this APIM-based model, although it must be acknowledged that there are certainly factors besides understanding that impact quality of collaboration.

Hypothesis H3c built upon the same arguments and was supported by the survey data as well. Partial least squares analysis of a slightly modified version of the APIM-based model (where quality of collaboration was aggregated to one construct) confirmed the significance of the CIO's understanding of the CEO ($\beta = 0.28$, $p < 0.01$) and the insignificance of the CEO's understanding of the CIO ($\beta = -0.15$, $p > 0.05$) in predicting a dyad's aggregated quality of collaboration.

Lastly, the model estimation (see Figure 4) also provided support for hypotheses H4a and H4b. CEOs and CIOs who were more satisfied with the collaboration stated significantly higher levels of IT contribution to the business in their organizations ($\beta_{CEO} = 0.88$, $\beta_{CIO} = 0.90$, both $p < 0.001$). This was an integral assumption to make the case for the relevance of the social dimension of business-IT alignment.

Discussion

Synopsis of Key Findings

The findings from our empirical investigation raise several key points. First, our empirical study examined perceptual congruence between business and IT leaders, which can be viewed as a crucial socio-psychological aspect of strategic business-IT alignment. Contrary to our hypothesis, the sampled CEOs' and CIOs' opinions were actually more similar than both perceived them to be. This observation is not in line with marital relationship research where partners typically tend to succumb to the "*false consensus effect*" (Ross et al. 1977). We see this as an indicator of a high level of professionalism in the CEO-CIO relationship. Both executives do not shy away from conceptually confronting conflicts of opinions, so much so that more disagreement is perceived than actually existent. This extreme, on the other hand, is not describing a healthy relationship either. Individuals who perceive significantly more disagreement than existent are most likely biased by negative prejudices and experience a lack of effective communication of each other's viewpoints.

Second, we focused on how well the CEOs and CIOs in our sample understood one another's opinions on relevant business and IT topics and related their level of understanding to the quality of the two executives' professional collaboration in an APIM-based model. We found the CIO's understanding of the CEO plays a more important role in the CEO-CIO relationship than the CEO's understanding of the CIO. CEOs want to be understood while CIOs seek to understand their counterpart. We explain these desires with a power differential in their roles by virtue of the organizational hierarchy. It is more important for the less powerful to understand the more powerful partner in order to maximize the satisfaction of both and bring about fruitful collaboration. As expected, quality of collaboration had strongly significant impact on the extent of IT contribution to the business indicated by both executives.

Third, despite the disparity in importance, we found both executive groups in our sample about equally able to accurately predict their counterpart's viewpoint on the global level. When split by topic groups, however, we discovered significant differences post hoc. On IT topics, the CEOs were better able to correctly perceive their CIO's opinions, whereas on business topics, the CIOs were better able to predict their CEO's opinions. We explain this finding with mutual recognition of subject matter expertise and a slight negligence of the other individual's opinion on topics of one's own respective domain. Hence, business leaders tend to listen to their CIO's judgment of IT-related problems more than to the CIO's opinion on business strategy (if he or she is asked at all to state an opinion). CIOs, on the other hand, pay closer attention to their CEO's business direction than to the CEO's opinion on IT-related questions. This is certainly a quite pragmatic speculation for the observed divergence of attention that has to be verified in future research studies.

Contributions to Theory, Research, and Practice

This study makes several contributions to IS research and theory. From a theoretical standpoint, we utilized proven conceptual models from social psychology to analyze the CEO-CIO partnership, which allowed us gain more insights into social relations between business and IT leaders. In particular, the applied frameworks helped conceptualizing the two directions of understanding as well as the divergence between actual and perceived agreement. Although there are some empirical studies on business-IT alignment that are concerned with the parity of CEO-CIO opinions, measurement of perceptual congruence in accordance with White's (1985) model⁵ and the use of the actor-partner interdependence model are a novelty in this field. Employing the two models provided a more holistic and thorough conceptualization of dyadic personal relationships than models previously used in IS research.

Our unique modeling approach yielded new insights on cognitive coherences in interpersonal relations of business and IT executives. The distinction between actual similarity of opinions, intrapersonal perception of agreement, and interpersonal ability to accurately predict one another's opinions on both business and IT topics allowed viewing the CEO-CIO relationship from multiple angles in parallel. Our APIM-based model shed light on the disparate importance of the two directions of understanding. This distinction was made possible by the separative approach of the actor-partner interdependence model that distinguished between actor and partner effects. Models in prior related research studies mainly revolve around "shared understanding" or "shared vision" (e.g., Johnson and Lederer 2010; Preston and Karahanna 2009a; Reich and Benbasat 2000), which are measured as agreement (i.e., similarity of responses). Understanding, viewed as the perception accuracy of one another's attitudes, has been largely overlooked as a factor in social relations between business and IT leaders. Our finding that the importance of the CIO's understanding of the CEO outweighs the importance of the CEO's understanding of the CIO in their relationship is a valuable and useful insight that deserves attention among researchers.

There are also several practical implications for the partnership between business and IT leaders that can be inferred from the results of our study. First, we want to elaborate more on the unusual difference between perceived agreement and actual agreement we found in our sample. If, as found, CEOs and CIOs perceive each other's opinions significantly less similar than they actually are, this is an indication for the existence of negative prejudices and room for improvement when it comes to communication. We know from our pretest interviews and ongoing dialogues with practitioners that tensions between the business side and the IT side of an organization exist more often than not and perceptions of the players involved are a matter of importance. The removal of incorrectly perceived disagreement can act as an effective tool to improve poor business-IT relationships and ultimately lead to better alignment. Both business and IT executives should make sure their take on controversial topics are effectively communicated, especially when their relationship is troubled. Perceptions can only be accurate when topics are openly discussed and both agreement and disagreement are candidly communicated.

Second, other studies frequently call for efforts to extend the CIO's level of business knowledge (e.g., Chan et al. 2006; Hussin et al. 2002). Our results clearly indicate that the CIOs' understanding of their chief executive officer plays an important role for the productiveness of their partnership. Thus, the CIO's ability to communicate in business terms and comprehend the firm's business models is indeed imperative. At the same time, our data do not provide evidence of a prevalent lack of the CIOs' ability to accurately perceive their CEO's views on business topics.

Finally, authors often call for CIO-orchestrated educational efforts that are meant to increase business executives' knowledge of IT (e.g., Preston and Karahanna 2009a). Our findings do not necessarily lead to this conclusion. We found a comparably high level of understanding that CEOs have of their CIO's perspective on IT topics and we could show that the CEOs' understanding of their CIO plays a non-significant role for the fruitfulness of their partnership. Our advice to practitioners is rather that educating IT leaders on business yields more success in terms of strategic business-IT alignment than teaching CEOs about IT. CEOs expect from their CIOs to understand them (and their business) and guide them in making IT-related decisions. CIOs who successfully accomplish becoming their CEO's trusted advisor in IT questions do not need to educate their CEO on IT but need to continue enhancing their

⁵ In the end (given the lack of support for H1 and H2), White's model was primarily useful for measuring the "understanding" variables that were utilized by our APIM-based model.

knowledge of ongoing business and industry developments. CEOs, on the other hand, should not underestimate their CIO's know-how in business. We were able to show that CEOs and CIOs in our sample actually stated significantly more similar views on the course of the business than perceived by the CEOs.

Limitations, Future Research, and Conclusion

Our study is not without limitations which also provide directions for future research. We obtained our data from an online CEO-CIO survey that allowed participants to skip questions. In order to work with the data, we had to eliminate a substantial segment of our sample (74 of the 176 response pairs) because of incomplete dyadic data or low data quality. Although this procedure is common practice, it is possible, on the one hand, that our sample is subject to a bias from filtering out the data of incomplete dyads and response pairs of insufficient data quality; on the other hand, a smaller sample size tends to impact the results' statistical significance negatively. Altogether, the resulting sample size of $N = 102$ was bigger than we had hoped for initially and is comparable with other CEO-CIO studies (e.g., Tan and Gallupe 2006 ($N = 80$); Kearns and Lederer 2000 ($N = 107$)). With respect to our results, we suggest that future research should continue to empirically test the propositions developed in this paper. It would be particularly interesting to find out if future studies can replicate the phenomena that appeared in our study, such as actual agreement transcending perceived agreement and the CIO's understanding of the CEO dominating over the CEO's understanding of the CIO in explaining the quality of CEO-CIO collaboration. The application of more sophisticated statistical testing techniques than t-tests for the perceptual congruence model could lead to further substantiation of our propositions.

The survey-based data collection for our study happened at a single point in time from executives in a distinct geographic area (Germany). Different conclusions might have resulted from a longitudinal perspective, had we collected data at multiple points in time. Furthermore, a potential geographic bias caused, for example, by economic conditions or regional attitudes could have been alleviated, had we included companies in other geographic areas. An industry bias, as mentioned frequently by other authors who deal with CEO-CIO survey data (e.g., Preston and Karahanna 2009a), is unlikely to have influenced our results as we had a fairly diverse range of industries represented in our survey sample (see Appendix B). As for future research, launching a CEO-CIO survey that measures interpersonal and intrapersonal perceptions in countries other than Germany would certainly be of value in order to improve the generalizability of our findings. The statistical analysis of longitudinal data is another direction that could be attractive to follow. Survey results might alter over time as economic cycles and other external variables impact executives' mood and thinking. There is a modified version of the basic actor-partner interdependence model that can handle longitudinal data and allows for measuring stability of actor and partner effects over time (Cook and Kenny 2005).

Resulting in a third limitation, the fear of negative consequences from rating the CEO-CIO relationship quality poorly and being easily identifiable in the survey sample might have led to dishonest responses to the quality of collaboration items in the survey. This concern was indicated by one of the CIO pretest participants. Nevertheless, we compared CEO and CIO responses to the collaboration quality items and found no evidence for different rating behaviors of CIOs as compared to CEOs ($p > 0.05$). Both groups used the full spectrum of the seven-point scale. However, the representativeness of our sample in terms of collaboration quality remains an assumption. A potential bias due to non-responses from CEO-CIO dyads with poor relationship quality cannot be ruled out completely. Although we have no immediate concern, future research could mitigate this potential bias by obtaining collaboration quality measures from a neutral third party's perspective (e.g., a third executive or human resource manager).

In general, future research should explore the concept of mutual CEO-CIO understanding more fully. We revealed disparate importance of the two directions of understanding for CEO-CIO collaboration quality. Still, we did not pursue the identification of factors antecedent to understanding. It remains to be studied what generally enables and inhibits the executives' ability to take the counterpart's viewpoint. Furthermore, it also remains to be examined what causes the uncommon divergence between actual and perceived agreement in the CEO-CIO relationship. Our theoretical explanation of this unexpected finding might seem plausible, but is empirically unverified. Continued research in this area becomes increasingly important as the CIO's responsibilities are expected to grow in a digital economy (Weill and Woerner 2013) and closer (personal) partnerships between CEOs and CIOs are consequential.

In conclusion, our results provide impetus for further analysis of the social dimension of strategic business-IT alignment and give food for thought to communities in practice. Notwithstanding the CEOs' biased interest in consultation on information technology, CIOs can grow their role as IT advisors and become trusted partners of their business counterparts, while developing a relationship that allows businesses to gain an IT-enabled competitive edge through strategic alignment.

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Appendix

Appendix A: Descriptive Survey Sample Characteristics

Personal Characteristics	CEOs	CIOs	Company Characteristics	
Gender	86% Male	96% Male	Annual Revenue in Million Euros	
Age (SD)	50.8 (4.1)	46.9 (4.8)	<10	1%
Highest Level of Education			10-49	28%
Less than 4-year Degree	2%	1%	50-99	20%
4-year Degree	4%	7%	100-499	38%
Graduate or Prof. Degree	50%	70%	500-999	10%
Doctorate Degree ⁶	41%	17%	≥1000	3%
Experience			Total Assets in Million Euros	
Years in Industry (SD)	27.5 (4.8)	23.0 (5.1)	<10	10%
Years in Firm (SD)	18.9 (5.2)	16.2 (4.9)	10-49	30%
Years in Position (SD)	5.7 (3.7)	4.1 (3.1)	50-99	23%
Years in IT (SD)	1.8 (4.5)	14.0 (3.4)	100-499	30%
CIO Reporting Level			500-999	4%
Direct Report		45%	≥1000	3%
Two Levels below CEO		45%	Number of Employees	
Three Levels below CEO		11%	<100	2%
CIO Title			100-499	36%
CIO		58%	500-999	27%
VP of IT		26%	1,000-4,999	31%
IT Director		14%	5,000-9,999	3%
Executive IT Officer		2%	≥10,000	1%

⁶ The high percentage of executives with doctoral degrees is not uncommon in Germany.

Appendix B: Industries Represented in Survey Sample

