

Influence of Network Characteristics on Inter-Organizational IT Integration: The Role of Commitment and Trust

Full paper

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Abstract

Research on inter-organizational relationships has become prominent in business and IS research and over the past two decades networks in particular have been widely recognized by both academics and practitioners as an important form of multi-organizational governance. Those networks rely heavily on information systems, and the integration of IS across partnering organizations has become the backbone of collaboration. In this context, the importance of organizational attributes has been highlighted by various studies, but antecedents of integration have primarily been derived from IT related factors and do not consider network characteristics. This study sets out to expand the understanding of how network organizations can effectively develop and manage IT integration in order to co-create relational value. By drawing on the commitment-trust theory we develop and test a theoretical model based on data gathered from 228 network organizations to explain how network attributes facilitate IT integration.

Keywords

IT integration, trust, commitment, relational IT value, inter-organizational networks.

Introduction

Since the importance of external resources and collaboration across organizational boundaries for firms' competitive success continues to grow dramatically, research on inter-organizational relationships has become prominent in both business and information systems (IS) research (e.g., Im and Rai 2014; Provan et al. 2007; Sanders 2007). The potential advantages of participation in inter-organizational relationships are manifold and have been unanimously attested in the literature. The essence of the majority of these articles is that inter-organizational relationships help firms create relational value by combining resources, sharing information and knowledge, increasing speed to market, and gaining access to foreign markets and competitive advantages (Barringer and Harrison 2000). Despite the existence of various forms of inter-organizational relationships in the tension between markets and hierarchies, over the past two decades inter-organizational networks in particular have been widely recognized by academics and practitioners as an important form of multi-organizational governance, as they offer considerable advantages for organizations in both private and public sectors (Provan and Kenis 2007). The continual progress of information- and communication technologies plays a fundamental role in the functioning of those networks and has emerged as a crucial tool in managing business-to-business relationships (Pereira 2009; Thomas et al. 1996). Thus, the integration of information systems across partnering organizations has become the backbone of collaboration in inter-organizational networks (Prasad et al. 2013). It facilitates information sharing, enhances organizational flexibility and responsiveness, and minimizes

risks and costs (Rajaguru and Matanda 2013). Therefore, prevailing research highlights its importance in co-creating relational IT value (Chen et al. 2013; Rai et al. 2006; Saraf et al. 2007).

However, the integration of boundary-spanning information technologies is inherently complex, since it involves multiple partners with different associated interests, cultures, and strategic intentions. As a result, their implementation can be problematic, as it claims significant effort to redefine and extend the boundaries of participating organizations (Rajaguru and Matanda 2013). Consequently, organizational characteristics and behavior, such as compatibility and congruency between partnering organizations, are a primary ingredient for successful IT integration in inter-organizational networks. The importance of organizational attributes in the context of inter-organizational information sharing and collaboration across organizational boundaries has so far been highlighted by various studies in different contexts (e.g., Grover and Saeed 2007; Lee and Lim 2005; Rajaguru and Matanda 2011; Teo and King 1997). However, antecedents of IT integration identified in previous studies have primarily been derived from highly technology driven contexts, and thus are mostly restricted to IT related factors of integration in pure and do not consider network-related characteristics. Since collaborative relationships in inter-organizational networks differ from this perspective for a variety of reasons, we argue that it is necessary to examine network attributes as antecedents of IT integration. Thus, this study addresses the following research question: Which network characteristics facilitate the development of IT integration capabilities in order to enhance value co-creation in inter-organizational networks?

Drawing on the commitment-trust theory (Morgan and Hunt 1994), we develop and test a research model and hypotheses to explain how network attributes facilitate IT integration. Because modern types of supply chains can be characterized as network constellations (Chen and Paulraj 2004; Miles and Snow 2007), we investigate inter-organizational networks in this study. The remainder of this study is structured as follows. We begin with a general discussion on aspects of inter-organizational IT integration, followed by an overview of its network-related antecedents. We then use the commitment-trust theory as a theoretical lens and integrate network-related factors for the research model and hypothesis development. Subsequently, we present the methodology and data analysis. The paper closes with a discussion of results, implications as well as directions for future research are given.

Theoretical Background

IT Capabilities in Inter-Organizational Networks

In the context of the “Productivity Paradox of IT” (Brynjolfsson 1993) and based on the resource-based view (RBV) (Barney 1991), researchers have argued that IT investments per se do not lead necessarily to competitive advantage (Mata et al. 1995; Nevo et al. 2007; Santhanam and Hartono 2003; Wade and Hulland 2004). Because IT-related resources, such as software and hardware, are widely available on the market and mobile in nature, they can be easily duplicated by competitors (Powell and Dent-Micallef 1997). According to the RBV, firms should develop unique capabilities to use their IT resources in a more effective and efficient way than their competitors in order to achieve sustained advantage (Bharadwaj 2000). The same applies for inter-organizational networks, where legally and economically, autonomous organizations work together to achieve common goals (Camarinha-Matos and Afsarmanesh 2008). While earlier research has been focused on investments in specific inter-organizational technologies, such as Electronic Data Interchange (EDI) (Zaheer and Venkatraman 1994), recent research highlights the importance of inter-organizational capabilities. In order to create relational value, firms have to create idiosyncratic inter-firm linkages and combine their resources and capabilities in a unique way, which creates competitive advantage that could not be attained in isolation (Dyer and Singh 1998). Thus, by building inter-organizational IT-based capabilities, such as IT customization (Klein and Rai 2009), IT governance structures (Prasad et al. 2013), and IT advancement (Jean et al. 2010), network firms are able to co-create value by joint IT investments (Kohli and Grover 2008).

In various studies, IT integration has been introduced as an inter-organizational IT capability that facilitates the building of higher-order business capabilities (Barua et al. 2004; Chen et al. 2013; Rai et al. 2006; Rajaguru and Matanda 2013; Saraf et al. 2007) and enhances relational value (Benitez-Amado and Ray 2012; Bharadwaj et al. 2007; Chang et al. 2008; Rajaguru and Matanda 2009). It refers to “the extent to which the IS applications of a focal firm work as a functional whole in conjunction with the IS

applications of its business partners” (Saraf et al. 2007, p. 324) and encompasses integrated IT infrastructure, data, and applications (Barua et al. 2004; Fischer 2008; Rai et al. 2006; Saraf et al. 2007).

Network Characteristics and Antecedents to Inter-Organizational IT Integration

Previous research has investigated various factors that could influence inter-organizational IT integration. As shown in Table 1, most studies examine the relationship between IT-related factors and IT integration in networks and do not investigate network-related characteristics. For example, various studies show a positive effect of IT infrastructure flexibility on IT integration in inter-organizational networks (Benitez-Amado and Ray 2012; Hu et al. 2011; Saraf et al. 2007). Furthermore, Grover and Saeed (2007) demonstrate that environmental factors and market and product characteristics influence inter-organizational IT integration. However, network-related factors are rarely investigated in the context of inter-organizational IT integration. So far, technical, strategic, cultural compatibility (Rajaguru and Matanda 2013) and partner dependence (Seggie et al. 2006) were identified as antecedents to inter-organizational IT integration, which refer to characteristics of the network relationships.

Study	Network type	Antecedents to inter-organizational IT integration
(Kim et al. 2006)	Supply chain relationships in the logistics industry	Applied technological innovation Administrative innovation
(Seggie et al. 2006)	Supply chain relationships	Partner dependence
(Bharadwaj et al. 2007)	Supply chain relationships in the manufacturing industry	Manufacturing IS coordination
(Grover and Saeed 2007)	Supply chain relationships in the electronics industry	Information sharing environment Demand uncertainty Product complexity Market fragmentation Market volatility
(Saraf et al. 2007)	Relationships in high-tech and financial service industries	IS flexibility
(Hu et al. 2011)	Supply chain relationships	IS flexibility IS standardization
(Benitez-Amado and Ray 2012)	Mergers and acquisitions relationships	IT infrastructure flexibility
(Rajaguru and Matanda 2013)	Supply chain relationships in the retailing industry	Technical compatibility Strategic compatibility Cultural compatibility

Table 1. Antecedents to Inter-Organizational IT Integration in Extant Empirical Literature

Researchers have identified a variety of network-related factors which can influence the performance and capabilities of network partners, such as goal congruency, compatibility, strategic importance, interdependency, or long-term orientation (Kim et al. 2013; Möller 2006; Rajaguru and Matanda 2013). The commitment-trust theory by Morgan and Hunt (1994) identified two key factors which are critical for the success of inter-organizational relationships. Commitment refers to the belief of network partners that the relationship is “so important as to warrant maximum efforts at maintaining it” (Morgan and Hunt 1994). Actors in a committed relationship expect that the relationship will continue for a long time, and thus commitment can be seen as an indicator for the stability and strength of the relationship (Golicic and Mentzer 2006; Kumar et al. 1995). Consequently, commitment will lead to a lower propensity to leave the relationship (Morgan and Hunt 1994). Trust generally refers to the belief that another party has beneficial attributes (Nicolaou and McKnight 2006). In this study, we view trust as inter-organizational, meaning trust in other organizations by actors of a focal firm (Zaheer et al. 1998). Three key aspects of trusting beliefs are frequently mentioned in the literature (Mayer et al. 1995; Nicolaou et al. 2011): integrity, i.e., honesty of firms; benevolence, understood as a positive orientation to other firms; and competence, defined as the ability to perform expected tasks. Trust is an effective inter-organizational governance mechanism because it can be seen as a substitute for formal contracts and control mechanisms (Dyer and Singh 1998; Uzzi 1997). Both factors contribute to cooperative behavior (Morgan and Hunt 1994).

Research Model

Our study has the goal to investigate network characteristics in the context of value co-creation by inter-organizational IT integration. For this purpose, we integrate two research streams into our research model (see Figure 1). First, we draw on the RBV and IT capability literature. Based on the common nomology in the IS literature, we introduce IT integration as an inter-organizational capability, which enhances the co-creation of relational value. Second, we use the commitment-trust theory as a theoretical basis to integrate network-related factors into our research model for the following reasons. First, commitment and trust have both been identified as antecedents to various inter-organizational factors and capabilities, such as information and knowledge sharing (Cai et al. 2010; Chen et al. 2013; Klein and Rai 2009; Li and Lin 2006), performance (Sarkar et al. 2001), supply integration (Vijayasathya 2010) and EDI adoption (Hausman and Stock 2003; Zaheer and Venkatraman 1994). Second, although Morgan and Hunt (1994) investigate marketing relationships, these relationships encompass supply chains and thus the theory provides appropriate insights for inter-organizational networks (Msanjila and Afsarmanesh 2008).

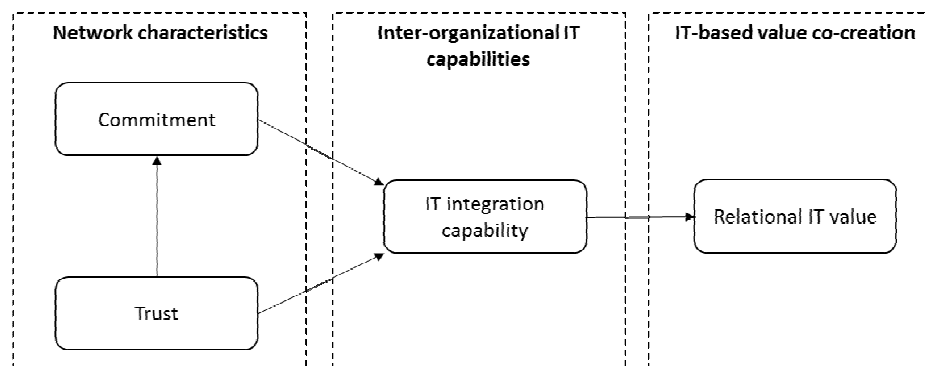


Figure 1. Proposed Research Model

IT Integration as Inter-Organizational Capability

An integrated IT infrastructure can be seen as the backbone of inter-organizational networks (Prasad et al. 2013), making the support of inter-organizational processes possible. Although less integrated IS, such as e-mail, can support inter-organizational activities (Chi and Holsapple 2005), there is nothing idiosyncratic about these systems (Bharadwaj et al. 2007; Saraf et al. 2007). Consequently, they will not contribute to relational IT value in the same manner as integrated systems, which can be seen as relation-specific investments (Chen et al. 2013). Such investments increase the willingness of network partners to engage in further value-adding initiatives (Saraf et al. 2007). This applies particularly to IT integration, because it is customized and specific to the network (Saraf et al. 2007). Furthermore, IT integration strengthens the coordination of collaborative activities (Dong et al. 2009; Kim et al. 2006) for the following reasons. First, integrated functions of IT systems, such as consistent data and seamless access to data, enable improved visibility and information flow of inter-organizational business processes (Bharadwaj et al. 2007). Second, integrated IT facilitates the coordination of network resources (Liu and Chen 2010), such as IT resources. Third, IT integration leads to improved decision making and interactions, because network partners have more accurate information about each other's plans and operations (Bharadwaj et al. 2007). Consistent with these arguments, it can be suggested that:

H1: IT integration capability is positively related to relational IT value.

Commitment and Trust as Network Characteristics

In order to create relational value through inter-organizational capabilities, network relationships have to be idiosyncratic, rare, and difficult to imitate (Dyer and Singh 1998). They thus have to clearly differ from market arm's length relationships, where firms only exchange goods or services and do not cooperate, e.g. by investments in common assets. Consequently, network partners need a high level of cooperation to meet these requirements and therefore to develop idiosyncratic linkages (Duffy 2008; Kumar and van

Dissel 1996; Mentzer et al. 2000; Sarkar et al. 2001). Although cooperation is a key aspect of inter-organizational networks in general (Camarinha-Matos and Afsarmanesh 2008), the intensity of cooperation can differ between networks and results from an evolutionary process (Duffy 2008; Johnson and Sohi 2001; Spekman et al. 1998). For this purpose, it is necessary to investigate network characteristics as antecedents to IT integration. According to the commitment-trust theory, commitment and trust contribute to a higher level of cooperation between partners that is necessary for the presence of inter-organizational IT integration in this research model. These two network-related factors characterize networks which truly cooperate, differ from arm's length relationships, develop unique capabilities and engage in joint activities (Bunduchi 2005; Chi and Holsapple 2005; Golicic and Mentzer 2006; Kumar et al. 1995; Spekman et al. 1998).

IT integration between network partners requires capital and effort (Chen et al. 2013). Moreover, relation-specific investments, such as IT integration, have less value outside the network (Heide and John 1990; Wilson and Vlosky 1998). Integrated hardware and software can also easily be used for other purposes. However, relation-specific tasks, such as mapping of data elements, have to be performed, which leads to switching costs (Grover and Saeed 2007). If firms do not expect a long-term relationship with their partners as well as future benefits, they will be unwilling to invest in such relation-specific technologies (Kim et al. 2013; Mentzer et al. 2000). Consequently, IT integration requires a high level of commitment between network partners (Rajaguru and Matanda 2013). Committed network partners will accept short-term losses resulting from high investments in relation-specific technologies because they expect long-term benefits from the relationship (Vijayarathy 2010). Furthermore, network partners want to become more deeply involved in the network and thus have an intention to invest effort and capital (Kumar et al. 1995). In summary, commitment contributes to the willingness of network partners to invest in relation-specific resources (Mentzer et al. 2000), such as integrated IT systems. Based on the above reasoning, we argue that:

H2: Commitment is positively related to IT integration capability.

Despite the fact that IT integration can have beneficial effects for network partners, it increases the risk of being vulnerable, because firms could be locked into an unfavorable relationship (Saraf et al. 2007). When network members perceive each other as trusted partners, they accept to make themselves vulnerable because they believe in each other's integrity, benevolence, and competence (Dyer and Chu 2003; McEvily et al. 2003). They accept risks of relation-specific investments because trust reduces uncertainty about their partners (Krishnan et al. 2006; Kumar and van Dissel 1996). Consequently, believing in the cooperative behavior of their network partners, firms are more willing to make relation-specific investments (Chen et al. 2013; Mentzer et al. 2000), such as integrating IT systems. Furthermore, networked IOS are characterized by low structurability and high potential for conflict (Kumar and van Dissel 1996). Under these circumstances, informal governance mechanisms, like trust, are efficient because they outweigh the necessity to control (Chi and Holsapple 2005). These arguments can be supported by various studies that investigated the effect of trust on inter-organizational capabilities, such as knowledge sharing (Cai et al. 2010; Klein 2007) and supply integration (Chen et al. 2013; Vijayarathy 2010). Thus, we argue that trust also facilitates the inter-organizational capability of IT integration.

H3: Trust is positively related to IT integration capability.

Finally, it has to be considered that trust positively affects commitment. Relationships based on high trust are so highly valued for network partners that they want to continue the cooperation for a long time and thus commit to the relationship (Morgan and Hunt 1994; Vijayarathy 2010). The positive relationship between trust and commitment is already part of the commitment-trust theory by Morgan and Hunt (1994) and is also empirically supported by Vijayarathy (2010). Consequently, a positive effect is also expected in this investigation.

H4: Trust is positively related to commitment.

Research Methodology

Operationalization of Research Variables

All scales were adopted from previous research and are reflective in nature. The constructs in the survey were measured using multi-item scales with seven-point Likert rating systems. A scale with 5-items for relational value has been adapted from Prasad et al. (2013). It measures the degree to which IT-related investments in the network lead to business value. For IT integration, a scale with 4-items from Saraf et al. (2007) has been adapted, which covers the infrastructure, data, and software layer. A 3-items scale for commitment has been adapted from Morgan and Hunt (1994). Finally, trust is measured with a 6-items scale from Nicolaou et al. (2011). It encompasses the three key aspects of trust, namely integrity, benevolence and competence. An overview of the scales and their items can be found in the Appendix. Given that this investigation was conducted in Germany, all items were translated into German by the authors. The German questionnaire was then back-translated into English by other researchers to check for and eliminate semantic discrepancies.

Data Collection Procedure and Sample Characteristics

The sampling frame in this investigation was provided by Cluster Observatory, an online database for regional networks in Europe (Clusterobservatory 2014). A list of 226 regional networks in Germany was obtained from this database from which 4,300 firms were randomly picked. Survey invitations targeted persons who are responsible for the management of IT in the respective firm. After two weeks, reminder e-mails were sent to encourage response. From the 4,300 original firms sampled, 324 e-mail deliveries failed and 24 firms did not exist anymore. Those firms had to be excluded from the sample frame (Armstrong and Overton 1977). From the resulting sample frame size, 238 surveys were completed, resulting in a response rate of 6.02 percent. A total of 10 questionnaires were discarded because these participants commented that they had not given valid answers. In summary, the sample consists of 228 firms.

The average size of the organizations in the sample is as follows: small (<50 employees) 53 %, medium (<250 employees) 21 %, and large (\geq 250 employees) 26 %. Around one third of the firms are working in the manufacturing industry (34 %). Professional, scientific and technical activities (22 %) as well as information and communication (18 %) are also frequently mentioned. Organizations working in the wholesale, retail trade, and logistics industry (7 %), as well as in financial and insurance activities (2 %), account for a minor share in the sample. Other participants mainly mentioned multiple industry types (17 %).

Analysis and Results

In order to test the theoretical model, a SEM approach was used. We decided on the partial least squares method (PLS) because it has fewer demands for sample size and makes no normal distribution assumption (Ringle et al. 2012). SmartPLS 2.0.M3 was used as the primary statistical software for the analysis. SPSS Statistics 22 was used for tests that are not available in the SmartPLS packages.

In order to ensure validity and reliability of the instruments, we first assess the quality of the data and the measurement model. We then analyze the structural model. Finally, an additional mediation analysis is conducted.

Data Diagnostic Checks

Because of the low response rate in this investigation, it might be argued that persons who did not respond differ significantly from those who did. This problem is known as non-response bias (Armstrong and Overton 1977). To test the non-response bias, the procedure by Armstrong and Overton (1977) was used. They argue that late respondents are similar to those who did not respond. Thus, early and late respondents should be compared for any significant differences. In this investigation, late respondents were those who completed the questionnaire after receiving a reminder e-mail. Of the respondents in the sample, 48 percent (n=110) were early respondents and 52 percent (n=118) were late respondents. T-tests

were conducted on all measurement items and demographic variables used in this investigation. No significant differences were found between early and late respondents for any measure at a significance level of 0.05, which suggests that non-response bias is not an issue in this investigation.

Because all measures in this investigation were collected by a single questionnaire, common method bias might threaten validity. The Harman’s single-factor test was performed to test for common method bias (Podsakoff 1986). All measurement items used in the investigation were subjected to an exploratory factor analysis. No single factor emerged from the analysis, and no factor accounted for most of the variance. Thus, it can be concluded that there is no evidence of presence of common method bias in this investigation.

Measurement Model

Items \ Construct	Relational IT value (RV)	IT integration capability (IN)	Commitment (CO)	Trust (TR)
RV1	.852	.536	.248	.178
RV2	.924	.554	.304	.219
RV3	.952	.531	.290	.206
RV4	.916	.516	.299	.230
RV5	.901	.532	.257	.168
IN1	.319	.700	.193	.186
IN2	.464	.837	.289	.196
IN3	.606	.910	.211	.148
IN4	.534	.899	.191	.107
CO1	.206	.138	.903	.751
CO2	.230	.261	.846	.584
CO3	.376	.301	.892	.650
TR1	.207	.183	.515	.744
TR2	.211	.172	.637	.782
TR3	.095	.045	.578	.809
TR4	.127	.113	.619	.848
TR5	.230	.195	.687	.859
TR6	.196	.177	.641	.849

Table 2. Item-to-Total Correlations and Cross-Loadings

The measurement model is analyzed according to the recommendations for PLS estimations by Hair et al. (2011) for reflective measures. This includes the assessment of convergent and discriminant validity. Convergent validity refers to whether items measuring a construct correspond with one another. Individual item reliability, composite construct reliability (CR), and average variance extracted (AVE) were evaluated for each reflective measure. As depicted in Table 2, each item loaded on its own construct at .70 or above, which indicates satisfactory levels of individual item reliability (Gefen and Straub 2005). The CR of all constructs are above the acceptable limit of .70 (Hulland 1999). All AVE also exceeded the lower bound of .50 (Bhattacharjee and Premkumar 2004). Accordingly, we argue for convergent validity in the measurement model. Discriminant validity refers to whether theoretically distinct concepts are

empirically distinct from one another. First, cross-loadings were checked and, as expected, all items have higher loadings on their assigned construct than on any other construct in the model (Chin 1998). Second, the criterion of Fornell and Larcker (1981) was used as a further measure to assess discriminant validity. The AVE for each construct is greater than the variance shared with other constructs (see square root AVEs on the diagonal in Table 3). The results of the analysis of the measurement model suggest that the data could be used for the analysis on the structural level.

Construct	Range	Mean	Std. dev.	AVE	CR	1	2	3	4
1. Relational IT value	1 - 7	2.925	1.578	.828	.960	.910			
2. IT integration capability	1 - 7	2.974	1.521	.707	.905	.588	.841		
3. Commitment	1 - 7	4.450	1.259	.776	.912	.307	.261	.881	
4. Trust	1 - 7	5.043	1.055	.666	.923	.220	.183	.755	.816

Table 3. Mean, Standard Deviation, Average Variance Extracted (AVE), Composite Reliability (CR), Square Root of AVE (see bolded numbers) and Inter-Construct Correlations

Structural Model

In addition to the PLS estimations, bootstrapping was performed with 1000 subsamples to assess the significance of the hypothesized relationships in the research model. The results are depicted in Figure 2.

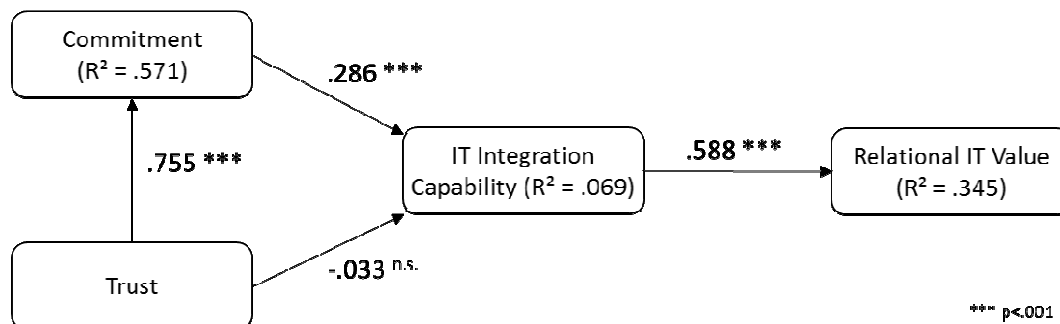


Figure 2. Partial Least Squares and Bootstrapping Estimations for the Structural Model

The first hypothesis (H1) of the research model could be supported. The path coefficient of IT integration capability on relational value is $b = .345$ and significant at $p < .001$ level. Moreover, more than one third of the amount of variance of relational IT value can be explained. Furthermore, the results indicate partial support for the network related antecedents. First, commitment is positively associated with IT integration (H2) with $b = .286$ and $p < .001$. However, a similar effect of trust on IT integration (H3) could not be shown with $b = .033$ and $p > .05$. Finally, the data gives support for hypothesis 4 (H4), i.e., that trust is positively related to commitment with $b = .755$ and $p < .001$.

Post-hoc Mediation Analysis

Because the data indicates an indirect relationship between trust (independent variable) and IT integration (dependent variable) over commitment (mediator), we conducted additional mediation analysis and followed the four steps described in Baron and Kenny (1986). First, we checked whether trust (the independent variable) significantly accounts for variation in IT integration (dependent variable). Indeed, when excluding commitment from the model trust significantly predicts IT integration capability ($b = .203$, $p < .001$). Second, trust (independent variable) accounts significantly for variation in the mediator, i.e., commitment ($b = .755$, $p < .001$). Third, commitment accounts significantly for variations in IT integration ($b = .286$, $p < .001$). Fourth, when controlling for commitment (mediator), the influence of trust (independent variable) on IT integration becomes insignificant ($b = .033$, $p > .05$). This indicates a full mediation. Finally, we checked the strength and significance of the indirect effect by bootstrapping

the indirect path (Preacher and Hayes 2004). With $b = .197$ and $p < .001$ for the indirect effect, the results suggest that commitment fully mediates trust on IT integration.

Discussion and Conclusion

Our study sets out to explain the role of network characteristics in the context of value co-creation by inter-organizational IT integration. We developed a research model which integrated the inter-organizational capability of IT integration, as well as trust and commitment as its network-related antecedents. Based on data gathered from 228 organizations working in regional networks, we could show that commitment and trust are important network characteristics when it comes to inter-organizational IT integration.

Our study contributes to the growing body of literature that explores the role of inter-organizational IT capabilities in co-creating relational value (e.g. Chen et al. 2013; Prasad et al. 2013; Rajaguru and Matanda 2013; Saraf et al. 2007). So far, the role of network characteristics in the context of inter-organizational IT integration has rarely been examined. By using the commitment-trust theory as theoretical basis, we could show how inter-organizational networks can be characterized in order to build the capability of IT integration. Consistent with previous work on inter-organizational IT capabilities (e.g. Cai et al. 2010; Chen et al. 2013; Klein and Rai 2009; Vijayarathay 2010), we demonstrated that commitment and trust also facilitate the building of the IT integration capability. The findings indicate that a high level of cooperation between network partners is necessary for developing IT integration capabilities. Inter-organizational networks thus have to differ from arm's length relationships and have idiosyncratic characteristics in order to integrate IT systems. In contrast, it might be argued that inter-organizational networks which are more transactional and less cooperative can also adapt IS to fit their needs, such as improving communication and lowering transaction costs, and thus co-create value (Bunduchi 2005; Tafti et al. 2013). However, these types of relationships will not gain a sustained advantage (Mentzer et al. 2000) and will not have idiosyncratic characteristics (Dyer and Singh 1998). Consequently, they will not develop a unique IT integration capability and not generate relational IT value in the same manner as high cooperative networks. The results support the foregoing arguments, showing that commitment has a significant effect on inter-organizational IT integration. Furthermore, the effect of trust is fully mediated by commitment.

Contrary to expectations and previous studies, trust, however, did not have a positive direct effect on inter-organizational IT integration. In fact, there are inconsistencies in literature about these relationships, especially with regard to knowledge sharing (Cheung et al. 2010; Hu et al. 2011). There are two possible explanations for this finding. First, Germany can be seen as a high-trust culture (Lane and Bachmann 1996). Also, regional networks are often based on trust (Sydow 1992). Thus, managers will assume, until proven otherwise, the trustworthiness of network partners (Gallivan and Depledge 2003). Consequently, trust might not be crucial in these circumstances, and it affects IT integration only through commitment. These arguments are supported by the high mean value of trust in relation to other constructs of this research model (see Table 3). Second, it might be possible that trust is a dynamic process. Thus, well-integrated IT systems can in turn enhance trust (Bunduchi 2005; Gallivan and Depledge 2003). Such feedback loops (Hu et al. 2011) might have decreased the effects of trust in this investigation.

For practitioners, the results imply that firms have to choose inter-organizational networks and network partners properly. Network partners should have shared values in terms of common goals, policies, and behavior (Morgan and Hunt 1994). However, differences among partners may, to a certain extent, be valuable in order to create synergies (Lavie 2012). Firms should thus concentrate on a few networks which have such attributes and foster commitment among network partners. Subsequently, they need to establish long-term oriented and stable inter-organizational networks. Building trust was shown as another way of achieving commitment among network partners. In addition to the selection of complementary partners, frequent contact, fulfillment of promises, and building of reputation are some of the ways to build trust in inter-organizational networks (Doney and Cannon 1997).

The results of this study must be interpreted with caution due to the following limitations. The target population of regional networks has some characteristics, such as high trust, that have to be considered when interpreting the findings. Although regional networks provide an appropriate target population to

study the influence of network characteristics on IT integration, the results of the study may, to some degree, not be fully generalized. Thus, future research could attempt to extend this research model to other network types as well as to international contexts. Moreover, there is also the typical limitations of cross-sectional surveys. However, statistical tests were conducted to show that the probability of non-response bias and common-method bias is minimal. Nevertheless, longitudinal studies could receive insights into the dynamic process of trust and commitment building in the context of inter-organizational IT integration.

Further research should follow in order to investigate network characteristics in the context of inter-organizational IT integration more deeply. Although the results of this study confirm that the commitment-trust theory provides a strong theoretical basis for examining how to derive inter-organizational IT integration, other network-related theories can provide insights on how to extend this research domain and explore more network-related factors. Furthermore, it should be investigated if a high level of trust and commitment is always desirable. In the context of inter-organizational IT integration, researchers argue that there is a tension between integration and flexibility of IT infrastructures, because highly integrated IT systems are difficult to adopt for new network partners (Saraf et al. 2007). Such considerations might also be applied to network characteristics. In some circumstances, a certain level of conflict and control in contrast to commitment and trust might be desired (Gallivan and Depledge 2003). Consequently, future research needs to investigate mechanisms to foster cooperative behavior in order to co-create value by IT integration capabilities.

Appendix

Operationalization of the research constructs

Relational IT value (Prasad et al. 2013)

Level of agreement on a 7-point Likert scale from “very low” to “very high”

- PF1 IT-related investments within the network have decreased operational costs of network partners.
- PF2 IT-related investments within the network have increased market power of network partners.
- PF3 IT-related investments within the network have improved financial position of network partners.
- PF4 IT-related investments within the network have improved competitive position of network partners.
- PF5 IT-related investments within the network have reduced business risks of network partners.

IT integration capability (Saraf et al. 2007)

Level of agreement on a 7-point Likert scale from “very low” to “very high”

- IN1 Data are entered only once to be retrieved by most applications of the network partners.
- IN2 Data can be easily shared among network partners.
- IN3 Most software applications of network partners are successfully integrated within in the network.
- IN4 Most software applications of network partners work seamlessly across the network partners.

Commitment (Morgan and Hunt 1994)

Level of agreement on a 7-point Likert scale from “very low” to “very high”

- CO1 The relationships among network partners are something they are very committed to.
- CO2 The relationships among network partners are something they intend to maintain indefinitely.
- CO3 The relationships among network partners deserves their maximum effort to maintain.

Trust (Nicolaou et al. 2011)

Level of agreement on a 7-point Likert scale from “very low” to “very high”

- TR1 If required help, network partners would do their best to help each other.
- TR2 Network partners are interested in each other’s well-being, not just their own.
- TR3 Network partners can be characterized as honest.
- TR4 Network partners keep their commitments.
- TR5 Network partners perform their role in the network very well.
- TR6 Overall, network partners are capable and valuable member of the network.

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