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DISMANTLING THE ENVIRONMENTAL CONTEXT - THE ROLE OF ENVIRONMENTAL CHARACTERISTICS IN THE ORGANIZATIONAL ADOPTION OF OPEN STANDARD-BASED INTER- ORGANIZATIONAL INFORMATION SYSTEMS

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DISMANTLING THE ENVIRONMENTAL CONTEXT - THE ROLE OF ENVIRONMENTAL CHARACTERISTICS IN THE ORGANIZATIONAL ADOPTION OF OPEN STANDARD-BASED INTER-ORGANIZATIONAL INFORMATION SYSTEMS

Complete Research

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Abstract

Open standard-based inter-organizational information systems play a critical role in today's organizations and their relationships with business partners. However, theoretical understanding of organizational adoption of such systems in existing research is limited. Prior studies highlight the role of the external business environment in influencing organizational adoption of such systems, but lack focus on the various environmental context characteristics influencing organizational adoption decisions. This study conducts a structured analysis of scientific literature on factors of the organizational, technological, and environmental contexts that are able to influence the organizational adoption of open standard-based inter-organizational information systems. Using the results of the literature analysis, this study focuses on the critical role of the business environment in influencing organizational adoption of such systems and derives a typology of environmental context characteristics exhibiting inherently differing types of business environment related influence on organizational adoption decisions. The derived typology leads to a better theoretical understanding of organizational adoption of such systems and provides practitioners with a structured view on the external forces operating in the business environment of their organization. Finally, the study discusses important implications for future research in this context as well as for decision makers considering the adoption of particular systems.

Keywords: inter-organizational information systems, open standards, environmental context characteristics, business environment, literature analysis.

1 Introduction

The ability to conduct business transactions across organizational borders in electronic form by utilizing inter-organizational information systems (IOIS) holds the promise of substantial productivity gains and of generating considerable business value for today's organizations (Loukis and Charalabidis, 2012). Prominent examples of such IOIS include but are not limited to airline flight reservation systems such as American Airlines' SABRE system (Copeland and McKenney, 1988), systems for electronic integration based on custom proprietary standards for electronic data exchange (EDI) (Masseti and Zmud, 1996), electronic business-to-business (B2B) marketplaces such as the

B2B e-marketplace Covisint for the automotive industry (Howard et al., 2006), or Internet-based ordering platforms such as the PharmX system for the pharmaceutical sector (Reimers et al., 2013).

IOIS have existed for several decades (Barrett and Konsynski, 1982), and have since been successfully utilized in numerous contexts and industries (Iacovou et al., 1995; Ramamurthy and Premkumar, 1995). Most early IOIS were highly specific in their structure and purpose (Venkatraman and Zaheer, 1990). These systems were based on proprietary communication protocols and business process standards (Zhu et al., 2006a), with the primary goals to reduce costs of transactions and to minimize supply uncertainties in supply chains through the lock-in of supply chain participants (Johnston and Vitale, 1988; Kauffman and Mohtadi, 2004).

With the dawn of the Internet, open Internet-based communication protocols and procedures became increasingly important (Hovav et al., 2004). Based on these open standards for business interaction, the development of IOIS began to shift towards a higher focus on interoperability between, and collaboration among larger groups of organizations (Reimers et al., 2013; Zhu et al., 2006a). Open standard-based IOIS have been successfully deployed to digitalize procurement processes (Penttinen and Hyytiäinen, 2008), optimize inter-organizational business processes in high-technology supply chains (Venkatesh and Bala, 2012), as well as to enable B2B electronic markets (Yao et al., 2009).

Extant research on IOIS adoption acknowledged that IOIS seem to lack specific characteristics that differentiate them from any other innovation (Robey et al., 2008). However, it is also recognized that classical diffusion of innovations (DoI) theory (Rogers, 1962), which has been extensively utilized to analyse the organizational adoption of IOIS, is limited in the variety of analysable innovation characteristics. In particular, the rather general typology of classical DoI theory lacks an awareness of the business environment in which IOIS as networked systems are embedded (Lyytinen and Damsgaard, 2001; Robey et al., 2008). Prior research utilized alternative theories in addition to classical DoI to expand the body of knowledge on organizational IOIS adoption, as had previously also been called for by the IS community (Fichman, 2004; Robey et al., 2008). Recent studies investigated the specific nature of open standard-based IOIS, with a respective focus on the growing influence of the business environment, business collaboration, and relational exchange on the adoption of open standard-based IOIS (Christiaanse et al., 2004; Howard et al., 2006; Zhu et al., 2006a).

However, focus on the environmental context remained shallow in extant research on IOIS adoption. Similarly, there exists no approach to date that presents characteristics of the environmental context of IOIS adoption in a structured and aggregated way. Nevertheless, by focusing on these characteristics, being characteristics of the business environment the IOIS are embedded in, theoretical understanding of organizational IOIS adoption can be extended and IOIS artefacts can be attributed a role in theory beyond that of non-specific assets (Lyytinen and Damsgaard, 2011; Robey et al., 2008).

Thus, a focus on the influence of the environmental context on the adoption of IOIS by specifically incorporating characteristics of the business environment the IOIS are embedded in into further investigations, represents addressing a substantial gap in research that affects various domains in Information Systems (IS) research (Lyytinen and Damsgaard, 2011; Markus and Loebbecke, 2013; Robey et al., 2008). Furthermore, while a broad consensus on the factors influencing the adoption of proprietary IOIS already exists (Chatterjee and Ravichandran, 2004; Robey et al., 2008), there are to our knowledge no studies providing such a consolidated understanding of the specific factors influencing the adoption of open standard-based IOIS.

As a first step in the direction of further research with a special focus on the environmental context of organizational IOIS adoption, and to address the aforementioned deficiencies, we conduct a structured review of literature covering factors influencing the adoption of open standard-based IOIS. The primary contribution of our study is thereby to provide a concise and exhaustive typology of environmental context characteristics that are able to influence the organizational adoption of open

standard-based IOIS, thus providing an analytic theory-type contribution to the IS body of knowledge (Gregor, 2006). The main research questions guiding our investigation thus are:

- RQ1:** What are the factors identified in the technological, organizational and environmental contexts that can influence organizational adoption of open standard-based IOIS?
- RQ2:** How can the identified factors of the environmental context be meaningfully grouped into characteristic categories regarding the type of their influence on organizational adoption of open standard-based IOIS?

Acknowledging the differences between proprietary and open standard-based IOIS, and following the notion that IOIS have been continuously changing (Reimers et al., 2013; Robey et al., 2008), so that over time proprietary standard-based systems have been supplanted by open standard-based ones, we likewise focus our subsequent research primarily on open standard-based IOIS. First, we analyse literature on the adoption of open standard-based IOIS and identify factors of influence, with a special focus on factors relating to the environmental context. Furthermore, we discuss how the identified factors are able to influence organizational adoption decisions and conclude by deriving a typology of business environment influence on organizational adoption of open standard-based IOIS described by identifying characteristics of the environmental context. The derived typology leads to a better theoretical understanding of the organizational adoption of open standard-based IOIS and provides practitioners with a structured view on the external forces operating in the business environment of their organization.

2 Theoretical Background

2.1 Inter-organizational information systems

Existing research defines IOIS as information systems shared by two or more companies facilitating the creation, storage, transformation, and transmission of information across organizational boundaries (Johnston and Vitale, 1988). Such IOIS are characterized by two main parts being the content platform, transforming information between its internal organization-specific representation and a representation understandable by the IOIS, and the delivery platform, transferring or delivering the content from one organization to another as illustrated in Figure 1 (Zhu et al., 2006a).

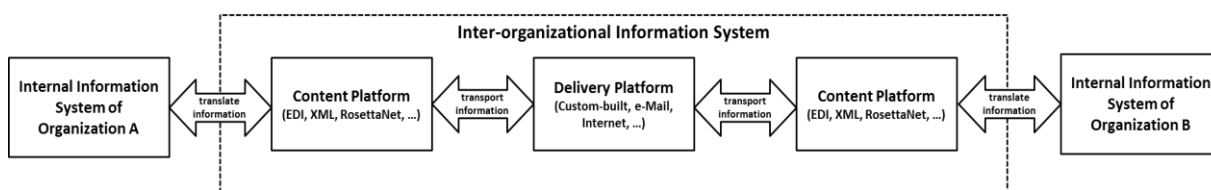


Figure 1. Schematic view of an inter-organizational information system

In early IOIS originating prior to the uptake of the Internet, the content platform (e.g. data standards such as the electronic data interchange (EDI) standards) as well as the delivery platform (e.g. the protocols and systems used to transmit the data) were proprietary (Venkatraman and Zaheer, 1990). Proprietary hereby means that use of these platforms was granted to organizations only under certain conditions protected by the legal rights of the respective copyright holders, and restricting them from other uses thereof, such as modification, sharing, studying, redistribution, or reverse engineering. However, through the emergence of Internet-based content platforms (e.g. the Extensible Markup Language (XML) standard, XML-based standards such as the RosettaNet standard, or the Unified Business Language (UBL) standard) and delivery platforms (e.g. electronic mail systems or file transfer protocol (FTP) systems) based on open standards developed and freely distributed by

independent consortia, IOIS began to shift from using fully proprietary content and delivery platforms to the use of newer open and Internet-based platforms (Reimers et al., 2013; Zhu et al., 2006a).

2.2 Theoretical foundations of business environment influence on the adoption of open standard-based IOIS

Research on the adoption of proprietary IOIS largely utilized the theoretical lens of classical DoI theory to investigate the influence of critical DoI factors on the organizational adoption of IOIS (Robey et al., 2008), following what Fichman (2004) calls the dominant paradigm of innovation adoption and diffusion research. According to this so-called dominant paradigm, the rate of adoption and diffusion of innovations is affected by the characteristics of both the innovation and each of the adopters (Rogers, 1962). The dominant paradigm makes several central assumptions, one of which is that innovations and their diffusion will benefit adopters. Furthermore, adopters make independent, rational choices and are guided by goals of technical efficiency, are always clear about their goals, and never decide to adopt an inefficient technology or to reject an efficient one (Rogers, 1962).

However, the underlying assumptions of the dominant paradigm have been claimed as insufficient to address questions concerning the adoption and diffusion of technically inefficient innovations (Fichman, 2004). Furthermore, the use of DoI theory's rather generic typology of innovation characteristics to investigate IOIS adoption is criticized for producing explanations and predictions similar to those gained in the analysis of any other innovation (Robey et al., 2008). As the focus of DoI theory lies in examining singular technologies not embedded in complex networks by investigating an organization's adoption decision according to organizational and technological factors, several studies acknowledge it to be insufficient for analyzing complex and especially networked systems such as IOIS (Lyytinen and Damsgaard, 2011, 2001). As a result, classical DoI theory in particular lacks characteristics specific to IOIS, and in particular to the business environment in which they are embedded, to be able to explain why specific IOIS are adopted while others are not (Markus and Loebbecke, 2013; Robey et al., 2008), as well as why structurally apparently similar adopters eventually exhibit different behaviors and meet differing decisions concerning IOIS adoption (Lyytinen and Damsgaard, 2011).

To expand theoretical understanding, studies of proprietary IOIS adoption included factors pertinent to the external business environment into their investigations and utilized alternate theories in addition to classical DoI. Iacovou et al. (1995) investigated the influence of the business environment on the organizational adoption of proprietary IOIS through the degree of competitive pressure and the degree of imposition by trading partners. Similarly, Premkumar and Ramamurthy (1995) investigated the influence of competitive pressure and exercised power by the dominant organization on organizational IOIS adoption decisions. Chwelos et al. (2001) further described the business environment through the degree of trading partner readiness, the degree of dependence on business partners, the degree of competitive pressure, as well as the degree of industry pressure, when analysing its influence on organizational adoption of proprietary IOIS. Chau and Hui (2001) utilized the degree of government influence, as well as the degree of business partner influence in the context of organizational adoption of proprietary IOIS. Grover (1993) further confirmed the influence of such business environment characteristics on adoption decisions. An overview of environmental factors investigated in proprietary IOIS adoption is given in Figure 2.

More recent research on the adoption of open standard-based IOIS similarly introduced the external business environment of an organization as the missing link, leading to better explanations of organizational adoption of IOIS as technological innovations. Building upon prior work on proprietary IOIS adoption, research on the adoption of open standard-based IOIS primarily relied on the technology-organization-environment framework (TOE), which combined the environmental with the organizational and technological contexts into a single model explaining organizational adoption and diffusion of technological innovations (Tornatzky et al., 1990).

However, investigations of the influence of environmental context factors on organizational adoption of open standard-based IOIS have largely remained fragmented concerning the choice of analyzed factors, having inherited the shallow focus on, and differing conceptions of, the business environment. Thus, they likewise neglected a rich emphasis on the environmental context by laying only ancillary focus on its various characteristics (Lyytinen and Damsgaard, 2011; Markus and Loebbecke, 2013).

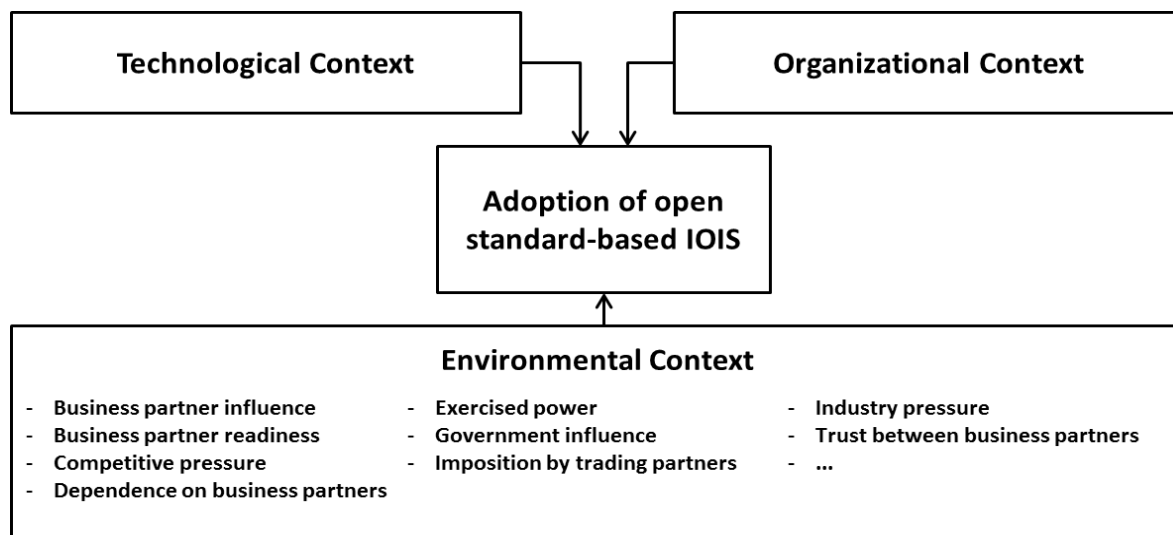


Figure 2. Environmental context factors investigated in literature on adoption of proprietary IOIS

Nevertheless, a rich emphasis on the business environment and its different mechanisms of influence on adoption of open standard-based IOIS can lead to more in-depth explanations of organizational adoption decisions. Participation in different eventually conflicting business communities can lead to different perceptions towards particular IOIS and different decisions being made towards their adoption (Markus and Loebbecke, 2013). Furthermore, when adopting organizations are situated in multiple overlapping business communities, they are eventually more reluctant to adopt IOIS than their structurally similar counterparts which are embedded only in one type of business community and do not have to ultimately cope with multiple variations of the same IOIS (Markus and Loebbecke, 2013). Additionally, business partner-specific characteristics are able to influence a focal organization's decision to adopt IOIS (Venkatesh and Bala, 2012). In a similar vein, the institutional environment, in which a focal organization is embedded, can exert forces on each of its members thus dictating a particular behavior towards IOIS adoption (DiMaggio and Powell, 1983). Furthermore, the dominant mode of inter-organizational interaction in a business community or an organization's ecosystem can possess a particular organizing vision and a perception of necessary key functionalities, affecting organizational decisions towards the adoption of particular IOIS (Lyytinen and Damsgaard, 2011). Finally, the degree of support from the government and its benevolence towards the diffusion of open standard-based IOIS (e.g. by offering incentives to organizations or by mandating the use of such systems) can likewise influence organizational adoption decisions (Tsatsou et al., 2010).

3 Research Method

The review of the literature was conducted using the recommendations of Webster and Watson (2002) for identifying relevant literature and structuring the analysis process, which are generally accepted in the IS field and provide a suitable foundation for the development of an analytic type theory as described by Gregor (2006). Accordingly, we started with leading journals in the IS field, further enriched with outlets from other areas such as management science and e-commerce, being also relevant to the research topic. We first included the eight journals from the "Senior Scholars' Basket

of Journals” of the Association for Information Systems (AIS) into our search. Additional journals from other areas, as identified by prior research on the topic (Robey et al., 2008), were then included to further widen the scope of the search. In total, a set of twelve journals was screened for this analysis as presented in Table 1. Though there exists debate on the selection of journals and its impact on the outcomes of the literature analysis (Straub, 2006), clear guidelines and criteria for a rigorous approach to literature selection are still lacking (Robey et al., 2008). By conducting our search among the journal set recommended by the AIS as well as additionally including recommendations for journal selection in prior research, we tried to achieve a rigorous and IS-focused methodical approach, which is also in line with the recommendations of Webster and Watson (2002). We further limited our search to encompass articles of the period from January 2003 to December 2013 to present a concise view of innovative literature on the adoption of open standard-based IOIS. There were several reasons for going back as far as 2003. First, we wanted to encompass all articles dated after the publication of the seminal article by Fichman (2004), which was also a focal point for research on open standard-based IOIS adoption, fostering investigations of the environmental context based on alternate theories in addition to classical theories of innovation diffusion and technology adoption in subsequent investigations. Second, we wanted to seamlessly follow up on prior literature reviews of the topic up to 2003 (Chatterjee and Ravichandran, 2004; Robey et al., 2008).

Journal Title	Hits Step 1	Hits Step 2	Hits Step 3
Management Information Systems Quarterly	151	16	2
Journal of Information Technology	113	11	1
Information Systems Research	395	21	2
Information and Management	285	32	3
Management Science	109	6	1
Journal of Management Information Systems	166	20	1
Journal of the Association for Information Systems	91	5	1
Journal of Strategic Information Systems	192	9	3
European Journal of Information Systems	36	8	3
Information Systems Journal	97	11	2
IEEE Transactions on Engineering Management	157	15	1
Journal of Organizational Computing and Electronic Commerce	160	21	1

Table 1. Selected journals and results of the multi-step literature search.

The search was conducted using the journal-own search engines of the relevant journals in Table 1. To mitigate any implementation-specific differences in the search logic of the different search engines, the search process was conducted in several steps. The first step involved a simplistic full-text search in journal-own search engines. Used search terms included various alternate variants of the terms “inter-organizational”, “inter-firm”, “electronic data interchange”, and “EDI” yielding a total of 1952 hits (e.g. “inter organizational”, “inter organisational”, “inter-organizational”, etc.). In a subsequent step, all relevant hits were screened by thoroughly reading the respective article’s title and abstract to identify its relevance for the analysis (Webster and Watson, 2002), yielding a total of 175 hits. In the third step, an offline full-text search (all articles were downloaded and availability of full text data in the documents was ensured) was conducted on the 175 resulting documents with the terms “open” and “internet”. Found documents were read in detail to identify if and how they addressed the adoption of open standard-based IOIS, and to strip literature reviews from our analysis retaining the focus on novel literature, yielding a final set of 21 relevant articles. Table 1 shows the results of our search as

well as the distribution of found articles across the searched journals. The final set of articles was then read in detail and transformed into a concept-centric representation as recommended by Webster and Watson (2002). The resulting representation, as shown in Table 2, is discussed in the following.

4 Results

A total of 21 research articles were identified focusing on the organizational adoption of open standard-based IOIS. To clearly structure and visualize our results, we utilized the TOE framework as a clear frameset to differentiation according to one of the three main contexts - organizational, technological, and environmental (Tornatzky et al., 1990). Thus, identified factors of adoption were categorized into the three main categories according to their affiliation to a particular context, as can be seen in Table 2. Furthermore, the identified factors were grouped into meaningful sub-categories.

4.1 Identified factors of the technological and organizational contexts

Our results show that with a total of 14 articles, a large portion of research investigating the adoption of open standard-based IOIS focused factors of the technological and organizational contexts. Analysed factors encompass classical technological factors such as compatibility, complexity, perceived benefits, adoption costs, and technological readiness, as well as classical organizational factors such as managerial complexity and organizational structure. These findings are in accordance with previous research on IOIS adoption (Chatterjee and Ravichandran, 2004; Robey et al., 2008), broadly acknowledging the importance of these predictors. Likewise, and in line with prior research, no technological or organizational factors specific to open standard-based IOIS or IOIS in general were found in the analyzed literature. However, several organizational factors have been identified, which were not present in prior research (Robey et al., 2008). These factors, grouped under the categories of organizational inertia, and organizational uncertainty, relate to two concepts emerging in the organizational context with influence on organizational adoption of open standard-based IOIS.

Organizational Inertia

Teo et al. (2006) describe organizational inertia as difficulties in organizational change pertaining to changes in corporate culture, structure or redesigning business processes. As the adoption and integration of IOIS is likely to affect the structure of the organization, it can thus influence an organization's decision to adopt such a system. Similarly, Hong and Zhu (2006) describe organizational inertia as being based on resistance to change and the degree of entrenchment with existing systems and infrastructure. Howard et al. (2006) further describe organizational inertia as being based on internal organizational resistance from employees. Venkatesh and Bala (2012) describe organizational inertia as being related to the degree of openness of an organization to new ideas and innovations, as well as to stem from routine rigidity described as the difficulty to change tightly embedded organizational routines (Bala and Venkatesh, 2007). In conclusion, factors in this category relate to internal organizational resistance originating from an organization's employees or its management to changes in corporate culture, organizational structure, or routines that are associated with the adoption of an open standard-based IOIS.

Organizational Uncertainty

Organizational uncertainty is described by Teo et al. (2006) as being based on fears of opening corporate systems to suppliers and customers, as well as uncertainty about achieving a critical mass of business partners and customers when adopting a particular IOIS. Venkatesh and Bala (2012) further emphasize uncertainty over standards in this context as the reluctance to adopt particular IOIS when the future and pervasiveness of the standards the IOIS is based on is unclear. Zhu et al. (2006a) emphasize concerns about data security and privacy on the Internet as being related to organizational uncertainty towards adopting open standard-based IOIS. Soliman and Janz (2004) share these

concerns on data security and additionally describe concerns about network reliability as equally related. Concluding, factors in this category relate to corporate concerns about security, privacy and network reliability on the Internet as the fundament of open standard-based IOIS, as well as to concerns about realizing the benefits of such networked systems.

Technological Factors	Compatibility	Lack of Interoperability, Process Compatibility, Relational Extendibility	Bala and Venkatesh, 2007; Teo et al., 2006; Venkatesh and Bala, 2012
	Complexity	Complexity, Process Complexity	Legner and Schemm, 2008; Melville and Ramirez, 2008; Soliman and Janz, 2004
	Perceived Benefits	Difficulties of Cost-Benefit Assessment, Expected benefits, Usefulness, EDI Support, Scalability	Hovav et al., 2004; Son et al., 2008; Teo et al., 2006; Venkatesh and Bala, 2012; Zhu et al., 2006a; Soliman and Janz, 2004
	Adoption Costs	Asset Specific Investments, Financial Costs, Implementation Costs, Setup Costs, Adoption Costs, Switching Costs	Christiaanse et al., 2004; Hong and Zhu, 2006; Legner and Schemm, 2008; Soliman and Janz, 2004; Zhu et al., 2006a
	Technology Readiness	Lack of IT Expertise and Infrastructure, Prior Use of EDI, Technology Competence, Technology Integration, Technology Readiness, Unresolved Technical Issues, Use of Outsourcing, Web Functionalities, Web Spending	Hong and Zhu, 2006; Legner and Schemm, 2008; Lin, 2006; Teo et al., 2006; Venkatesh and Bala, 2012; Zhu et al., 2006a, 2006b
Organizational Factors	Managerial Complexity	Lack of Clear Strategy, (Lack of) Top Management Support, Managerial Complexity, Managerial Obstacles, Problems in Project Management	Legner and Schemm, 2008; Lin, 2006; Soliman and Janz, 2004; Teo et al., 2006; Zhu et al., 2006a, 2006b
	Organizational Inertia	Difficulties in Organizational Change, Internal Organizational Resistance, Organizational Innovativeness, Perceived Obstacles, Routine Rigidity	Bala and Venkatesh, 2007; Hong and Zhu, 2006; Howard et al., 2006; Teo et al., 2006; Venkatesh and Bala, 2012
	Organizational Structure	Resource Rigidity, Firm Size, Scope of Operation, Industry Type, Organizational Centrality	Bala and Venkatesh, 2007; Hong and Zhu, 2006; Kauffman and Mohtadi, 2004; Lin, 2006; Venkatesh and Bala, 2012; Zhu et al., 2006b
	Organizational Uncertainty	Fear, Uncertainty, Standards Uncertainty, Transactional Risk, Data Security, Network Reliability	Soliman and Janz, 2004; Teo et al., 2006; Venkatesh and Bala, 2012; Zhu et al., 2006a
Environmental Factors	Business Community-specific Characteristics	Adherence to Universal Industry Standards, Competition Intensity, Clock Speed, Competitive Conflict of Interests, Conduciveness of Environment to Adoption, Network Complexity, Supply Chain Complexity, Trading Community Influence, Peer Adoption, Network Effects, Degree of Variance in Supply and Demand	Hovav et al., 2004; Howard et al., 2006; Kauffman and Mohtadi, 2004; Melville and Ramirez, 2008; Zhu et al., 2006a, 2006b
	Business Partner-specific Characteristics	Supplier's IT Capability, Suppliers Perceived Benefits, Trading Partner Readiness, Partner's Process Compatibility, Partner's Standards Uncertainty, Partner's Technology Readiness	Lin, 2006; Son et al., 2008; Venkatesh and Bala, 2012
	Regulatory Environment-specific Characteristics	Legal Barriers, Regulation, Regulatory Environment, Unresolved Legal Issues	Teo et al., 2006; Tsatsou et al., 2010; Zhu et al., 2006a, 2006b
	Relationship-specific Characteristics	Duration of Relationship, Relational Specificity, Relational Depth, Supplier's Transaction-specific Investment, Transaction Volume, Dependence of Suppliers, Dependence on Trading Partner, Transaction Costs, Perceived Transaction Costs, Procurement Costs, Competence-based Trust, Institution-based Trust, Openness-Trust, Reputation-based Trust, Trust Between Trading Partners	Bala and Venkatesh, 2007; Christiaanse et al., 2004; Hsiao, 2003; Ibrahim and Ribbers, 2009; Kauffman and Mohtadi, 2004; Legner and Schemm, 2008; Soliman and Janz, 2004; Son et al., 2008; Tsatsou et al., 2010; Venkatesh and Bala, 2012
	Institutional Environment-specific Characteristics	Competitive Pressure, Exercised Power, Firm Dominance, Coercive Pressure, Mimetic Pressure, Normative Pressure, Institutional Pressures, Pressure from Competitors, Pressure from Trading Partners	Bala and Venkatesh, 2007; Christiaanse et al., 2004; Lin, 2006; Soliman and Janz, 2004; Son et al., 2008; Venkatesh and Bala, 2012

Table 2. Identified factors influencing open standard-based IOIS adoption

4.2 Identified factors of the environmental context

Our results show that a major portion of 17 articles in total investigated the environmental context and its influence on organizational adoption, largely utilizing the TOE framework as a theoretical foundation in addition to the classical theories of innovation diffusion and technology adoption. While several characteristics identified in this context have already been investigated in prior studies on IOIS adoption (Robey et al., 2008), the quantity and diversity of environmental context characteristics investigated in the context of adoption of open standard-based IOIS is surprising. However, while the aggregated view on the environmental context reveals the richness of investigations in this direction, it also reveals the fact that in the environmental context, identified studies barely focused on more than two of the sub-categories identified in our analysis of the extant literature. Notable exceptions are investigations by Venkatesh and Bala (2012) and Son et al. (2008) which gave especial focus to a larger number of factors in the environmental context covering business partner characteristics, relationship characteristics, institutional pressures, and relational trust.

Business Community-specific Characteristics

Business community-specific characteristics encompass factors not pertinent to any particular organization but to a particular business community. Hovav et al. (2004) summarize business community specific characteristics as the conduciveness of the business environment to the adoption of open standard-based IOIS. Zhu et al. (2006a, 2006b) investigate the degree of competition intensity in a business community, the degree of influence a particular business community has on an organization's decision making as well as network effects in terms of the degree of adoption among business partners as important environmental context characteristics influencing organizational adoption decisions. Howard et al. (2006) further identify the degree of competitive conflicts of interests in the business community, the degree of adherence to universal industry standards in the business community, as well as the degree of complexity of the business partner network as factors characterizing a particular business community, and influencing organizational adoption decisions. In a similar vein, Kauffman and Mohtadi (2004) describe the degree of variability in supply and demand as an environmental context characteristic influencing organizational adoption decisions. Furthermore, Melville and Ramirez (2008) describe the degree of change in an industry regarding new products, processes and organizational structures as well as the degree of complexity in the supply chain as important business community-specific characteristics influencing organizational adoption decisions.

Business Partner-specific Characteristics

Characteristics in this category encompass factors which characterize business partners of a focal organization. Lin (2006) characterizes business partners according to their IT-readiness or general IT-expertise, as well as according to the degree of open standard-based IOIS use by business partners, and analyses the influence of these characteristics on organizational adoption decisions. Venkatesh and Bala (2012) lay special emphasis on business partners of a focal organization and describe business partners' process compatibility, standards uncertainty, and technology readiness as important business partner characteristics having synergistic effects on a focal organization's decision to adopt open standard-based IOIS. Similarly, Son et al. (2008) investigate suppliers' IT-capability and suppliers' perceived benefits as characteristics influencing a focal organization's adoption decision.

Regulatory Environment-specific Characteristics

Regulatory environment-specific characteristics encompass factors not pertinent to any particular organization or a particular business community. These factors mirror the legal framesets for economic interaction of all actors alike, irrespective their business community or other affiliation. Teo et al. (2006) describe the presence of unresolved legal issues such as unclear legal landscapes and differing laws across different countries as a characteristic influencing organizational adoption decisions. Zhu et al. (2006b) further highlight the importance of the regulatory environment, and the

degree of its benevolence and support towards the diffusion of open standard-based IOIS within its legal borders as an important characteristic of the regulatory environment. Similarly, Zhu et al. (2006a) describe the presence of legal barriers as an important characteristic. Tsatsou et al. (2010) further stress the importance of active regulatory support towards the diffusion of IOIS as a characteristic influencing the organizational adoption of such systems.

Relationship-specific Characteristics

Relationship-specific characteristics encompass factors characterizing the type of relationship between business partners. Bala and Venkatesh (2007) characterize the relationship between business partners by the degree of relational specificity, describing it as the degree to which an organization willingly develops or sustains the relationship with a particular business partner, and the degree of relational depth, defining it as the degree of variety in forms of exchange in the relationship with a particular business partner. Son et al. (2008) describe the transaction volume between business partners, the amount of supplier's transaction specific investments, and the degree of resource dependence of suppliers on the focal organization as factors characterizing a particular relationship between business partners. Venkatesh and Bala (2012) further describe the duration of a relationship between business partners as well as the degree of dependency on particular business partners as characteristics of their relationship. Kauffman and Mohtadi (2004) further explicate costs of procurement, based on the classical notion of transaction costs as described by transaction cost economics, as relationship-specific characteristics influencing the organizational adoption of open standard-based IOIS. Similarly, Christiaanse et al. (2004) acknowledge the influence of perceived transaction costs on organizational adoption decisions. Furthermore, Venkatesh and Bala (2012) investigate relational trust as a characteristic describing the degree of stability and certainty in an inter-organizational relationship between business partners. Similarly, Hsiao (2003) describe trust based on the competence of business partners, trust based on the reputation of business partners as well as trust based on institutional norms in a business community or regulatory environment as viable characteristics of an inter-organizational relationship, being able to influence organizational adoption of open standard-based IOIS. Soliman and Janz (2004) similarly emphasize the importance of trust between trading partners as a factor of influence. Ibrahim and Ribbers (2009) focus on trust based on the competence of business partners, and on openness-trust based on the honesty of communication and willingness to share information as characteristics of inter-organizational relationships. Tsatsou et al. (2010) further acknowledge the importance of trust in fostering organizational adoption of open standard-based IOIS.

Institutional Environment-specific Characteristics

Factors characterizing the institutional environment of an organization stem from neo-institutional thoughts describing forces of institutional isomorphism present in the environmental context, often referred to as institutional theory (DiMaggio and Powell, 1983). According to institutional theory, the institutional environment of organizations can dictate a certain code of conduct upon its members, also involving the use of particular, even inferior, technologies. Such institutional forces can be of a coercive, mimetic, and normative type. Mimetic forces result from pressures expressed through the need to imitate the actions of other eventually competing organizations, when a focal organization is subject to uncertainty relating its own decisions and further actions. Formal or informal influence on a focal organization by a business partner or competitor, e.g. by sanctioning illegitimate or promoting legitimate action, leads to coercive forces acting on the focal organization. Normative forces relate to the need to be accepted by other members of equal occupation, such as a particular business community. Soliman and Janz (2004) identify coercive pressures felt from trading partners, and normative pressures felt from the business community as important factors influencing organizational adoption decisions. Christiaanse et al. (2004) identify coercive forces, describing them as the exercised power of dominant business partners, as an important factor. Lin (2006) investigates the influence of coercive forces, described as the degree of competitive pressure, on a focal organization's decision to

adopt open standard-based IOIS. Similarly, Son et al. (2008) investigate the degree of exercised power by a dominant organization as a form of coercive pressure influencing adoption decisions in a buyer/supplier context. Finally, Bala and Venkatesh (2007) and Venkatesh and Bala (2012) investigate the influence of institutional forces on organizational adoption decisions by addressing all three types of institutional isomorphism.

5 Towards a Typology of Business Environment Influence on Organizational Adoption of Open Standard-based IOIS

Our analysis of scientific literature on open standard-based IOIS clearly shows the importance of the business environment for the adoption of open standard-based IOIS on an organizational level by highlighting the quantity and diversity of business environment-related environmental context characteristics investigated in the context of open standard-based IOIS adoption. Furthermore, our analysis uncovers a set of types of environmental context characteristics influencing organizational adoption decisions, each of them being inherently distinct in how they manifest themselves in the environmental context of and the type of business environment influence they have on organizational adoption of open standard-based IOIS. Figure 3 presents this finding in schematic form.

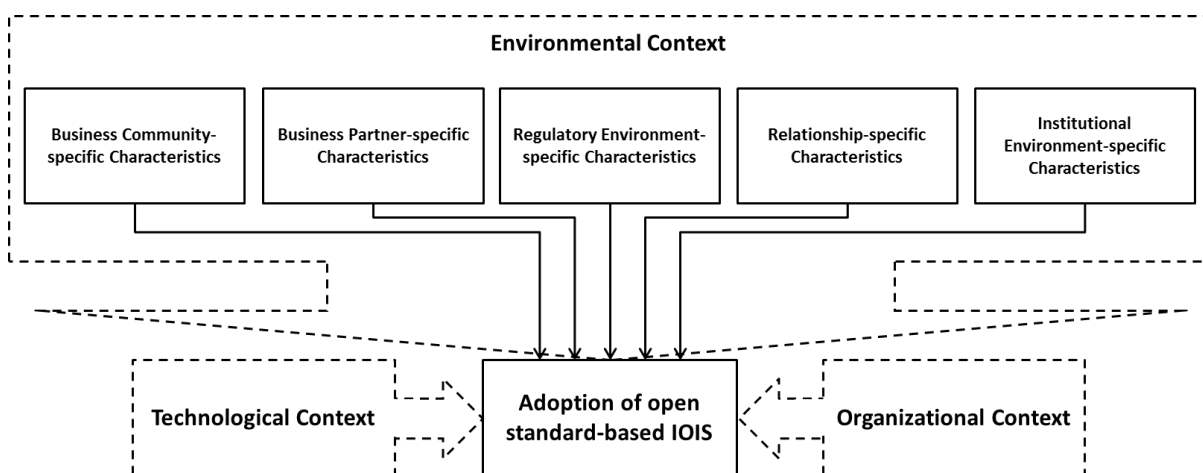


Figure 3. Schematic view of the typology of environmental context characteristics

Business community-specific characteristics correspond to a particular business community (Markus and Loebbecke, 2013). These characteristics describe a particular condition with regard to the adoption of open standard-based IOIS, in which a particular community, comprising eventually competing organizations of similar type, is situated at a given point in time. Factors such as the degree of adherence to industry standards, the degree of competition intensity, or the business community's conduciveness to adoption characterize a particular business community in terms of the influence it has on organizational adoption decisions of all of its members. Thus, a difference in business community affiliation of otherwise similar organizations, or the membership of an organization in multiple business communities with eventually differing characteristics, does provide a possible explanation for differing adoption intentions of otherwise similar organizations according to other characteristics of the organizational, technological as well the environmental contexts.

Business partner-specific characteristics correspond to particular business partners of a focal organization. These characteristics describe the current condition of a particular business partner in terms of their technology readiness towards adopting open standard-based IOIS. This is expressed through factors of the technological context such as business partner's process compatibility, perceived benefits, or perceived adoption costs. These characteristics provide a possible explanation

for varying adoption behaviors of otherwise similar organizations, rooted in differences in their respective business ecosystems (meaning the particular structure of their suppliers and customers such as a prevalence of small suppliers with low IT-readiness) (Lyytinen and Damsgaard, 2011).

Regulatory environment-specific characteristics do influence all organizational actors located in a particular regulatory environment equally (Tsatsou et al., 2010). Nevertheless, regulatory requirements can vary considerably between different regulatory environments (e.g. different countries). Thus, by describing the benevolence of the regulatory environment towards the adoption of open standard-based IOIS within its legal region, these characteristics provide possible explanations for differing adoption intentions of otherwise similar organizations located in different regulatory environments, or organizations located in multiple regulatory environments with eventually differing characteristics.

Relationship-specific characteristics such as relationship duration or intensity are likewise able to influence organizational adoption decisions, especially when an important relationship to a particular business partner is threatened depending on a particular decision being made towards the adoption of open standard-based IOIS (Bala and Venkatesh, 2007). However, these factors are not specific to a particular business community; neither do these describe characteristics of business partners or any other type of environmental influence. These characteristics describe the depth of the relationship between particular business partners through material factors such as relationship type and duration, transaction volume, and transaction cost, but also through social factors such as reputation and trust. Thereby, they provide a possible explanation for the formation of sustained close inter-organizational relationships between business partners despite the lack of lock-in mechanisms such as proprietary standards or high asset specific investments.

Finally, characteristics of the institutional environment describe the particular condition and composition of institutional forces present in the particular institutional environment of an organization. These forces can stem from dominant business partners, suppliers, and customers, as well as from the need to imitate successful competitors of the same business community. Active participation in trade associations and the adherence to associated norms can also direct decisions towards the adoption of open standard-based IOIS. These characteristics are not specific to any other type of environmental influence and are able to trigger differing adoption behaviors of otherwise similar organizations, irrespective of the presence of other differences. Exemplarily, the voluntary participation of an organization in beneficial initiatives, such as the ecologically efficient use of IT (Watson et al., 2010), can produce institutional forces leading to such actions as the adherence to beneficial norms. Similarly, institutional forces can stem from professionalization and the adherence to particular norms and values such as mental models taught in particular management schools (DiMaggio and Powell, 1983), or the presence of certain managerial fads (Abrahamson, 1991).

6 Conclusion and Outlook

Summarizing our findings, we conclude by emphasizing several important implications of these findings for research and for organizational decision makers.

Prior research on the adoption of open standard-based IOIS has largely investigated the influence of the environmental context on organizational adoption decisions. To provide a concise and exhaustive typology of characteristics of the environmental context influencing organizational adoption of open standard-based IOIS, we conducted a structured review of relevant literature, thus answering our first research question. The results of our literature analysis show that despite the richness of investigations on the influence of environmental factors on adoption of open standard-based IOIS, prior research rarely analyzed more than two different types of environmental context characteristics in conjunction.

Therefore, we urge researchers to be cautious when including the environmental context into investigations of the organizational adoption of open standard-based IOIS, as the influence of the

analyzed factors of the environmental context and the mode of their operation can vary considerably with the type of the business environment influence they belong to.

The typology of business environment influence on organizational adoption of open standard-based IOIS derived in this study as an answer to our second research question is able to serve as a theoretical basis in future investigations and can help to extend the theoretical understanding on and to produce more precise explanations of organizational adoption decisions. Furthermore, by deriving a set of environmental context characteristics inherent to open standard-based IOIS, being characteristics of the business environment in which they are embedded, this study extends the theoretical understanding on the open standard-based IOIS artefact and provides theoretical support for its role in theory beyond being just a non-specific asset.

By considering interrelationships among different theory types as drawn by Gregor (2006), future investigations can utilize the derived typology to formulate more precise theories for explaining and predicting organizational adoption of open standard-based IOIS utilizing qualitative as well as quantitative methods. Exemplarily, when including all types of business environment influence into investigations of organizational open standard-based IOIS adoption, quantitative research is able to provide causal models explaining a higher degree of variance by accounting for the various distinct types of business environment influence. Similarly, qualitative research can use this more detailed view on the environmental context to better explain otherwise contradictory findings related to contrarily operating types of business environment influence on organizational adoption decisions.

The results of our analysis further present organizational decision makers with a set of critical characteristics of the business environment in which a particular open standard-based IOIS is to be embedded. Utilizing this typology, decision makers can assess the particular business environment surrounding a focal organization in a structured way and gain a more detailed understanding of the operating external forces in the particular business environment. This in turn can lead to more precise decision making regarding the adoption of particular open standard-based IOIS. For example, by analyzing the regulatory environments of trading partners in addition to the analysis of their business community affiliation (e.g. industry type), decision makers of a focal organization can gather information on business communities within which their organization operates, their size, and regulatory requirements of their members. They can then use this information to better choose a particular open standard-based IOIS compatible with the requirements of the business communities within which their organization operates the most to boost adoption among trading partners.

However, the results of our literature analysis are subject to several limitations. Our literature review aimed to present an exhaustive typology of environmental context characteristics influencing organizational adoption of open standard-based IOIS, being characteristics of the business environment in which they are embedded. Thus, the derived typology does not present an integrated view of characteristics of the business environment in general, but does include an exhaustive typology of business environment characteristics that can influence organizational adoption decisions, as derived from extant research on open standard-based IOIS adoption. We acknowledge that there may be other business environment characteristics, yet uncovered in the context of open standard-based IOIS adoption, that should be the aim of further research. By presenting an integrated view of the characteristics of the business environment, further research can eventually provide an extension to the present typology in the context of open standard-based IOIS adoption. Furthermore, we limited our analysis to encompass a set of only 12 journals. However, the selection of journals can have a critical impact on the outcomes of the literature analysis (Straub, 2006). While we based our selection on the recommendations of the AIS and prior literature on the topic, future research should extend this analysis to encompass a larger set of journals to further investigate the influence of the environmental context on organizational adoption of IOIS in general, as well as to further confirm our results. Likewise, while we focused our analysis on open standard-based IOIS, future research should investigate the generalizability of our findings to other and broader contexts.

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