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Toward a Process View in Adoption of Interorganizational Information Systems: A Literature Review

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Abstract. A better understanding of how interorganizational information systems (IOIS) are adopted is important since a successful implementation of information systems (IS) can be expected to raise long-term organizational efficiency. However, organizations often find IOIS adoption to be a bumpy ride, and despite the apparent reason to come to terms with IOIS, the utilization rate is still low. IOIS adoption is an interesting process to study, because of the high complexity in successful adoption of IOIS created by the increased number of organizations involved in the adoption process. This literature review found four different streams of research: 1) studies explaining why organizations adopt or reject IOIS by investigating factors determining adoption of or barriers to IOIS adoption; 2) studies explaining how to create the desired organizational effects from IOIS; 3) studies explaining how IOIS are affecting the buyer-supplier relationship they are introduced into; and 4) studies categorizing the structure of IOIS adopters in different configurations. Seemingly only limited effort has been made to study the actual adoption process. This apparent lack of studies of the adoption process calls for research opening the black box of IOIS adoption.

Keywords: Interorganizational information systems, adoption, literature review.

1 Introduction

The area of concern of this review is the adoption of interorganizational information systems (IOIS). Drawing on a definition proposed by Kumar & van Dissel (1996), IOIS are “ICT - based systems that transcend legal enterprise boundaries”. Lyytinen & Damsgaard (2011) define IOIS as information systems used jointly by at least two autonomous organizations to facilitate the creation, storage, transformation and transmission of information across organizational boundaries. IOIS are to be viewed as the technical implementation of interorganizational relationships.

The wide body of literature on adoption, diffusion and use of interorganizational information systems offers many different explanations for the factors that influence the decision process in adoption and diffusion of IOIS. Burton Swanson & Ramiller (1997) offer the concept of an organizing vision discourse both formed by and forming the interorganizational community as being central to development and diffusion of an IOIS. Hart & Saunders (1997) explain IOIS adoption with the level of trust or use of power in buyer-supplier relationships. Premkumar & Ramamurthy (1995) find four organizational variables (internal support, benefits potential of Electronic Data Interchange (EDI), EDI compatibility

and resource intensity) and two interorganizational variables (customer support and competitive pressure) to be determinants of EDI diffusion. But despite the diversity and plenty of research, recent studies show that the outcome of introducing interorganizational information systems is still uncertain (Ali, Kurnia, & Shanks, 2008; Nagy, 2006), and despite the apparent reason and lengthy opportunity to come to terms with interorganizational information systems, the utilization rate is still low (Nagy, 2006). Apparently we have still not found the philosopher's stone of IOIS adoption and in order to uncover the research already done to see if any research might be missing, the purpose of this article is to survey and synthesize prior research and to categorize the research which has been carried out so far. This categorizing of prior research is expected to reveal changing foci over time as the research agenda progresses from being somewhat immature to more profound and consolidated since more research is constantly added to the body of knowledge in IOIS adoption. The categorization of prior research will allow for the identification of potential research gaps that have not been covered yet.

2 Method

The area of concern of this review is to categorize prior research in adoption of interorganizational information systems. To categorize the existing body of knowledge I have depth-read the papers looking for commonly used concepts as well as the theories which have been used to explain the adoption of IOIS, as both commonly used concepts and theories are expected to change during the period where the the body of knowledge matures. For the categorization I have also examined whether the conducted studies focus on identifying independent variables causing changes in a dependent variable, which is what Van de Ven & Poole (2005) call a variance approach, or whether the conducted studies focus on how a sequence of events unfolds to produce a given outcome, which is what Van de Ven & Poole (2005) call a process approach. The variance approach has been dominating in studies of organizational change, and even if the variance approach offers good explanations of change driven by deterministic causation it might overlook other critical aspects of change (Van de Ven & Poole, 2005). If the body of knowledge on IOIS adoption mainly offers explanations of change driven by deterministic causation, studies conducted within the process approach might offer explanations as to why despite the diversity and plenty of research the outcome of introducing interorganizational information systems is still uncertain (Ali et al., 2008; Nagy, 2006), and the utilization rate is still low (Nagy, 2006).

The search terms are developed with respect to the fact that different journal databases use different terminology. Combining different terms for 'information system' in one facet with different terms for 'adoption' in another facet, and 'inter org*' in the third facet produces a search result containing papers that touch upon the three core aspects of this review.

IOIS became more widely spread with the emergence of the Internet in 1995, which made the technology more easily accessible and cheaper to use than the proprietary systems otherwise needed for interorganizational exchange of information (Lyytinen & Damsgaard, 2011). For this reason the review at hand will comprise the period from 1995 till now. In 1995 the adoption of IOIS was often to replace manual work processes with information technology. By that time it was quite popular to adopt EDI in supply chains to replace the manual exchange of structured business information e.g. orders given by telephone, fax or letter. When these manual steps occur in otherwise automated processes they slow the

processes down and increase the risk of errors because data have to be keyed in by hand. Today it would probably be fair to expect that most adoptions are to replace already existing information systems with new information systems, as the required technology has been in use for almost 20 years and that a rise in long-term organizational efficiency can be expected when adopting information systems to support the daily operations as well as administration (Krasnikov, Jayachandran, & Kumar, 2009; Menon, Yaylalicegi, & Cezar, 2009; Parry, 2011).

Webster & Watson (2002) recommend to start with the leading journals when doing a literature review, as the major contributions are likely to be found here. In the IS field the eight top journals have been identified by the Senior Scholars Consortium of the Association for Information Systems (AIS) in their basket of eight (AIS, 2011). As these eight journals are available in either one or both of the databases Business Source Complete and Scopus the bibliographic searches have been conducted in both databases. By conducting bibliographic searches in both Business Source Complete and Scopus, the searches not only cover the eight top journals but also a large number of other journals in the IS field which are available in these databases, e.g. multidisciplinary outlets and specialty areas omitted by the basket of eight. Also the searches in Business Source Complete and Scopus cover business journals ranked in top 50 by AIS' Journal Ranking Page (AIS, 2013). These journals are very attractive for IS researchers and the search terms discard all the papers from these journals that are off topic with respect to this particular literature review. Concentrating on papers investigating the topic empirically, the business journals to be included are Management Science, Decision Science, Academy of Management Journal, Organization Science, Administrative Science Quarterly, and Operations Research. Papers published in these journals are included in the literature review, whereas papers from other non-IS journals and all papers from review journals are excluded, as this review is intended for the IS audience. In all, approximately 180 journals are covered in the searches. Only peer-reviewed content in English is searched. The time period is limited to 1995-2013 because the internet became commercially available in the mid-1990s hence easing the adoption and diffusion of interorganizational information systems. Conducting the bibliometric search in Business Source Complete yielded 198 papers and 177 papers in Scopus. Merging the two results in EndNote, discarding duplicates, narrowed the result to 214 unique papers. Papers published in journals that were neither IS field journals nor top business journals were discarded, leaving me with 120 unique IS field or top business papers. For these 120 resulting papers, the central theme and key concepts of the papers were identified to determine the relevance for the literature review topic; adoption of IOIS. Papers focusing e.g. on how to use IOIS as an instrument to price goods, increase profit, or how to undertake the technical design, or development of IOIS were left out of the review as well as literature reviews. The review discusses the remaining 37 relevant papers in detail. These 37 remaining papers were studied using open coding to inductively derive categories from data (Charmaz, 2006). These different categories were identified and registered in an Excel sheet for future reference during the analysis. The commonly used concepts discussed in the literature review at hand were identified by analyzing this Excel sheet.

3 Analysis

In order to discover any movement in the structure of the topic, the papers were split in 5 year periods, ranging from 1995 to 1999, 2000 to 2004, 2005 to 2009 and 2010 till now.

3.1 IOIS factors and barriers, 1995 – 1999

In the papers covering the period from 1995 to 1999, eight out of the nine relevant papers use the variance approach to identify either factors contributing to the success of IOIS adoption (Argyres, 1999; Cavaye & Cragg, 1995; Hart & Saunders, 1997; Premkumar & Ramamurthy, 1995; Ramamurthy, Premkumar, & Crum, 1999), or barriers to IOIS adoption and ways of overcoming them (Cavaye, 1995; Kumar & van Dissel, 1996; Kumar, Van Dissel, & Bielli, 1998). In the last paper, Burton Swanson & Ramiller (1997) offer a process approach narrating how information systems are applied and diffused among organizations through the institutional process of forming an organizing vision of the IOIS within and across the adopting organizations. Theories used to explain the adoption of IOIS are diffusion of innovation theory (Cavaye, 1995), different economic-rational theories such as transaction cost theory and competitive benefits (Argyres, 1999; Cavaye, 1995; Kumar & van Dissel, 1996; Kumar et al., 1998; Premkumar & Ramamurthy, 1995; Ramamurthy et al., 1999) as well as trust and power (Hart & Saunders, 1997). By depth-reading the papers, looking for common concepts, the concepts commonly found were: *‘Interorganizational systems’* denominating the IT-based system manifestation of interorganizational relationships designed to operationalize the relationships between the partners in an alliance (Kumar & van Dissel, 1996) and *‘EDI’* referring to the computer-to-computer communication between two or more business entities of standardized business-related information (Premkumar & Ramamurthy, 1995). *‘Sponsors’* denominating the organizations which develop and implement IOIS to handle interorganizational relationships (ibid.). *‘Adopters’* denominating the organizations that are the intended users of IOIS (ibid.). *‘Trust’* referring to confidence that the behavior of another organization will conform to one’s expectations (Hart & Saunders, 1997). *‘Power’* defined as the capability of a firm to exert influence on another firm to act in a prescribed manner (ibid). Even though it is not explicitly mentioned in any of the papers, the technology enabling electronic exchange of interorganizational information was by that time in its infancy, so the papers must be concerned with IOIS replacing manual work processes.

3.2 Creating effects with IOIS, 2000 – 2004

In the papers covering the period from 2000 to 2004 12 papers were found to be relevant. Four of these are concerned with factors contributing to the success of IOIS adoption (Chau & Jim, 2002; Chwelos, Benbasat, & Dexter, 2001; Garfield, Kamis, & LeRouge, 2004; Teo, Wei, & Benbasat, 2003), and two explore barriers to IOIS adoption and ways of overcoming them (Allen, Colligan, Finnie, & Kern, 2000; Han, Kauffman, & Nault, 2004). Four papers are concerned with harvesting the effects of IOIS: Kaefer & Bendoly (2000) discuss the scenarios determining cost effectiveness of IOIS, Truman (2000) is concerned with how to effectively integrate EDI with internal systems and thereby increasing the effects of IOIS, Zhu & Weyant (2003) explore how strategic decisions to increase competitive capability with IOIS are taken, and Subramani (2004) uncovers how supplier firms use supply chain

management systems to create benefits. Two papers are constructing a theory: Johnston & Gregor (2000) are explaining the diffusion, adoption and operation of supply chain e-commerce technologies, and Wastell, Kawalek, Langmead-Jones, & Ormerod (2004) are exploring the role of information systems in supporting public sector partnerships. Only the paper by Johnston & Gregor (2000) explaining the diffusion, adoption and operation of supply chain e-commerce technologies offer a process approach explaining how a sequence of events over time leads to IOIS adoption. The other 11 papers are looking at IOIS adoption as a dependent variable in which change is explained with a set of independent variables. Still both diffusion of innovation theory and different economic-rational theories such as transaction cost theory and competitive benefits as well as trust and power are used to explain the adoption of IOIS (Allen et al., 2000; Chwelos et al., 2001; Subramani, 2004; Truman, 2000). But now also institutional theory is used to explain the intention to adopt IOIS (Teo et al., 2003). *‘Interorganizational systems’* is still a commonly used concept in the subset of papers covering the years from 2000 to 2004, but now also *‘e-commerce’* is used by approximately half of the papers without any attempt to define the concept, though. Also the term *‘sponsors’* is still used to identify the organization(s) with the primary responsibility for development, maintenance and operation of IOIS (Truman, 2000), but it seems that the more passive term *‘adopters’* is discontinued in favor of the more neutral term *‘participant’* with the definition “users that perform no sponsoring role” (Truman, 2000) or the terms naming the functional role in the interorganizational relationship: *‘payer’* in financial EDI (Teo et al., 2003), *‘borrower’* in financial risk management IOIS (Han et al., 2004) or *‘supplier’* in supply chain management systems (Subramani, 2004). Only two papers are explicitly addressing the replacement of manual work processes (Allen et al., 2000) or the actual development of new information exchange processes (Wastell et al., 2004). In the remaining papers it is unclear whether the IOIS’ are replacing existing information systems or manual work processes.

3.3 Post-adoption effects of IOIS on the buyer-supplier relationship, 2005 – 2009

In the papers covering the years from 2005 to 2009, ten papers were found to be relevant, all of them using the variance approach. In this subset eight papers are concerned with factors determining adoption or use of IOIS (Cho, 2006; Geri & Ahituv, 2008; Grover & Saeed, 2007; Huang, Janz, & Frolick, 2008; Khazanchi, 2005; Melville & Ramirez, 2008; Nicolaou & McKnight, 2006; Son & Benbasat, 2007). The remaining two papers are concerned with post-adoption effects of IOIS on the buyer-supplier relationship in organizations actually using IOIS. Son et al. (2005) show that “the customer’s reciprocal investment in the form of EDI-related support” is a factor that will increase the EDI volume and diversity between trading partners, whereas the customer’s exercise of power as means to the same end is not effective. Saeed, Malhotra, & Grover (2005) show how the contextual variables competitive intensity, product characteristics, and internal integration affect process efficiency and sourcing leverage through the use of IOIS. Still both diffusion of innovation theory and different economic-rational theories such as transaction cost theory and competitive benefits as well as trust and power are used to explain the adoption of IOIS (Cho, 2006; Grover & Saeed, 2007; Huang et al., 2008; Melville & Ramirez, 2008; Nicolaou & McKnight, 2006; Saeed et al., 2005; Son & Benbasat, 2007; Son et al., 2005). In addition to these evergreens,

Khazanchi (2005) uses structural contingency theory to explain under what conditions (or factors) an organization should consider itself as a likely candidate for EDI adoption. Eight out of ten papers are using the term '*interorganizational systems*' or '*EDI*', but Cho (2006) has studied what factors are impacting an organization's intention to adopt a '*third-party B2B portal*', and Son & Benbasat (2007) have studied the motivations for organizational strategic moves toward '*B2B electronic marketplaces*'. The use of these terms suggests that the internet enables a more loosely coupled design of IOIS between organizations. A distinctive difference between this subset of papers and the former two subsets is that the terms 'sponsor/adopter' have now been replaced by the more neutral terms '*initiator/participant*' or by the terms identifying the functional role in the interorganizational relationship '*customer/supplier*' (Son et al., 2005), '*clothing company/manufacturer*' (Cho, 2006). When used in this subset of papers, the term '*adopter*' is now dividing the current users, i.e. organizations, that have already adopted IOIS from '*non-adopters*' i.e. organizations that haven't adopted IOIS (Cho, 2006; Geri & Ahituv, 2008; Son & Benbasat, 2007). None of the papers explicitly mention whether the IOIS are replacing manual work processes or existing information systems.

3.4 Configuration of IOIS adopters, 2010 – 2013

In the papers covering the years from 2010 to 2013 six papers were found to be relevant. Two papers are concerned with factors determining adoption or use of IOIS (Henderson, Sheetz, & Trinkle, 2012; Mouzakitis & Askounis, 2010). Two of the remaining papers are concerned with the structural configuration of IOIS adopters: Lyytinen & Damsgaard (2011) shift attention away from viewing IOIS adoption as done by independent organizations – because one adopter cannot form an interorganizational system alone - to an 'adopter configuration' consisting of at least two organizations sharing an organizing vision and key functionality. Rodón & Sesé (2010) propose a typology that characterize IOIS by their structural configuration, and are thereby handing us four categories of IOIS configurations: market, hierarchy, net and hub. One paper is researching IOIS adoption in developing countries (Ali & Kurnia, 2011), and one paper is researching the institutional underpinning of IT innovation diffusion at the interorganizational level (Kaganer, Pawlowski, & Wiley-Patton, 2010). Three of the papers in this subset use the variance approach to predict IOIS adoption or success (Ali & Kurnia, 2011; Henderson et al., 2012; Mouzakitis & Askounis, 2010), two papers offer a adopter configuration typology (Lyytinen & Damsgaard, 2011; Rodón & Sesé, 2010), and one study use the process approach by exploring the forming of an actual organizing vision of IT innovation diffusion at the inter-organizational level (Kaganer et al., 2010). In this subset of papers diffusion of innovation theory is used to explain the adoption of IOIS in a single paper (Henderson et al., 2012). Other theoretical underpinnings are organizing vision (Kaganer et al., 2010; Lyytinen & Damsgaard, 2011), Giddens structuration theory (Rodón & Sesé, 2010), and the Technological–Organizational–Environmental framework (Henderson et al., 2012). Only one paper is using the term '*interorganizational systems*' (Ali & Kurnia, 2011), but a new term '*interorganizational information systems*' (IOIS) with the same meaning is now being used by Rodón & Sesé (2010) as well as Lyytinen & Damsgaard (Lyytinen & Damsgaard, 2011). None of the papers explicitly mention whether the IOIS' are replacing manual work processes or existing information systems.

4 Discussion

There are interesting facts to be observed in the review. 24 out of 37 reviewed papers were predominantly concerned with economic-rational factors leading to success with or barriers to the adoption of IOIS. As summarized in Table 1 new foci emerged in the research agenda over time starting with factors leading to success with or barriers to the adoption of IOIS, moving to how to create effects with IOIS, to how adoption of IOIS would impact the organization, and ending with how to categorize the configurations of IOIS adopters. In all 32 of the 37 studies used the variance approach focusing on the identification of independent variables causing changes in the dependent variable IOIS adoption. Three studies used the process approach focusing on how a sequence of events unfolds to produce IOIS adoption. Two studies offered a new typology for categorizing IOIS by their structural configuration.

Over time the topic evolved with new technologies, sectors, countries, and industries as well as with new perspectives. A very interesting thought from two of the latest papers is the suggestion that attention should be shifting away from viewing IOIS adoption as done by independent organizations – because one adopter cannot form an interorganizational information system alone - to an ‘adopter configuration’ consisting of at least two organizations sharing an organizing vision and key functionality. The terminology was also developed from ‘*interorganizational systems*’ over ‘*EDI*’ to ‘*e-commerce*’, and back to ‘*interorganizational systems*’ or ‘*interorganizational information systems*’. Theories commonly used throughout the years to explain the adoption of IOIS were diffusion of innovation theory as well as different economic-rational theories such as transaction cost theory and competitive benefits, as well as trust and power and organizing vision.

In the papers covering the period from 1995 to 1999 the predominant concern is the actual adoption of IOIS. Eight out of the nine relevant papers are concerned with factors contributing to the success of IOIS, or barriers to IOIS and ways of overcoming them. In the papers covering the period from 2000 to 2004 the actual adoption process is still dominant, and six of the twelve relevant papers are still concerned with factors contributing to the success of IOIS, or ‘barriers to IOIS and ways of overcoming them’. But the research agenda has also moved a step forward with four papers exploring how to create effects with IOIS. In the papers covering the years from 2005 to 2009, eight of the ten relevant papers were found to be concerned with factors determining adoption or use of IOIS. But this subset also includes two papers concerned with post-adoption effects of IOIS on the buyer-supplier relationship in organizations actually using IOIS. In the papers covering the years from 2010 to 2013 we find two out of six relevant papers concerned with factors determining adoption or use of IOIS. Two of the remaining papers are concerned with the structural configuration of IOIS adopters.

Throughout the years covered in this literature review, factors determining adoption or barriers to IOIS have been and still are a large area at the IOIS research agenda, but it seems that there is also complementary areas starting with how to create effects with IOIS moving to how IOIS affect the buyer-supplier relationship they are introduced into, and lately into categorizing the structure of IOIS adopters in different configurations.

| | <i>1995 – 1999</i> | <i>2000 – 2004</i> | <i>2005 – 2009</i> | <i>2010 – 2013</i> |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Emergent focus | IOIS factors and barriers | Creating effects with IOIS | Post-adoption effects of IOIS on the buyer-supplier relationship | Configuration of IOIS adopters |
| Variance approach | 8 studies | 11 studies | 10 studies | 3 studies |
| Process approach | 1 study | 1 study | 0 studies | 1 study |
| Typology proposal | 0 studies | 0 studies | 0 studies | 2 studies |
| Theories used to explain the adoption of IOIS | Diffusion of innovation theory Transaction cost theory Competitive benefits Trust Power | Diffusion of innovation theory Transaction cost theory Competitive benefits Trust Power Institutional theory | Diffusion of innovation theory Transaction cost theory Competitive benefits Trust Power Structural contingency theory | Diffusion of innovation theory Organizing vision Structuration theory Technological– Organizational– Environmental framework |
| Commonly used concepts | IOS, EDI Sponsors Adopters Trust Power | IOS, e-commerce Sponsors Participant or the term naming the functional role in the interorganizational relationship (payer, borrower, supplier etc.) | IOS, EDI, third-party B2B portal, B2B electronic marketplaces Initiator Participant or the term naming the functional role in the interorganizational relationship Adopter/ non-adopters | IOS, IOIS |

Table 1 Summary of findings

5 Research directions

Different papers on adoption of IOIS were found to focus either on the factors determining the adoption of IOIS or the barriers to IOIS and ways of overcoming them, but only three papers were found to focus on the related adoption process. The apparent lack of understanding of the adoption process calls for research opening the black box of IOIS adoption. Some of the research questions that could be asked in such a study are: What considerations does an organization go through when considering to adopt an IOIS? How do different actors such as different IOIS adopter units, IOIS suppliers, and regulatory bodies impact and shape the decision process in an IOIS adoption? How does the adopter configuration of the IOIS impact and shape the adoption decision process?

6 Conclusions

In this paper I have provided a review of the literature on adoption of IOIS from 1995 till now. The motivation was the recent studies showing that the outcome of introducing interorganizational information systems is still uncertain as well as the observation that many different explanations of IOIS adoption were offered in the wide body of literature. The synthesis of the literature found that the research agenda was focusing first on how to explain why organizations adopt or reject IOIS by studying factors determining adoption of or barriers to IOIS adoption, secondly on how to create the desired organizational effects with IOIS, thirdly on how IOIS are affecting the buyer-supplier relationship they are introduced into, and so far ending by categorizing the structure of IOIS adopters in different configurations. Many papers on adoption of IOIS were found to focus either on the factors determining the adoption of IOIS or the barriers to IOIS adoption and ways of overcoming them, but seemingly only limited effort has been made to study the actual IOIS adoption process. The apparent lack of understanding of this process calls for research opening the black box of IOIS adoption.

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