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THE EFFECTS OF COORDINATION MECHANISMS AND EMBEDDEDNESS ON THE ADOPTION OF OPEN STANDARDS

Research in Progress

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Abstract:

Organizations today face great challenges from the unpredictable, globalized and competitive business environment. One of the ways that organizations achieve competitive advantages is by the adoption and diffusion of open standard inter-organizational systems (OSIOS). Despite the benefits that are promised by the adoption of OSIOS, its adoption has slowed down and there are increased cases of failure in OSIOS adoptions. In trying to explain this phenomenon, this study examines various factors relating to the social network theory and coordination theory with the adoption of OSIOS. A survey questionnaire was administered and data was collected from 101 companies in China. Using partial least square analysis, we found that extent of coordination mechanism use and tie strength are positively and significantly associated with the adoption of OSIOS. Results and implications are briefly discussed.

Keywords:

Inter-organizational Systems, IOS, OSIOS, adoption, tie strength, embeddedness, coordination mechanisms.

1. Introduction

Inter-organizational systems (IOS) are IT systems that are built and implemented to link the business processes of multiple organizations by enabling the exchange of information between them. Through IOS, organizations can have access to more resources that they otherwise would not. Such resources include applications, networks, and databases. Improved management of supply chains with suppliers, distributors, partners, and customers is also made possible with IOS. IOS works by enabling partnering organizations to work together by sharing data (structured and unstructured) stored in repositories (Kumar, van Dissel, & Bielli, 1998). The implementation of IOS facilitates the collaboration and management of conflicts through the electronic integration of resources (Volkoff, Chan, & Peter Newson, 1999), which results in the redesign of interorganizational processes and the expansion of the organizations business scope.

A similar category of technologies that is becoming popular and is also significant in achieving the benefits mentioned is Open Standard Inter-Organizational Systems (OSIOS). OSIOS are IT standards that enable web-based information sharing among businesses supply chain (Nurmilaakso, 2013). OSIOS describes the whole business process, data exchange format, and communication standards, and also allows for the exchange of information between organizations to be automated (Zhu, Kraemer, Gurbaxani, & Xu, 2006). Unlike its traditional counterpart (e.g. IOS), OSIOS are developed by the open community, uses open standards, and are built on the Internet for information exchange between members of a supply chain (Venkatesh & Bala, 2012).

Even with all that OSIOS promises, it is still suffering with slow adoption rates and development. Researchers believe that the problem lies with the fact that there aren't adequate theoretical models and frameworks that can be used to better understand the adoption of OSIOS and make it successful. For such a technology, its implementation can only be successful if it is not only championed by a focal organization but also fully implemented among its supply chain partners (diffusion) (Oke & Idiagbon-Oke, 2010). Consequently, OSIOS internal adoption and external diffusion is subjective to the characteristics of the relationship between the championing organization and its partners (Zhu et al., 2006).

Recent studies on IOS have hinted that organizational ties and coordination problems have to be further examined with applicable research models and methods. The adoption of such technology is especially challenging when there is a rigid coordination system installed by a big organization that aligns its vision with that of its suppliers and customers (Lyytinen & Damsgaard, 2011). The organizational ties and coordination processes of organizations when adopting OSIOS need to be further studied by researchers with regards to the factors that have an influence on the adoption of OSIOS. Even with the benefits it provides, there still isn't an empirical examination of an OSIOS adoption model based on the research model proposed.

2. Theoretical Backgrounds and Hypotheses Development

2.1. Coordination Theory and Coordination Mechanisms

The coordination theory has been used to explore how activities of multiple organizations can be integrated so the organizations can work together towards achieving goals of mutual benefit (Im & Rai, 2014; Lai, Wong, & Cheng, 2008). Coordination theory posits that within organizations that carry out tasks, it is important to generate alternate processes which first involve identifying the dependencies and coordination problems that is faced by the organization and then determining what coordination mechanisms can be applied to manage them. Coordination mechanisms as introduced by Malone & Crowston (1994) are activities that are put in effect to limit the coordination problems that arise in organizations and also their decision making processes and actions. Coordination mechanisms ensure the reduction of coordination costs, better allocation of resources towards activities and tasks, and an efficient coordination structure (Chatterjee, Grewal, & Sambamurthy, 2002; Im & Rai, 2014). Classic examples of coordination mechanisms include liaison roles, task forces, and integration.

An interorganizational relationship that is highly coordinated is one characterized by information sharing, performance monitoring, incentive alignment and collective learning

(Simatupang, Wright, & Sridharan, 2002). The development of an organizations internal and external coordination maximizes its potential of achieving competitive advantages and increased profitability (Wu, Chiag, Wu, & Tu, 2004). Previous research has shown interfirm coordination to influence internal and external levels of channel conflict (Webb, 2002). Similarly, Chatterjee et al. (2002) studied and found the influence of coordination on the adoption of e-commerce technologies to be significant.

2.2. Social Network Theory and the Embeddedness of Ties

Embeddedness explains the relational ties and linkages between multiple entities, whereby an organization is seen as embedded amidst a structure of connections and ties (Kim & Choi, 2015; Levin & Cross, 2004). Borgatti and Foster (2003) suggest that ties are channels that give organizations access to resources, thus organizations develop and mobilize those ties to ultimately achieve some benefits. Relational ties and linkages can either be an arm's-length tie or an embedded tie. Uzzi (1999 p. 483) defines arm's-length ties as those "characterized by lean and sporadic transactions", while embedded ties refers to those characterized by a cooperative nature, closeness, cohesion, and have a long-term orientation. The literature on embeddedness is divided along two theories, Burt's (1992) structural hole argument which focuses on the benefits achieved from relationships characterized as weak ties and Coleman's (1990) network closure argument which focuses on strong ties.

Interorganizational ties are only useful if they provide organizations with access to quality new information or unique resources, and this can only happen between parties that have a strong embedded relationship (Kim & Choi, 2015). Organizations in embedded ties will be more willing to exchange information as such ties improve understanding and obligation while reducing risks and uncertainty. Some of the benefits of taking this approach and focusing on having few embedded ties rather than several arms-length ties is that organizations can manage their relationships much better so that they get more out of them, thereby also justifying the resources they allocate towards that end. In relation to the transaction cost theory, embedded ties initially look to require more resources to maintain and thus the natural limit of how many an organization can have. Once an organization has reached that limit it then becomes more efficient as the quality of information and resources achieved from them are higher. This is however also impacted by the adoption of technologies like OSIOS as it reduces transaction costs and improving communication between organizational partners (Venkatesh & Bala, 2012; Zhu et al., 2006). Similarly, in relation to coordination theory, having only few embedded ties means that organizations will have fewer coordination problems, a lesser number of coordination mechanisms will be required, and there will also be much less conflict (Chatterjee et al., 2002).

Based on the theoretical discussion above, we present our research model below (fig 1) and hypothesize that:

H1: Extent of using coordination mechanisms positively influences the adoption of OSIOS.

H2: Extent of using coordination mechanisms positively influences the diffusion of OSIOS.

H3: Extent of using coordination mechanisms positively influences tie strength.

H4: Tie strength positively influences the adoption of OSIOS.

H5: Tie strength positively influences the diffusion of OSIOS.

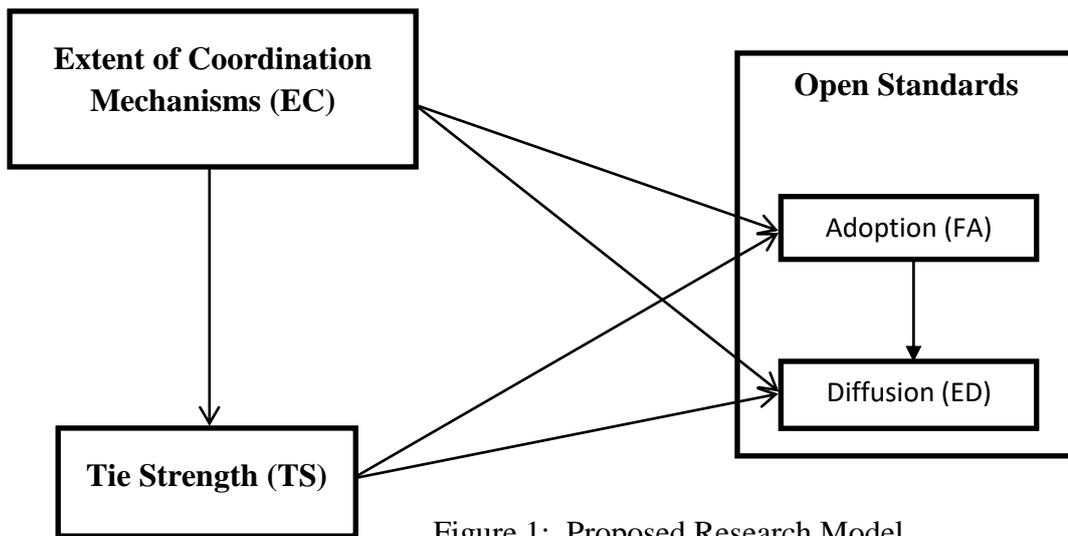


Figure 1: Proposed Research Model

3. Research Design and Plans

3.1. Survey Development

The proposed survey consists of 36 questions across 5 different sections relating to our research questions on OSIOS adoption and diffusion. The designed survey includes various questions relating to the respondent's organization and their relevant personal information. Typically, respondents were asked to indicate their level of agreement towards each statement which were assessed on a seven-point Likert-type scale where applicable. We employ the seven-point Likert-type scale whenever possible as it is most recommended by researchers primarily because it leads to increased response rate and reduced frustration for respondents (Sachdev & Verma, 2002). All questions were closed which enables us to convert responses into numerical format for testing.

3.2. Measurement of Constructs

With regards to the instrument development process, it began with the identification of prior studies that had the relevant scales for the constructs in the study. The measures for adoption (Zhang, Xue, & Dhaliwal, 2016), diffusion (Zhang & Dhaliwal, 2009), tie strength (Kim & Choi, 2015; Levin & Cross, 2004), and extent of coordination (Chatterjee et al., 2002) were all reported to be valid and reliable measures, and thus we adapted them with slight modification to fit the specific context of study where necessary. The whole process involved the various stages of theoretical specification, statistical testing, and refinement (Straub, 1989). All of the constructs were to be assessed using multiple items and were measured on seven-point Likert scales.

3.3. Data Collection

The data used in this study was collected from manufacturing companies in China primarily because of the country's size and economic power (Zhao, Flynn, & Roth, 2006). The supply chain units of these companies served as the research unit for the study as is typical for studies relating to supply chain technologies. Targeted respondents were personnel whose job title was typically supply chain manager, or more senior executives as they would likely have a significant knowledge of the companies supply chain operations. The respondents were contacted through telephone to obtain initial agreement to participate in the study. After they

had expressed their willingness to participate, they were sent a link to complete the survey online.

4. Data Analysis and Results

Using the stated approach of collecting data, we have collected 101 valid responses thus far. But for the purpose of this study we will be using only the 101 responses to conduct our analyses. We employ smartPLS (Version 2) to examine our research model and the collected data. SEM is our preferred tool for analysis as it has been used in various fields including information systems and it is also considered the “most fully developed and general system” for data analysis (McDonald 1996, p. 240).

4.1. Respondents Background

The characteristics of the respondents and the companies are presented in Table 1. The table indicates that the companies represent a variety of industries. The majority of the companies appear to be large scale companies that have been in operation for 10 years and above. The respondents also appear to have been in in their companies for at least 6 but not more than 15 years, thus, indicating they are knowledgeable about the requested information.

Industry	N	%	Years of Operation	N	%
Automobile	9	8.9	<1 Year	0	0.0
Chemical	24	23.8	1-5 Years	1	1.0
Construction	16	15.8	6-10 Years	8	7.9
Electrical/Electronics	29	28.7	11-15 Years	24	23.8
Machinery/Equipment's	11	10.9	>15 Years	68	67.3
Others	12	11.9			
Turnover	N	%	Employees	N	%
<25 million	1	1.0	<160	0	0.0
25–100 million	14	13.9	160-1,000	42	41.6
100-300 million	13	12.9	> 1000	59	58.4
>300 million	73	72.3			
Job Title	N	%	Job Tenure	N	%
CEO/President	2	2.0	<1 Year	0	0.0
Senior executive/Vice President	33	32.7	1-5 Years	16	15.8
IT Manager/CIO/CTO	24	23.8	6-10 Years	79	78.2
Supply Chain/Operations	42	41.6	11-15 Years	6	5.9
Manager/ COO			>15 Years	0	0.0

Table 1: Profile of companies and respondents

4.2. Measurement Model Assessment

Following the recommendations of Chin et al. (2012) we begin our analysis by examining the data for any common method bias that may distort any potential findings. The Harman’s single-factor test was carried out on the data and was found to be 39.7% (Harman, 1976). This falls very much below the maximum threshold of 50% as recommended (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). We also looked for high correlations (>.90) among variables as recommended by Bagozzi et al. (1991). As seen in table 2 no such high correlations are found.

We proceeded to examine the reliability of the indicators used in the study. 4 items with loadings significantly lower than 0.7 were dropped since all items used in the study were

reflective items. Internal consistency reliability was assessed using Cronbach's alpha and composite reliability. The variables all had values exceeding 0.7 in both cases as recommended (Nunnally, 1978). We then examined for convergent validity by assessing the average variance extraction (AVE), which must be higher than 0.5 to be confirmed (Choi & Choi, 2009). Only tie strength (TS) was found to be below the threshold with 0.4. Although not reported because of limited space, we also examined cross loadings and found them all to be greater than their respective outer loadings.

	Composite Reliability	Cronbachs Alpha	AVE	R ²	EC	ED	FA	TS
EC	0.92	0.90	0.70	0	1	0	0	0
ED	0.98	0.97	0.94	0.42	0.61	1	0	0
FA	0.95	0.92	0.86	0.72	0.84	0.67	1	0
TS	0.86	0.81	0.40	0.38	0.62	0.54	0.60	1

EC: extent of coordination, ED: diffusion, FA: adoption
TS: tie strength

Hypotheses	Coefficient	T value	Sig
EC -> FA	0.76	8.47	***
EC -> ED	0.44	4.46	***
EC -> TS	0.62	7.40	***
TS -> FA	0.14	1.21	ns
TS -> ED	0.27	2.42	**

*p>1.65, **p>1.96, ***p>2.57

Table 3: Hypotheses Test

Table 2: Quality Assessment

4.3. Structural Model Assessment

Being relatively satisfied with the measurement model, we then assessed the structural model to determine the acceptance or rejection of the hypotheses, the significance of the results, and the level of R² (Carte & Russell, 2003). Because of the nature of the tie strength construct, we modeled it as a second order variable with the level of interaction, closeness, multiplexity, and relational trust as its first order variables (Kim & Choi, 2015) before performing a bootstrap with 500 subsamples. Table 3 shows the path coefficients and their significance. All hypotheses except (H4) were confirmed and R² values were found to be substantial for FA (R²=0.72), and moderate for ED (R²=0.42) and TS (R²=0.38).

5. Conclusion and Future Plans

To conclude, we remind readers that this is a work in progress and thus may change significantly in its final form. We find that the results presented to be intriguing and the study overall has the potential to be developed further towards contributing to both theory and practice. The relatively small sample of 101 may have influenced the results and the significance of the findings. The sample restricted us from hypothesizing more relationships and developing a more complex research model. Only when the data collection is completed and the data is analyzed would we be able to evaluate the final scope of the study and know the true significance of the results, hence why they have not been discussed here extensively.

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