

Analyzing the Role of Interorganizational Systems on Coordination Cost between Firms

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Abstract: It is believed that the adoption of Interorganizational systems (IOS) can enable organization to use the information processing capabilities to reduce coordination costs and improve performance. However, the past researches have shown mixed results about the impact of IOS on coordination costs. While drawing on transaction cost analysis, this paper suggests that analyzing the association of IOS use and coordination costs of interorganizations should consider different levels of asset specificity. To illustrate the explanatory power of this analysis, this paper presents a case study from China. The findings from the case study show that, when asset specificity is high, IOS use can reduce coordination costs for monitoring or cooperative purpose. While under a condition of low asset specificity, the association between IOS use and coordination costs is negative.

Keywords: E-commerce management, Interorganizational system, Coordination cost.

I. Introduction

The recent increased interests focused on cooperative relationships across organizational boundaries have put great emphasis on interorganizational system (IOS) issues. IOS is firstly defined by Cash and Konsynski [5] as “an automated information system shared by two or more companies”. These kinds of systems are different from intra-organizational and distributed information systems by exchanging information across organizational boundaries. Although a number of researchers have demonstrated that in an interorganizational relationship, the adoption of IOS could enable organization to use the information processing capabilities to decrease costs and strengthen relationships among participating organizations and as thus improve performance [17], the past researches have also shown mixed results about the impact of IOS on the performance of participating organizations. For instance, Hengst and Sol [11] have introduced transaction cost theory to study the impact of information and communication technology (ICT) on coordinate activities among organizations. They argue that using of ICT can lower coordination costs and they assert there exists a positive relationship between benefits gained from coordination and the level of ICT applied. But on the other hand, they acknowledge that using of ICT will

also increase the complexity of coordination, such as inducing more communication activities and more information processing.

Such problem implies that we should analyze the impact of information system in coordinating activities among organizations under different conditions. This paper addresses this problem by analyzing how the use of IOS affects coordination costs under different levels of asset specificity. Based on our analyzing method, this article presents a case study about IOS using of a manufacturing firm from China. From this case study, we try to investigate the attitude of firms towards the effect of IOS use under different environments.

This paper, in the next section, reviews the primary contributions and arguments of transaction cost analysis in the context of interorganizational relationships. In the subsequent section, we present hypotheses to discuss possible directions to the impact of IOS use on coordination costs among firms under different conditions. Next, we describe the case study from perspectives of managers to explain the power of this framework. This paper ends with conclusions and directions for future research.

II. Implications of Transaction Cost Analysis

Transaction cost analysis (TCA) has focused on the appropriation concerns in interorganizational relationships, which are originated from pervasive behavior uncertainty and contracting problems. The basic assumption underlying the TCA perspective is that the specific governance form is based on an economizing on transaction costs. Williamson [18] argues that the total costs of an organization are consisted of production costs and coordination costs. An organization should choose a proper governance form according to a trade-off between the advantage of low coordination costs in the case of hierarchies and low production costs in the case of markets.

Asset specificity and environmental uncertainty are the key dimensions of TCA that are used to predict the boundaries of a given firm. The concept of environmental uncertainty plays a major role in TCA which is referred to circumstance surrounding an exchange cannot be specified *ex ante*. Considering environmental uncertainty is beyond the control of an organization, we take environmental uncertainty being substantial as the premise of our analysis.

Asset specificity refers to physical assets, production facilities, tools and knowledge tailored to a specific relationship that cannot be re-deployed for other purposes without the sacrifice of productive value. When entering an

interorganizational relationship, participants usually have to invest on assets with specific use only in this relationship. As regarding the manufacturing industry, a firm should, which is looking for appropriate supplier, make great effort on searching and evaluating the potential partners. This may consume a lot of capital, labors and time to establish and maintain the cooperative relationship. Besides, the participants might take the risk to be locked-in by special production equipment, computer technology and related interorganizational systems that link the buyer's and supplier's scheduling and production activities. As asset specificity becomes substantial, interdependency is deepened and coordination is needed for safeguarding the appropriation concerns.

Past researches have studied the association of coordination costs and asset specificity under substantial environmental uncertainty [2][4][9]. Their findings suggested that substantial asset specificity would create bilateral dependence and reduce the firm's control over its business partner. Therefore, the firm's coordination costs might increase [2][8][9]. For example, in the study of buyer-supplier alliance, Anderson and Buvik [1] have confirmed that the association between buyer's asset specificity and buyer's coordination costs was positive. Figure 1 illustrates the association between coordination cost and asset specificity.

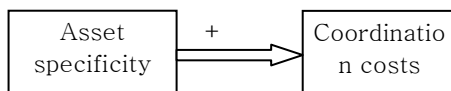


FIGURE 1: Association between coordination cost and asset specificity

III. Analysis of IOS and Coordination Cost

With the rapid development and diffusion of computers and telecommunications in the past decades, organizations can be able to extend the range of cooperation with other organizations based on information systems. Initially, the adoption of Interorganizational systems enables participating organizations to use the information processing capabilities to improve performance and to strengthen relationships with other organizations sharing the IOS. Therefore, IOS are widely adopted in industries such as airlines, banking and transport [17]. Nowadays, it is realized that cooperation and interdependence with other organizations are vital and information technology is an important enabler to such interorganizational activities. To address the influence of IOS, some researchers have investigated the efficiency advantages in transactions gained by IOS. Malone et al [14], Gurbaxani and Whang [10], Clemens et al [6] point out that using of IOS has a positive impact on the cost to coordinate activities between organizations and leads to competitive advantages. At the same time, other researchers have

identified disadvantageous effects of using IOS, such as the risks of becoming locked in with system and relationship specific investments and the issues of changes in bargaining power between firms [3][6][13].

We argue that the mixed findings about the effect of IOS on interorganizational coordination cost relate to the influence of asset specificity and interdependency. Therefore, the analysis of impact of IOS should be discussed under different conditions.

There are different forces of information system to influence the coordinative activities between firms. Gallivan and Depledge [7] classified them as monitoring effect and collaborative effect. The monitoring use of IOS is to ensure trading partners will act as expected to avoid opportunism and moral hazards. While the collaborative use of IOS is contributed to facilitate knowledge transfer and information share among partners. Based on such category of effect of IOS, we establish our analytical framework below.

When analyzing the impact of IOS use on interorganizational coordination cost, it must be realized that investments on IOS should enhance the level of total asset specificity [12][16]. Because IOS is built with interface and information exchange procedure which is proprietary to a particular group of firms, therefore, firms wishing to join the network often need to invest in the special hardware and software for the system. Besides, any trading partner should put into effort to train its personnel to operate such system which is perhaps unique to others [13]. Support for this argument has been provided by Nidumolu [15]. His findings manifest that specific investments of IOS will bring about great switching costs among firms involved in a buyer-seller relationship. The result leads to increasing bargaining power for the firm initiating the IOS which is against other business partners' favor.

According to TCA, when organization is confronted with external uncertainty, the introduction of interorganizational relationships may conflict with the safeguarding problem incurred by substantial investments in specific assets [4]. Consequently, under conditions of substantial asset specificity, IOS may be used to monitor and control over other party's behavior to avoid them taking advantage upon the situation or exercising opportunistic behavior. Therefore, gains by use of IOS are predicted to be much more dominant than the negative influence of additional asset specificity added by the investment of IOS.

On the other conditions of low asset specificity, analysis of impact from IOS using is somewhat complexity. In accordance with TCA, low asset specificity induces no substantial safeguarding problem and interorganizational coordination is an appropriate adaptation response to environmental uncertainty. As a result, IOS is introduced to facilitate the coordination among business partners. However, under this circumstance, using of IOS may bring about great risks to both initiators and participants of systems. On the one hand, investment on system should increase asset specificity of initiators which means that they

are facing a risk to suffer from the anticipated opportunistic behavior of other organizations. While for participants, owing to have no control on the operation over system, they would be locked-in by this system and might face the possibility to be impropriated by the initiators. Therefore, to alleviate the conflict originated from IOS, all the organizations should put into more efforts to coordinate with each other to achieve their common interests. Based on this reasoning, we hypothesise:

H1: Under conditions of high asset specificity, the association between investment in IOS and interorganizational coordination costs is negative.

H2: Under conditions of low asset specificity, there is a positive association between investment in IOS and coordination costs among trading partners.

Our hypothesized relationships between IOS use and interorganizational coordination costs are summarized in figure 2.

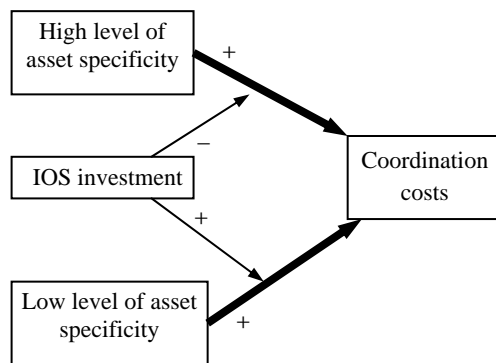


FIGURE 2: Impact of IOS use on coordination cost under different level of asset specificity

IV. A Case Study of Manufacturing Firm in China

To examine our research analysis, firstly we make a survey to investigate the using of IOS in Chinese manufacturing industry. Under the pressure of global competence, more and more firms have formed IOS-based inter-firm relationships to achieve competitive advantage. Our survey shows that more than 70% of firms have participated in certain kind of interorganizational system with their business partners. Most informants recognize they are motivated by the potential ability of systems to access greater quantity of better quality information. Nevertheless, they have different opinions on the decreasing effect of coordination cost by virtue of IOS. To illustrate our analytic method, here we select a firm located at Xiamen, a coastal city of China, for case study.

Amoi Electronic Corporation is a multinational electronic enterprise, which highly focuses on developing

and manufacturing products from telecommunication, digital video and audio to IT industry. Nowadays Amoi has become an internationally well-known leading manufacturer and supplier of mobile phones in China. In 2003, this firm has employed about 20,000 persons and the total sales reached 850 millions US dollar.

This firm has established its own interorganizational information system which has designed interface with its intra-organizational information systems. Participants of this IOS include Amoi's primary suppliers and distributors. For instance, Tianma Microelectronics Corporation (TMC) is an important supplier who provides mobile phone used liquid crystal display (LCD) for Amoi.

Since its business partners are mostly located in other cities all over China, managers of Amoi claim the operation of IOS has a crucial role on reducing communication costs and saving time of transaction. Nevertheless, considering the ability of reducing total interorganizational coordination costs by IOS, the situation is somewhat complexity according to different trading partners.

When considering its supplier, Amoi recognizes TMC as one of its most important business partners. The reason is that mobile phone is Amoi's most profitable kind of production and cutting costs is just the fundamental aspect to win competent advantage over drastic telecommunication product market. Another reason is that the supply of screen for mobile phone demands high degree of customization. Therefore, Amoi has spent a huge time, labors and capital to certify and adapt its designing and manufacturing processes for selected LCD. That means Amoi has invested high level of specific asset with TMC. If the supplier has any changes on R&D or output of LCD, and if Amoi cannot collect such information in time, that would bring about enormous damage to the producing arrangement of Amoi. To avoid contingency happening, or even being misappropriated, Amoi uses IOS to monitor this supplier's plan of R&D and throughput. On the side of TMC, it also benefit from using of this system. Because they can get the right demands from Amoi beforehand, that would be useful for them to arrange their manufacturing program. As a result, managers of Amoi acknowledge that they have experienced savings of coordination cost with TMC through IOS.

As for relationships with its distributors, both Amoi and distributors have no need to invest substantial specific asset to hold the bilateral cooperative relationships. Under such circumstance, Amoi faces a dilemma situation. On one hand, Amoi depends on distributors to occupy market. So this information system can assist Amoi to monitor sale activities of distributors' in time. On the other hand, distributors sell not only products of Amoi, but also the same kind products of others. Therefore, all the two parties have some extent of doubt. Amoi has a worry about secret leakage when using this system. And from distributors' perspective, they want to keep control of their business and remain independent from manufacturer. This leads to low level of interdependent relationships among them. Consequently, managers of Amoi claim that they cannot perceive significant reduction of

coordination cost with distributors from using of IOS.

V. Conclusion and Future Research

It is pervasively believed that interorganizational systems can play an important role in coordinating activities between organizations. Accordingly, it is reasonable to expect that the adoption of IOS can enable organization to use the information processing capabilities to reduce coordination costs and improve performance. However, the past researches show mixed results about the impact of IOS on the coordination costs. Some researches provide favorable evidences to this suggestion [10][14], while other results give no significant support to it [3][13]. This paper focuses on the possible conditions under which IOS use can positively affect coordination of activities between firms.

According to transaction cost analysis, under external uncertainty environment, asset specificity becomes the primary issues to influence coordinative patterns between business partners. From the perspective of technology, IOS may be used as a collaborative platform to share knowledge and facilitate knowledge transfer between firms [7]. Moreover, organizations usually use IOS as a control mechanism to monitor the business partners. In general, the monitoring use of information system is applied to alleviate risks induced by investment on specific asset, while the cooperative use of information system is to strengthen bilateral cooperative relationships. On the other hand, investment on system should increase asset specificity of initiators which means that they are facing a risk to suffer from the anticipated opportunistic behavior of other organizations.

This paper discusses impact of IOS use on interorganizational cost under two situations of asset specificity. If a high level of asset specificity exists, organizations have to put more coordinative efforts to maintain the cooperative relationships. Upon that, gains by use of IOS are predicted to be much more dominant than the negative influence of additional asset specificity added by the investment of IOS. However, on the conditions of low asset specificity, investment on system should increase asset specificity. As a result, IOS use has a potential to increase interorganizational coordination cost.

At last, a case study is presented here to investigate IOS use in manufacturing industry from China in accordance with our framework. The findings from the case study demonstrate researching direction of our method.

Though the findings of this study provide valuable insights, there are still a lot of works need for further research. For instance, considering the shortage of case study method, it is essential to require quantitatively methods examining large number of IOS use from a wide

extent. Second, because of diversified goals, abundant development and operation of IOS, association of information technology use and coordination cost under economic conditions needs to be examined in a much broader context incorporating more types of IOS.

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