THE ADOPTION DIFFICULTY OF
B2B E-COMMERCE IN ASIA

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27 June 2001
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Abstract

This study explores trust-related issues within inter-organisational systems (IOS) and seeks to advance our empirical knowledge of the early adoption of the electronic marketplace in an Asian context. It presents a qualitative study of the barriers faced by efforts to assist SMEs (small and medium-sized enterprises) to introduce B2B (business-to-business) electronic commerce in Singapore. The investigation employs an interpretative approach that draws on the theory of "technological frames". It traces the case over 15 months and presents the data in three time periods. Consideration is given to why the technology provider failed to gain commitments from adopters even though all the favourable conditions were present. Inductively, the results highlight four key factors that explain the adoption difficulties: lack of familiarity (with technology), risk aversion, lack of trust, and incongruent cultural practice. The findings suggest that researchers need to consider potential adopters’ technology fears, an alternative perspective which aims to understand the intractable controversies underlying the adoption of new technology. If these fears are not understood, then the technologist’s well-intended programs may only promote adopters’ negative responses and lead to the non-acceptance of inter-organisational systems. The findings provide a useful contrast to the current understanding of IOS adoption by extending the trust factor to a wider context. The conceptual basis is significant for both research and practice as enterprises are rapidly venturing into the evolving forms of B2B electronic commerce enabled by the Internet in Asia.

Keywords: B2B electronic marketplace, technological frames, technology fears, IOS adoption.

Introduction

This paper addresses the adoption barriers within inter-organizational systems (IOS). It investigates an Internet-based B2B e-Commerce (business-to-business electronic commerce) project called SMEOnline.com (a disguised name) over an introduction period lasting 15 months. Although the technology provider devised innovative strategies and offered the necessary supports, most potential adopters (small businesses) responded unenthusiastically. The practical concern of this study is to understand the controversies surrounding this IOS (inter-organisational systems) adoption. The case study seeks to explain technology adoption within the inter-firm environment from a cognitive perspective (Orlikowski and Gash, 1994), thereby complementing the existing factor-based analysis (e.g. Iacovou et al., 1995) and extending the scope of IOS research to Internet-enabled B2B e-commerce.
A Brief Account of B2B E-commerce

Although the idea of B2B e-commerce emerged around 1998 along with the pervasive use of the Internet, the concept is not seen as particularly novel by most researchers in IOS. There are basically two key business propositions at the heart of this idea: “electronic hierarchy” and “electronic marketplace” (Malone, Yates and Benjamin, 1987, 1989). Companies can use information systems to link up trading partners who have pre-existing business relationships and form an electronic hierarchy. Through this electronic integration, suppliers and buyers exchange standardized documents in order to reduce transaction costs or enhance production coordination. Alternatively, companies can participate in a more open electronic marketplace and outsource manufacturing and service activities to a particular business community.

In fact, long before the early 1960s and 1970s, companies discovered how to establish “information partnerships” within reciprocal industries (Konsynski and McFarlan, 1990). Computers, mainly mainframes and proprietary systems, were used to communicate, share information and respond quickly to shifts in customer demands. However, the early IOS were too expensive for most companies and hence the adoption rate was minimal. The idea of B2B e-commerce was limited to the automation of inter-organizational processes for a selected group of participants. Then, in the 1980s, the client server technology became affordable and was thus able to replace mainframe solutions. In the 1990s, the emergence of EDI (Electronic Data Interchange) systems made electronic trading a more attractive idea and the electronic marketplace a feasible goal. Companies began to appreciate the operational benefits and strategic importance of inter-firm e-commerce. Order-entry costs could be reduced significantly and supply chain coordination could be greatly enhanced (Mukhopadhyay et al., 1995). Moreover, once such an electronic business network was established, as Kumar and van Dissel (1996) pointed out, companies could “lock-in” suppliers (to provide better products and services) and customers (to create higher switching costs).

Since then, EDI-based B2B e-commerce has become an increasingly popular business proposition. However, in spite of the steady adoption growth, the results have been disappointing (Hart and Estrin, 1991; Lee et al., 1999). Researchers have identified a number of critical factors explaining the adoption difficulties. These include: (1) EDI solutions are still too expensive; (2) the IOS do not fit into the existing management processes, (3) there are major security concerns; (4) there is a lack of common strategic vision among partners, (5) there are important issues relating to trust and power. For example, Reekers and
Smithson’s (1996) findings suggest that although EDI enables both parties to rationalize their operations, manufacturers still optimise their production at the expense of their suppliers, as they have the power to dominate the business network. This may result in a negative impact on the trust relationship with suppliers, thereby inhibiting long-term partnerships.

The advent of Internet technologies has brought new hopes. The pervasive use of the Internet effectively enables electronic hierarchies and electronic markets. Nowadays, the Internet can be installed at affordable costs even for small businesses. This makes outsourcing a better way to save costs. It therefore makes sense for buyers and suppliers to link up electronically and form different types of business communities to provide services within the supply chain. Market analysts also anticipate that this Internet-based B2B e-commerce will re-integrate the supply chain to establish an “extended enterprise” and enable more innovative business models (Ramsdell, 2000), resulting in the rapid growth of new forms of e-business networks.

But Internet-based B2B e-commerce also gives rise to new challenges that can result in significant adoption difficulties. These challenges include online security (e.g. in the payment gateway) and crime prevention. Moreover, problems relating to trust and power also become key challenges for participating partners (Hart and Saunders, 1997). So far, however, researchers have made few attempts to understand these emerging challenges of B2B e-commerce in the Internet context.

**The Motivation of this Study**

This study explores the new challenges underlying the adoption of inter-organizational systems. There are three specific aims. First, the study aims to investigate Internet-based systems in order to complement the current focus in the IOS adoption literature on EDI systems. Secondly, it seeks to examine the problems associated with building B2B e-marketplaces for SMEs (Small and Medium-sized Enterprises). Thirdly, the study has a special interest in the Asian context. Although market analysts recognize the importance of fitting B2B e-commerce to the special needs of the Asian business environment (Dhawan and associates, 2000), little empirical research has been conducted in this field. The Asian focus of this study offers a useful comparison with previous studies based on the US and European environments.
The study is also motivated by the lack of qualitative analysis in this research area. Previous studies have enhanced our understanding of the adoption difficulties involved in EDI-based e-commerce, but their focus remains primarily factor-based. Apart from a few EDI-based studies (Hart and Estrin, 1991; Allen et al., 2000; Barrett, 1999; Barrett and Walsham, 1999), we know very little about the dynamics and contextual details of IOS adoption. The present research starts with the question of why the adoption of a well-devised B2B initiative (SMEOnline) was unsuccessful. This requires us to look beyond the technical and managerial issues and examine the cognitive assumptions that underlie adopters’ perception of the use of IOS.

The rest of the paper is structured as follow. The next section reviews the literature on IOS adoption, mainly focusing on EDI-based systems, in order to explore the current understanding of the barriers underlying B2B e-commerce adoption. The next section explains the research design, data collection protocol and data analysis techniques. Then the findings are presented for three time periods, with a focus on the interaction between the technologist and the adopters. This is followed by a discussion of the concept of technology fears and its development in relation to the case evidence. Consideration is then given to explaining how technology fears can be induced by the incongruent perceptions of the technologist and the adopters towards IOS adoption. The theoretical development of “technology fears” is further elaborated by relating the concept to previous studies in different technological contexts such as automation, groupware and EDI. Finally, the limitations of the research are acknowledged and some suggestions for further research are offered.

**Conceptual Basis**

The difficulties associated with inter-organizational systems (IOS) adoption are different from intra-organizational systems (Johnston and Vitale, 1988; Kumar and Crook, 1999). The studies of intra-organizational systems (such as enterprise resource planning systems) explore the use of information systems among members within the same organization. The inter-organizational systems, by contrast, involves organizations with different goals and cultures performing collaborative work enabled by information technology. Such cooperation requires special managerial attention if it is not to lead to conflicts among participating companies.
Although current studies of B2B e-commerce provide a useful examination of IOS issues, the question of adoption difficulty has been addressed mainly with reference to EDI-based systems (see, for example, Choudhury, et al., 1998; Bakos, 1991; Hart and Saunders, 1998; O'Callaghan et al., 1992). There are few empirical studies of Internet-based B2B e-commerce systems. For this reason, our literature review will draw on the EDI-based IOS literature to establish the conceptual basis for the present study.

The Adoption Difficulty of B2B E-commerce

Why is it difficult to adopt B2B e-commerce? Previous studies suggest three groups of adoption barriers: technological, intra-organizational, and inter-organizational (based on Kumar and Crook, 1999; Iacovou et al., 1995; Premkumar and Ramamurthy, 1995). A review of these factors will help us understand the problems associated with the introduction of B2B e-commerce systems (see Table 1).

First, the category of technological barriers includes problems related to the use of technology. The key factors of EDI adoption difficulty include, for example, network security, system integration, system migration, data conversion, and the compatibility of hardware and software (Jones and Beatty, 1998). From an operational viewpoint, companies resist the adoption of B2B e-commerce systems because EDI technology is too expensive (Arunachalam, 1997; Bamfield, 1994; Curtis, 1996). For example, there are the costs of leasing a VAN (Value-Added Network), purchasing EDI-related software, and buying computer hardware. As security technology is still at an embryonic stage, companies are concerned about the safety of electronic transactions (Ratnasingham, 1997). Moreover, the adoption of EDI also involves the complex integration of incompatible information systems. The migration from legacy systems to EDI systems usually requires the company to convert from an old data format to a new one (Truman, 2000; Webster, 1995). The technical conversion of a database and the validation of data integrity can easily consume three to four years of a company’s time. Moreover, the problem of data transmission and network bandwidth also adds to the complexity of technology management (Hart and Estrin, 1991).

The second group of adoption barriers is related to intra-organizational factors. Researchers indicate that the non-acceptance of EDI systems can be attributed to the lack of awareness of
potential benefits (Iacovou et al., 1995). Because such IOS also involve sophisticated operations between partner firms, the lack of appropriate training and education can easily inhibit users from realising the potential of IOS (Arunachalam, 1995). Furthermore, the effective implementation of EDI systems often requires companies to redesign their internal business processes in order to optimise the whole supply chain operation (Clark and Stoddard, 1996; Kambil and Short, 1994; Lee and Clark, 1997; Riggins and Mukhopadhyay, 1994). This is particularly difficult as most companies have unique processes for managing their supply chain that are not fully compatible with the processes of other partnering companies.

The third group of adoption barriers is related to inter-organizational factors. Current studies highlight four important factors: competitive pressure, power, trust and culture. In terms of the first of these factors, in stable industries companies have less incentive to adopt IOS-enabled collaboration because the environment is not sufficiently sophisticated and competition does not threaten the firms’ survival (Reekers and Smithson, 1996; Premkumar, Ramamurthy, and Crum, 1997). “Power” is the next important factor: buyers in a strong position who instigate the use of IOS can influence their trading partners to accept B2B e-commerce (Clemons and Row, 1993; Hart and Saunders, 1997). The powerful firms can help suppliers to understand technology use (e.g. in procurement) and achieve mutual goals. However, the “power” factor can also incur resistance to IOS when the lead firm exercises domination over the technological use, thereby creating a “lock in” effect. This point is illustrated in Webster’s study (1995: 37):

In pursuing their [Ford Motor] agendas for reducing market uncertainty, or simply for locking trading partners into trading relationships with them, these powerful players have unilaterally imposed their own in-house computer systems or information handling practices upon their trading partners, extending their own hardware systems into their suppliers’ premises, dictating product and inventory coding according to their own established in-house information systems, and dictating the type of frequency of data to be exchanged.

Allen et al. (2000) also highlight the role of “trust” in maintaining productive IOS adoption. They observe that mistrust, once introduced, will set off a vicious cycle and inhibit productive communication, thereby undermining the EDI-mediated cooperation between participating organizations (see also Kanter, 1994; Hart and Saunders, 1997). They investigated an EDI-based electronic trading systems, TransLease (for automobile insurance), and explain that mistrust was a prime factor in adoption resistance. Their research shows how such mistrust occurred between repair agents and lease firms (Allen et al., 2000: 31):
Repair agents’ viewpoint: It’s their [lease firms’] culture – they always try to rip us off. They are different from us because they are only interested in short-term gains so they always try to make money every time. We trust hardly any of them.

Lease firms’ viewpoint: Repair agents didn’t appreciate how strict lease company budgets are, and never change their attitude toward revenue gain.

Another barrier to IOS adoption is the culture factor. Stakeholders with different organizational cultures and who have different views on how EDI systems should be used and implemented can potentially hinder the use of B2B e-commerce among trading partners (Bowersox, 1990; Orlikowski and Gash, 1994; Poulymenakou and Holmes, 1996). For example, Barrett (1999) examines the four-year adoption process of EDI in the London Insurance Market in terms of different stakeholders’ cultural assumptions, focusing on what EDI means to them and what their expectation are of EDI use. He explains that such different assumptions can potentially impede EDI implementation because companies involved in B2B e-commerce are often incapable of overcoming these cultural limits.

Factor-based vs. Context-based Analysis

The current IOS adoption studies tend to emphasize factor-based analysis (Newman and Robey, 1992; Galliers and Baets, 1998). Moreover, they are largely survey-based studies (e.g. Premkumar et al., 1997) which investigate the causal relationship between variables (Langley, 1999; Markus and Robey, 1988). These factor-based studies hypothesize a list of factors and test them with large sample survey (e.g. Iacovou et al., 1995; Howells and Wood, 1995; Premkumar and Ramamurthy, 1995). Although the factor-based approach is useful for compiling a checklist of potential barriers impeding B2B e-commerce, it needs to be complemented by in-depth studies into organizational issues, of which there are few examples (e.g. Barrett, 1999). The factor-based approach inevitably ignores the problems attached to context-specific situations and thus promotes oversimplified solutions (e.g. Baskerville and Smithson, 1995; Sauer, 1999).

It is important to be sensitive to contextual details in order to understand how problems are developed and how social actors shape outcomes (Pettigrew, 1990). For instance, Hart and Estrin (1991) explain the development of inter-organizational networks in the US semiconductor industry. By examining the dynamics of coordination, value chains and inter-firm relationships, they are able to show how EDI impacts on firms’ interdependency and
presents subsequent adoption constraints. In a UK context, Barrett’s (1999) historical examination of an insurance e-marketplace explains why and how trust issues can emerge as a result of different stakeholders’ incongruent cultural assumptions with regard to three elements: the nature of technological change, the nature of business transactions, and the importance of market institutions. The context-based analysis helps us gain a better understanding of the organizational dynamics in which IOS is used.

The present research therefore employs an in-depth case study to examine the contextual details of IOS adoption. The intention is also to extend the investigation to Internet-based B2B e-commerce. The advent of the Internet has led to new ways of linking collaborative organizations electronically. The pervasive use of the Internet and its low cost features offer a strong incentive for firms to adopt B2B e-commerce. However, the Internet also involves various adoption barriers. For example, Internet-based systems are operated on public networks and are thus more vulnerable to security invasion (Hancock, 2000). Scalability (how quickly a B2B network can expand capacity to accommodate huge traffic load over Internet) is a new strategic issue that is causing increasing concern among managers (Riggins et al., 1994). Moreover, the task of technological integration is becoming more complex, since it involves the integration of the Internet, EDI and existing back-end information systems.

It is also important to note that the current discussion of IOS is based mainly on the US (e.g. O’Callaghan et al., 1992) and European (e.g. Reekers and Smithson, 1996) business environments. Because of the low cost advantage offered by the Internet, Asian firms, especially SMEs, are highly motivated to participate in B2B e-commerce initiatives (see, for example, ChinaEB.com, based in China, and Gate2Buiz.com, based in India). However, at present, IS researchers still know very little about IOS adoption issues in the Asian business context, except for a handful of case-based descriptions such as the example of Singapore TradeNet (Teo et al., 1997). This has led to many market analysts speculating that Asian companies are not ready for B2B e-commerce because of the lack of funding, the absence of strategic vision, and poor process integration. It is still not clear what specific IOS adoption barriers may be encountered in Asian contexts. One senior executive addressed this concern:

One topic that is of interest to us is the complexities of B2B across multiple borders in terms of regulatory, trade and cultural issues and barriers. We find that a US-centric approach to B2B does not adequately cover this from both a solution and an implementation approach.
As the expansion of the Asian market become increasingly important, there is a need to appreciate issues relating to B2B e-commerce in different cultural contexts. This study aims to enhance our understanding of the importance of trust for IOS adoption by highlighting the barrier of *technology fears* for firms operating mainly in Chinese business communities. The concept of technology fears is also related to the theory of technological frames (Orlikowski and Gash, 1994), which explains that technology fears are socially induced between the technologist and the adopters. The problem arises when there are incongruent expectations about inter-firm collaboration enabled by technology.

**Research Methods**

*Case study.* This study uses interpretative methods to generate an explanatory theory of adoption difficulty with particular reference to inter-organizational systems rooted in the experience of Internet-based B2B e-commerce. A qualitative approach is used to collect and analyse the data for a detailed examination of a series of related events exhibiting key theoretical principles (Mitchell, 1983; Smith, 1990). The purpose is to understand human thought and action in an organizational context in order to show how the investigated situation emerged and evolved (Klein and Myers, 1999: 73). For this reason, the study employs the single case study approach to organize social data so as to “preserve the unitary character of the social object being studied” (Smith, 1990: 127). This approach is particularly valuable for refining theory, suggesting complexities for further investigation, and helping to establish the limits of theoretical generalization (Stake, 1994: 245). The underlying rationale, however, is to optimise our understanding of phenomena rather than to test hypotheses linking a number of variables.

*The research site.* The field study was conducted within DecisionSys (a pseudonym), a consulting firm (based in Singapore) which provides information systems and related services. Operating mainly in the Asia Pacific region, DecisionSys employs more than 50 employees in the headquarters in Singapore. In August 1999, DecisionSys decided to undertake a major organizational change and become an ASP (Application Service Provider) providing e-commerce solutions. This means that DecisionSys has to set up software as part
of a pre-configured service that can run on servers at a managed data centre, and that allows users to access the application remotely in return for usage-related payment. With the help of the Association of SMEs (in Singapore), DecisionSys offered B2C (business-to-customer) e-commerce software and eventually established a B2B electronic marketplace called SMEOnline.com for SMEs in various industries in Singapore. The findings reflect the SME adopters’ expectations of, as well as their early exposure to, the B2B e-commerce systems. They also highlight social actors’ perceptions of a new technology in light of their existing cognitive assumptions and current work practices (Orlikowski and Gash, 1994: 182).

Data collection: Field data were collected through semi-structured interviews and on-site observation. Other sources used included company archives and project documents (such as promotional brochures, training materials and annual reports). Over 50 interviews were conducted, each about an hour in length, during which field notes were taken. In addition to the implementation team of SMEOnline (a total of 15 staff, representing the technologist), 41 SME executives (representing the adopters) were interviewed (31 by telephone). In the second phase of the implementation, DecisionSys set up alliances with a data-mining firm and two third-party logistic companies in order to complete e-fulfilment services. Three CEOs from these partnering companies were also included in the interviews (see Table 2).

INSERT TABLE 2

Throughout the study, the researcher also participated in four key project meetings and several other key events (such as company exhibitions and seminars) that allowed in-depth observation of the implementation process so as to verify or elaborate the interview data. These on-site observations are especially useful for relating the ongoing organizational contexts to emerging themes. As Anselm Strauss notes: “It’s only by being on the spot and watching things that we get the full impact of how that’s going to affect the organizations and how changes are going to occur” (in Kaghan et al., 1999: 69). During the 13 months of the real-time study (October 1999 to November 2000), access to the B2B portal was also available through the Internet, allowing observation of the adopters’ activities in the e-marketplace. This kind of multiple-source data collection seeks to enable triangulation and enhance data integrity, as well as strengthen emerging theoretical concepts (Orlikowski, 1993). Although this study acknowledges that interpretations are never repeatable, triangulation serves “to clarify meaning by identifying different ways the phenomenon is being seen” (Stake, 1994: 241).
Data analysis: To understand the social interpretations of the technologist and the adopters, the research employed Orlikowski and Gash’s (1994) analytical framework that was designed to investigate the incongruent frames between two groups of social actors in the process of groupware adoption. Their theoretical proposition explains that social actors often apply technology with a tacit “frame” embedded with certain assumptions, intentions or interests. Social actors thus produce “frame-induced actions” that lead to unfruitful results. These frame-induced actions, when implemented by technologists, can bring about the negative reactions of adopters. The rearranged framework is shown in Figure 1.

INSERT FIGURE 1

Three theoretical constructs are used in Orlikowski and Gash’s (1994) data analysis: the nature of technology (what the selected technology means to the social actors), technology strategy (how the social actors may apply/receive the technology) and technology-in-use (how the social actors think of the application of technology). With a different arrangement, this study reports the data in three phases: Time 1 describes the frame-induced actions of the technologist (DecisionSys) and examines the tacit frames underlying the adopted “technology strategy”; Time 2 reports the frame-induced reaction (i.e. the adopters’ social interpretation of the technologist’s actions) and the tacit frames underlying the adopters’ perception of the “nature of technology” and “technology-in-use”; Time 3 traces the story further to show how the technologist responds to the adopters’ feedback and constructs a new “technology strategy” (which is still deeply rooted in the rationalist frame).

In an inductive manner, iterative examinations yield four common themes, from which the core concept of technology fears emerges. In this study, the focus is more on the interpretation of early technology adoption than on the interpretation of later implementation. The aim is to get as close as possible to the worlds of the technologist and the adopters so as to illustrate their frame-induced actions and reveal their deep rooted frames. As a result, the case descriptions attempt to explicate a set of unique experiences that allows theoretical development beyond the limits of existing studies (Dyer and Wilkins, 1991: 614).
Research Results and Analysis

The theoretical framework developed in the above section is employed to structure the findings of this study. As shown in Figure 2, Time 1 explains the technologist’s viewpoint on how the technology should be introduced in order to achieve customer satisfaction and market success. The analysis first reports the technologist’s rationale for formulating strategies and actions to introduce the e-marketplace systems (these actions were however frame-induced); and secondly it examines the underlying frames of the technologist towards “technology strategy”. Time 2 traces the adopters’ rejections of the Internet-enabled B2B e-commerce and their frame-induced reaction. It reports the adopters’ fears of technology use by relating them to four core themes that emerged inductively from the fieldwork: lack of familiarity (with Internet), risk aversion, lack of trust, and incongruent cultural practices. The analysis then explains these four types of technology fears by examining the adopters’ frames in relation to the “nature of technology” and “technology-in-use”. Time 3 considers the technologist’s response when the adopters’ feedback was revealed. The analysis traces the technologist’s new strategy for introducing B2B e-commerce by enhancing the Internet-related infrastructure and redesigning new business models. Next, the analysis examines the technologist’s frames underlying the reorientation of “technology strategy”. Finally, the analysis concludes by reporting the unsatisfactory outcomes of IOS adoption. Figure 2 offers an overview of the three-period framework.

INSERT FIGURE 2 HERE

Time 1: Technology Strategy – B2C2B

DecisionSys have over 15 years experience in developing information systems for the exhibition industry and SMEs (with over 860 customers) in Singapore and the Asia-Pacific region. In 1999, in light of increased competition, DecisionSys decided to move to a new operating model – ASP (Application Service Provider), which offers a packaged software-based service online for rent. In June 1999, DecisionSys set up ASP data centres (with up to 150 servers) to secure Internet hosting, with 48 proprietary software programs.

DecisionSys also expanded its structure to accommodate ten senior management staff and a team of over 60 IT professionals focusing on research and development. Through the ASP model, DecisionSys aimed to provide e-commerce services in four areas: (1) reengineering
workflow; (2) one-stop consulting services to launch business on the Internet; (3) centralized technology resources managed by DecisionSys; (4) an integrated platform for information systems that can upgrade the latest software at low cost.

The frame-induced actions of the technologist. To enable the ASP model, DecisionSys decided to launch a B2B e-marketplace for SMEs in Singapore. A two-step strategy, known as the “B2C2B” initiative, was used to establish a viable business. First, the idea was to offer a low-cost B2C e-commerce service by building electronic stores over the Internet at a cost of about US$4000 and within a week’s delivery time. The B2C solution involved designing a website, installing inventory systems, building membership management, setting up web-based email systems, and implementing customer relationship systems. It was expected that once DecisionSys reached a critical mass of B2C customers, it could turn these electronic stores into a B2B e-marketplace called SMEOnline, where SMEs could register free of charge, identify trading opportunities, and conduct transactions over the Internet. The Managing Director of DecisionSys explained this strategy:

A lot of SMEs come in and they don’t know what they want for e-commerce. So we can best help them to have a B2C website and join our SMEOnline.com portal, because the B2C part is currently more active than the B2B part. …When we have a sufficient amount of SMEs in this portal, we can turn them into an e-marketplace: for example, an e-marketplace for the food industry. From there we can drive them into a platform using B2B exchanges. (Technologist #01)

At the beginning of its launch, SMEOnline quickly built 60 B2C e-commerce websites for companies from various industries such as food distribution, furniture, chemicals, construction materials, automobiles and electronics. DecisionSys decided that in order to line up more SMEs, two key issues must be resolved: (1) SMEs could not afford investments of even a few thousand dollars; and (2) SMEs were closely attached to trade associations. DecisionSys then sought support from the IDA (The Information/Communication Development Authority, a government agency in Singapore) to offer a matching fund scheme for SME applicants. In addition, the IDA offered a special promotion scheme for SMEs in different trade associations. In three months, DecisionSys swiftly obtained the support of the IDA and a number of trade associations. DecisionSys expected to reach 600 adopters in the first quarter and 2000 adopters by the end of the year 2000. According to DecisionSys’s Chief Operation Officer, this was expected to jumpstart the B2B e-marketplace within less than a year:
Most SMEs have no budget to invest in the future. In particular, these SME businessmen are shortsighted; they won’t touch any technological investments unless the government is involved. More than this, if you want to get them on board B2B electronic trading, you need to sell the idea through their relationship network. That’s why we need to work with trade associations to reach these SMEs. (Technologist #02)

At the same time, the Chief Operation Officer also incorporated the fulfilment mechanism for the B2B e-marketplace. He was concerned that the effective operation of an e-marketplace requires logistic support and business intelligence services. DecisionSys subsequently established strategic alliances with three partners (in June 2000). These partners (all disguised names) were TransLog (a Singapore-based international logistic provider), ExcelMail (a local automated mailing service company) and DataSolutions (a firm specialising in data-mining). With the help of these partners, DecisionSys aimed to offer cost-effective logistic services, effective communication among trading partners, and intelligent customer data-mining as the transactions increased rapidly in SMEOnline.

However, the actual results were less than satisfactory for DecisionSys: up to the first quarter of 2000, the company had reached 111 adopters for B2C e-stores and 200 traders in B2B exchanges. A majority of these B2B adopters did not come from B2C adoption but rather from members of different trade associations. Most of these traders were from the chemical industry because the chemical trade association asked DecisionSys to build and run a B2B portal for its members. DecisionSys’s top management team were perplexed by this result and decided to investigate why their B2C2B model was not received well by SME customers.

The frame of “technology strategy”. In Time 1, researchers can observe the perspective of technology imperative in action (Markus and Robey, 1988). There are at least two implicit assumptions held by the technologist when formulating the “technology strategy”. First, in order to compete in the Internet market, success depends on having a better business model enabled by advanced technology. In this case, the business model is B2C2B and the enabling technologies include B2C e-commerce and B2B exchanges (SMEOnline). The technologist was more worried about building the business model through the Internet technologies and fulfilment partners (TransLog, ExcelMail, and DataSolutions). These well-devised solutions (low cost entry and one-stop consulting services) reflect the rational actions of the technologist, which allow little scope for considering the social actions from the customers' viewpoint.
Time 2: Technology Adoption – Adopters’ Responses

In Time 2, the researcher worked with DecisionSys to collect feedback from the existing adopters and other potential SME senior managers. The customers’ feedback illustrates a contrasting picture of technology acceptance imbued with different cultural assumptions (Barrett, 1999). The investigation took about three months to complete. Interestingly, the adopters’ responses seemed to have little in common with the rational actions as conceived by the technologist. This section describes these potential adopters’ fears toward technology adoption with reference to four areas: lack of familiarity (with Internet technology), risk aversion, lack of trust, and incongruent cultural practice.

First, “lack of familiarity” refers to adopters’ ignorance of B2B e-commerce applications. The following extracts from interviews reveal the wide range of opinions (often unrealistic and incorrect) about the purpose of B2B e-commerce and the use of the Internet:

My understanding of B2B e-commerce is to have Internet hardware to handle my business transactions. I don’t like the idea of having the machine take over my business and tell me what I should do for my clients. (Adopter #01)

Doing business on the Internet is to give away products for free. That’ll make me go out of business in no time. (Adopter #02)

It’s one of these free sites like hotmail that send you emails and ask you to register, right? I don’t know what they do; but I don’t find any freebies there [SMEOnline]. They should at least offer some electronic coupons or free gifts to encourage us to do B2B e-commerce. (Adopter #03)

I know B2B e-commerce is a bit like a big electronic yellow page. We can advertise our services in cyberspace and attract more businesses… Actually, until now I’m surprised that there is still no advertising of my company on the website. The reason for us registering with SMEOnline is to get exposures. I expect SMEOnline to perform this role. (Adopter #04)

I know how to use email and MS Office software… I believe B2B e-commerce is a similar kind of software. But what I found out is fairly disappointing: the B2B ecommerce is nothing more than a few hypertext links. I don’t know how useful this B2B stuff would be for my business. (Adopter #05)

The second dimension is risk aversion, which refers to the lethargy shown towards the adoption of new technology and the unwillingness to deal with uncertainties. The following are three typical comments:

We don’t have an IT department in our small business. So I don’t know whether we should use it [SMEOnline], as it seems to require experts to deal with this kind of technology. Even
if it’s very easy to use, thing can still go wrong. I wouldn’t know what to do once these systems stopped working. (Adopter #06)

It’s not that I reject the B2B e-commerce idea. I just don’t have to take the risk. My son and my daughter are both at university now. I can have more time for my family and for myself. I really don’t want to risk my business with this new technology. (Adopter #07)

I like the idea of doing business exchange over the Internet. But I worry that my role in this company will quickly become unnecessary. Then I’ll lose my job here. I have been working here for over ten years and it’s my turn for the senior executive position soon. I would not like the idea of losing promotion. (Adopter #08)

The third factor is concerned with “lack of trust”. This has a rather different implication from that in previous studies of trust. The emphasis here is more on the brand name, trade security, and technology security. The following remarks by adopters are typical:

My idea of B2B e-commerce is that should be hosted by big names such as IBM or NCS [National Computer Systems, a key IS provider in Singapore]. Big companies can give me better services, and their technological solutions are probably better too. I cannot see any recognizable names in there; so, I won’t use their site for B2B trading. (Adopter #09)

One of my staff just happened to register as a user there [SMEOnline] because she wanted to find out what SMEOnline can offer. Normally you have to submit your website to be evaluated. But they [DecisionSys] just put my company name up in the website – no screening at all. How can they register a company on their B2B portal without doing some crosschecking? (Adopter #10)

Before my company gets involved in any B2B activity, I want to make sure that these companies I trade with are sound and I won’t get cheated. (Adopter #11)

I saw someone with a personal domain, dot.per in the SMEOnline portal… I think any Tom, Dick or Harry can just register on that website. I don’t trust this kind of B2B trading. (Adopter #12)

I know all the local companies; I know all the suppliers. I’ve been in the business for over 20 years. I know my business partners very well. We know which companies are bad paymasters and we don’t want to sell them anything. We know which companies have good links to our competitors and we don’t want to deal with them. And we know which companies pay us good commission so that we need to provide good services to them. It is very much a trust-based trading relationship. It would be too naïve to think that B2B e-commerce can replace all this knowledge about your trading partners. (Adopter #13)

I know who to trust and who not to trust… If I go online [B2B e-commerce], I might not know who to trust and get stuck with customers who default on their payments. (Adopter #14)

I won’t dare to do business online. B2B ecommerce is not safe. For example, I saw this notice in their [SMEOnline] “business opportunity” section: there was a Nigerian company offering lucrative drilling and oil exploitation deals. I was thinking: they must be conmen; everything is so high-tech now, even conmen go online. You must be very careful whom you do business with. (Adopter #15)
The fourth problem emerging from this investigation is the incongruent cultural practice induced by B2B e-commerce systems. Adopters felt that the B2B systems would disrupt their current practice in their cultural contexts:

I will use their B2B e-commerce if they can provide my company with ‘money laundry’ services. You see, in the Chinese market, the trade regulations prohibit businesses from sending money back to the home country. I would like to participate in SMEOnline if the portal could help me transact business and direct the payment right back to my account in Singapore from China. This kind of payment gateway would definitely be an incentive for my company and my fellow partners. (Adopter #16)

We have money for B2B e-commerce, but I just don’t like the idea of sending money by clicking on the screen. I like the cheque being issued by my punch machine. It gives me a real sense of doing business. It is the tradition of trading. The SMEOnline will perhaps also reveal our internal trade secret and jeopardise my business. (Adopter #17)

I don’t think the idea of B2B e-commerce will get any further in Chinese trading communities. We value the Guan-Shi [i.e. relationship] network before conducting formal businesses. It is important for us to maintain our reputation in the network; and it is based on the trust relationship among this Guan-Shi network. It’s a word-of-honour business. I don’t believe that B2B e-commerce can replace this kind of trust with a group of strangers. All it can do is just disrupt our current practice (Adopter #18)

The frame of the “nature of technology” and “technology-in-use”. The adopters’ responses are far removed from the “rational” viewpoint associated with the improvement of technology and business strategy. We can observe four implicit assumptions about how the adopters perceived the nature of technology and technology-in-use: (1) the technology (SMEOnline) will dominate and eventually take over our businesses; (2) technology will bring added risk to my existing life security; (3) technology is just a sweet poison to cover crime and bad trading practices; (4) technology will reveal our trade secrets and disrupt the current practice in our cultural context. These four assumptions help us to understand why these adopters were fearful of the introduction of B2B e-commerce.

Time 3: Technology Reorientation – The Technologist’s New Strategy

In Time 3, the adopters’ feedbacks were reported to the top management of DecisionSys so that they could reorient their strategies to counter the previous setback. Interestingly, the technologist’s responses also showed a new pattern of technology fears. DecisionSys felt that it could not deal with most of the “irrational” causes of adoption difficulties. It therefore
decided to hold on to something more “tangible” in order to achieve measurable outcomes. Some of these sentiments are captured in the following comments:

SMEs do not have money to invest in their future. What we need to do is to reduce the price [for B2C e-stores and the SMEOnline subscription fee] again. (Senior consultant, technologist #03)

I do not think the B2B market in Asia is ready… I think these comments [SMEs’ feedback] are unrealistic and ignorant. SMEs cannot embark on e-business simply because most of their internal processes are untidy. (Strategic manager, Technologist #04)

I know SMEs are worried about security issues… But there is nothing we can do about it. It’s the government’s job. You cannot possibly ask us to provide all this e-security for our clients. (Chief Marketing Officer, Technologist #05)

We need to conduct another market survey. We have to shift to a different business model. With the Internet competition, we need constantly to change our business model. We need to replace the B2C2B model with a new approach to get SMEs to buy-in the e-marketplace idea. We also need to reposition our ASP service to the recent e-builder idea. (Managing director, Technologist #06)

In October 2000, DecisionSys decided to encourage SMEOnline adoption by building e-communities. The aim was to position DecisionSys as an “e-builder” to add to the existing ASP services by providing a full range of B2B e-commerce consulting services targeted at trade associations (in light of the previous success in the chemical B2B exchange). The e-community strategy sought to promote the adoption of a B2B e-marketplace by building systems to manage online communities for different trade associations. DecisionSys would act as an e-builder, assisting these trade associations to set up their membership management systems. They offered consulting and ASP services, including customer relationship management, online discussion areas, knowledge management, and electronic learning. DecisionSys’s top team believed that this would place the company in a favourable position to attract SME adopters: ultimately, when there were enough online communities, B2B transactions would follow. Furthermore, once different trade associations employed the e-builder service, it would then take no effort to establish many B2B e-marketplaces within a particular industry.

As the e-community idea was given more serious attention by the top team, the latter began to consider upgrading the technology infrastructure in order to make the new business model viable. The emphasis was on the expansion of data centres, Internet security software, and payment gateway systems across industries. Soon, resources were invested to promote the e-
community idea to trade associations. The engineering team also concentrated on developing a new version of B2B e-commerce that would incorporate the function of an online community. The Chief Technology Officer explained this important move in technology improvement:

For Internet business, electronic infrastructure is the foundation of all services. You need to begin by building a solid basis. Otherwise, when you scale up your business, the whole business will falter like the Leaning Tower of Pisa [in Italy]. What we can do is to invest in more data centres, security software, and a payment gateway mechanism in order to ensure that the security issue is dealt with effectively. (Chief Operating Officer, technologist #07)

We also need to plan for wireless Internet access. Nowadays PDA (personal digital assistants) have become a popular way for people to access e-marketplaces and participate in online communities. To strengthen our e-infrastructure, we must invest in wireless, speedy communication networks. (Chief Operating Officer, technologist #08)

The frame of “technology strategy”. In the third time period we can observe a new set of assumptions similar to the rationalist mindset. The technologist was mainly interested in exercising control, and thus remedial actions were based primarily on rational actions, e.g. new business model formation and technology enhancement. There are three key assumptions about “technology strategy” in the re-orientation period: (1) to improve the adoption rate, the technologist thinks that a more innovative business model is required; (2) a better technological infrastructure is needed to support a viable business model; (3) better technology can overcome adopters’ fears of technology use.

The Outcome of SMEOnline Adoption

By the end of 2000, DecisionSys regarded the adoption rate as unsatisfactory. The company had recruited 250 adopters in a B2B e-marketplace (via B2C e-stores). By early February 2001, the number had dropped to 14. At first, DecisionSys still managed to maintain 200 traders in the chemical e-marketplace, but in November 2000 only 60 infrequent adopters were trading through SMEOnline. In spite of this setback, the company continued to implement the e-builder business model (building online communities for SME trade associations); and at the same time the management team began to conceive yet another new business model. The top managers argued that in the Internet world it was necessary to pursue ongoing and adaptive changes.
Discussion

This paper has explained and developed the concept of technology fears on the basis of a qualitative empirical study. The first part of this section considers how the findings relate to the existing literature on IOS adoption difficulty. The concept of frame-induced technology fears is elaborated, and previous treatments of the concept are explored. The findings offer a social action analysis to help us understand the dynamics of IT adoption in the emerging context of B2B e-commerce. The second part of this section discusses the limitations of the research and makes some suggestions for future research directions.

Implications of the Research

*Implications for the existing literature on IOS adoption difficulty.* The current IOS literature suggests that adoption difficulties arise from three main barriers: technological, intra-organizational, and inter-organizational. Although most existing studies employ factor analysis, there is a growing awareness of the limitation of this approach, and researchers are seeking to enhance our understanding by paying more attention to context-based analysis (for example, Allen et al., 2000; Barrett, 1999), which aims to explore the underlying dilemma of technology resistance. Following a similar approach, this study attempts to explore the discrepant social interpretations of IOS between the technologist and adopters in Internet-enabled B2B e-commerce.

The results focus on the early adoption of new technology. They are less concerned with the technology itself and intra-organizational barriers. The most important suggestion in this study is that “technology fear” is a further inter-organizational barrier to IOS adoption, adding to the power, trust and culture factors that have already been analysed in the literature.

*Explaining the concept of technology fears.* The most common reasons given for not adopting Internet-based B2B e-commerce are: technical insecurity, lack of legal protection, loss of privacy, the high cost of technology, and an unfriendly interface. In a selected e-marketplace experience, this study suggests that IOS adoption barriers are more related to technology fears in terms of four elements: lack of familiarity (with e-commerce), risk aversion, distrust, and incongruent cultural practice.
Our findings indicate that technology fears are frame-induced. Such fears are more concerned with perception rather than practical reality (such as a budgetary shortfall). The premise is that although technology itself is neutral, the people (social actors) who use it are not. Therefore, people usually have tacit assumptions (frames) about what technology is and how technology should be used. These tacit frames, which are often unnoticed, justify and shape a particular orientation towards technology adoption. Orlikowski and Gash (1994) offer a comprehensive review of the theory of frame and explain how “frame” can influence technology use:

Frame is a core set of assumptions, expectations and knowledge of technology collectively held by a group of community. While technological frames are individually held, they are also social phenomenon, in that mutual understanding shared by individuals undergrids enactment of a social reality (p. 199)

The theory of technological frame is a useful analytical lens for this study. It is used to examine how and why technologists and adopters act in particular ways towards IOS. It helps us to understand why unintended consequences follow. The concept of frame-induced fears explains why technologists and adopters may have incongruent expectations of technology, which then lead to difficulties of IOS adoption. As shown in Figure 2, when these different interpretations are not articulated, they may result in conflicting expectations and unanticipated consequences (Orlikowski and Gash, 1994: 204; Sahay, Palit and Robey, 1994).

The examination of frame-induced fear also complements other types of social action analyses (Hirschheim, Klein, and Newman, 1991) such as those relating to culture (Romm et al., 1991), politics (Knights and Murray, 1992), and power (Markus, 1983). It provides an alternative viewpoint to the rationalist’s proposition, which treats technology as a tool for achieving the goal of greater efficiency. The rationalist assumes that technology adoption is free of intervention in social systems and can be dominated by a focus on technological improvement (Kling, 1980). This assumption encourages people to explore new technological capabilities and new areas in which technology can be applied (Robey and Newman, 1996). However, the rationalist assumption fails to take account of the orientation of the people involved and the meanings which they attach to technology use.

Rationalist thinking can be observed in Time 1 and Time 3 of this study, where the technologist was striving for better Internet applications (B2C e-store, B2B portal, e-
community systems, and wireless infrastructure) to support innovative business models. There is nothing wrong with these actions. However, because they did not acknowledge how the adopters perceived the nature of technology and what they expected from technology-in-use (shown in Time 2), these well-intended actions ultimately failed.

Therefore, technology fears can at least offer two useful lessons for IOS adoption. First, we must not see the four elements of technology fears as “irrational”. Such a view arises because the technologist overlooks the expectations arising from the actors’ past experiences, which define their perceptions of the probable reactions of others. Thus, the adopters’ reactions should be considered as “natural” because the adopters chose to act in those ways that seemed most likely to produce what they would regard as a satisfactory outcome and what they would regard as a threat (Silverman, 1970).

Secondly, we need to acknowledge the complexity of inter-firm collaboration, which poses an even more difficult challenge for IT introduction. IOS adoption involves diverse social actors in different organizations, who hold very different frames. These social actors, as Schön and Rein (1994: 26) point out, describe what is wrong with the present situation in such a way as to set the direction for their future actions. We can therefore see that the technologist ignored the adopters’ feedback and insisted on pursuing technological solutions as a result of the failure to reflect on the limitations of the rationalist assumption. This is captured in the metaphor of guns and hunting: we need better guns (B2B e-commerce systems) to hunt our prey (the adopters). In contrast, the adopters see technology more as a source of disruption to current practice. The metaphor here is one of bombs and destruction: the technology is a bomb that will destroy our comfortable life. Without examining the tacit frames, well-intended solutions (such as speedy network infrastructure) are likely to lead to more problems and induce more fears towards technology among adopters.

Reflecting on technology fears. The subject of technology fears is no stranger to the literature. Previous studies have illustrated the concept of technology fears in different contexts such as MIS implementation, groupware, and EDI, using various analytical lenses. To show their relevance to this study, we will refer to three important works: Zuboff (1988), Orlikowski and Gash (1994), and Barrett (1999). The first is Zuboff’s treatment of “informed organisation”. Her research explains employees’ fears toward information systems, which are based on conviction that industrial work will become increasingly abstract. This demonstrates the
barriers associated with lack of familiarity (with B2B e-commerce) and risk aversion. The author describes a factory worker’s technology fears:

When I go out and touch something, I know what will happen. There is a fear of not being out on the floor watching things. It is like turning your back in a dark alley. You do not know what is behind you; you don’t know what might be happening. It all becomes remote from you, and it makes you feel vulnerable...Today I push buttons instead of opening valves on the digester. If I push the wrong button, will it screw up? Will anything happen? (Zuboff, 1988: 63-64)

Zuboff points out that such fear does not exist only in the manufacturing environment, but also occurs in the service sector, e.g. in banking, where the use of information systems induces a loss of knowledge and thus jobs:

Now the banker loses knowledge when he uses reports produced by the system. They don’t know how to do it manually anymore. The machine calculates, and people see reports with figures that they themselves could not produce. They are unfamiliar with the basic concepts of the business, the basic accounting principles. (Zuboff, 1988: 167)

Upper management had looked at modernization as a way to eliminate jobs. The reduction of the work force has been a key element in the justification for all our new computer technology. Reducing [the] head count has been the focus of managerial rewards. We have simply looked at bodies rather than price per ton. We never asked the question, “Can I keep this person and get more tons?” (Zuboff, 1988: 249)

In the early era of IS-enabled automation, Zuboff also observes that people are not just afraid of losing the sense of physical work and losing jobs. Fundamentally, people are fearful that their bodies will eventually become simply an extension of information systems (or may actually be replaced by machines):

The fear is that people will become an extension of a machine, and in this way of someone else’s logic process. I would just as soon throw some of these systems away and invest our money in training people how to think.

The operator has to understand the logic patterns. We need to equip machines to help us, not to replace us. Individuals literally become an extension of the tool. I have asked our other top managers, where does the computer fit in the hierarchy? Will we end up with thinkers at the top, the computer at the next level down, and then the masses who if it says jump, they jump? It’s downright scary. (Zuboff, 1988: 286)
Such technology fears also have much in common with the situation in which early industrial methods saw people as part of the production mechanism. In this sense, information systems may simply replicate the response to Taylorism:

[Computer] robs my dignity... They [computers] are removing my job that lets me use my judgment. Now if you work on any one piece of the process, you have access to information about the entire bleach plant; you have access at your fingertips. That means that my knowledge – which used to be special knowledge – becomes open and available to a lot of people. (Zuboff 1988: 303)

Orlikowski and Gash’s (1994) study is a second treatment of technology fears. From a users’ perspective, they describe the lack of familiarity (with new technology) and distrust in the context of groupware adoption:

I would be more fearful that I’d put something out there [in a Notes database], and it was wrong and somebody would catch it.

Apart from the security concern, I would want to know if the Notes databases were subpoenaable. That’s scary if our research opinions could be used in a malpractice suit…I am worried that my information may be misconstrued… (Orlikowski and Gash, 1994: 196)

Barrett (1999) provides the third elaboration of technology fears in the use of EDI for electronic trading. The adopters (brokers and underwriters in the insurance e-marketplace) were concerned that human negotiation would be replaced by electronic negotiation, and that accordingly their future works in risk placement would involve limited social interactions with their clients. For both the adopters, human negotiation and social interaction were seen as a vital “cultural practice” that was inseparable from their everyday work. This fear ultimately led to a deterioration of their relationship with technologists and to the development of strong feelings of distrust.

If the EDI systems were adopted, the existing marketplace would be transformed into pure remote/ virtual trading… (p 8) The [underwriting] business is based largely on relationships and trust. This is why it is so vital to carry out business in a face-to-face manner…you are negotiating the business. It is important how well you put across the case…you use a lot of different skills in negotiating. You emphasize and de-emphasise certain aspects, handle objections…it is a sales situation. (Barrett, 1999: 12)

The adopters (insurance agents) believed that the use of EDI would undermine the principle of trust in the market. However, as Barrett (1999) explains, the “real” fear behind this
response was that once the EDI systems were live, the computerization of their work would drive out the mystique associated with financial service jobs (risk aversion).

Table 3 shows the different perspectives of technology fears in these studies. It illustrates how the four proposed adoption problems relate to these studies. It can thus help us to understand the importance of technology fears in relation to power, trust and cultural issues.

_LIMITED TABLE 3

Limitations and Future Research

The resolution of DecisionSys’s adoption problems is beyond the scope of this study, though a sufficiently in-depth analysis is provided for understanding the causes of the frame-induced conflicts. To enhance this study, two particular limitations will require attention in the future.

_The fundamental resolution lies in frame reflection; but reflection is difficult._ The analysis of technological frame is bound to be limited by practical reality. In particular, the reflection process is affected by the “attribution egoism” effect (Brown, 1998), because some key social actors (e.g. the technologist) may not want to admit their own problems and may prefer to attribute those problems to external factors (see, e.g., the quoted statement by Technologist #04). It is important to note that changing to a different use of technology may be easy, but changing people’s frames is not. In future studies, it would be useful to explore how a deep-seated frame can be reflected and reframed for the fundamental resolution of IOS adoption. Additionally, we also need to rethink the role of the researcher and the researched. The researcher’s own frame can influence his/her observation of the frames of technologists and adopters. We must thus ask: What should be the role of researchers in the frame-reflection process?

Although frame reflection is difficult and such an analysis may not necessarily provide an immediate resolution of the adoption problem, it does help social actors to avoid an oversimplification of problems in a particular context. In this way, social actors have at least the possibility of emancipating themselves from strategic stalemate. However, future studies face the challenge of exploring how researchers can effectively play such a reflective role.

_Frame analysis aims to achieve reflective learning, not to prescribe oversimplified solutions._ The frame analysis method proposed by this study suggests an alternative way to examine
IOS adoption difficulties in organisations. However, this approach should not be used for prescriptive purposes. The four aspects of technology fear are not to be used as a mechanism for variable manipulation. For example, if researchers could control the variable “lack of trust”, then the system would have an optimal outcome (successful adoption). The proposed framework (Figure 1) seeks to provide a thinking process for reflective learning. To this end, analysts are seeking a deep understanding of the situation in order to design leverage policy for fundamental resolution. In the future, it will be useful to evaluate the effectiveness of the extended “technological frame” analysis in other contexts.

**Conclusion**

This study has explored the adoption difficulty of inter-organisational systems. It has investigated the introduction of a B2B electronic marketplace for small-and-medium-sized enterprises in Singapore. To appreciate the controversies between the technologist and adopters, the study uses the analytical lens of “technology frame”, which examines how social actors assign meanings to situations and to the action of others, and how they react in terms of the interpretation suggested by these meanings. The study extends the previous work of Orlikowski and Gash (1994) by proposing a three-stage time-based framework (a new approach) to analyse IOS adoption (a new technology) in the Asian SME business environment (a new context).

The concept of “technology fears” has been developed through the analysis of the experience of a case study of DecisionSys. This concept offers a useful complement to existing theories of inter-organizational barriers (especially power, trust and culture). Most importantly, it directs researchers’ attention to the importance of the fear factor as an obstacle to the early adoption of IOS (why adopters distrust the technology provider). In order to ensure effective technology adoption, the fear factor must be taken into account. This also means that technologists should recognize the limitations of their characteristic rationalist assumptions.

In particular, there are four areas of technology fears that need to be considered: lack of familiarity (with new technology), risk aversion, lack of trust, and incongruent cultural practice. Managers need to tackle these four barriers in advance if they are to help adopters overcome their fear of technology use.
References


TABLE 1: A list of IOS adoption barriers summarized from the current EDI-based literature.

<table>
<thead>
<tr>
<th>Technology barriers</th>
<th>Intra-organizational barriers</th>
<th>Inter-organizational barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security infringement (e.g.</td>
<td>Lack of perceived benefits</td>
<td>Lack of peer pressure</td>
</tr>
<tr>
<td>payment gateway)</td>
<td>Lack of awareness</td>
<td>Power</td>
</tr>
<tr>
<td>Incompatibility of technological</td>
<td>Lack of champions</td>
<td>Trust</td>
</tr>
<tr>
<td>standards</td>
<td>Lack of education and training</td>
<td>Culture</td>
</tr>
<tr>
<td>Technology complexity</td>
<td>The difficulty of business process reengineering among</td>
<td></td>
</tr>
<tr>
<td>System integration</td>
<td>firms</td>
<td></td>
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<tr>
<td>Technology infrastructure</td>
<td></td>
<td></td>
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<tr>
<td>High set-up costs of technology</td>
<td></td>
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<tr>
<td>Bandwidth</td>
<td></td>
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TABLE 2: Interview scheme

<table>
<thead>
<tr>
<th></th>
<th>Technologists</th>
<th>SME Adopters</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Executives/Partners</td>
<td>5</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>Middle Managers</td>
<td>4</td>
<td>29</td>
<td>36</td>
</tr>
<tr>
<td>Consultants</td>
<td>6</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>41</td>
<td>56</td>
</tr>
</tbody>
</table>
TABLE 3: Different interpretations of “technology fears”

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Context</th>
<th>Technology fears</th>
<th>Descriptions</th>
</tr>
</thead>
</table>
| Zuboff (1988) | MIS automation in US factory | IT induces the abstraction of industrial work | Lack of familiarity (with technology): “There is a fear of not being out on the floor watching things.”
“If I push the wrong button, will I screw up?” |
| | | IT jeopardises job security | Risk aversion: “Now the banker loses knowledge... They don’t know how to do it manually anymore.”
“Upper management had looked at modernization as a way to eliminate jobs.” |
| | | Human bodies are replaced by IT | Cultural practice: “The fear is that people will become an extension of a machine, and in this way of someone else’s logic process.” “Will we end up with thinkers at the top, the computer at the next level down, and then the masses who if it says jump, they jump? It’s downright scary.” |
| Orlikowski and Gash (1994) | Groupware implementation in intra-organizational context (US) | IT use only replicates the antagonism of Taylorism | Incongruent cultural practice: “[The Computer] robs my dignity... They [computers] are removing my job that lets me use my judgment.” |
| Barrett (1999) | EDI adoption in electronic trading in UK’s London Insurance Market | Fears of being exploited via electronic texts | Lack of familiarity: “I would be more fearful that I’d put something out there [in a Notes database], and it was wrong and somebody would catch it.”
Lack of trust: “Apart from the security concern, I would want to know if the Notes databases were subpoenaable. That’s scary if our research opinions could be used in a malpractice suit… I am worried that my information may be misconstrued…” |
| This study suggests… | B2B e-marketplace enabled by Internet for SME in Singapore | Fears towards new technology among Asian firms | Risk aversion: “If the EDI systems were adopted, the existing marketplace would be transformed into pure remote/virtual trading…”
Lack of trust: “The [underwriting] business is based largely on relationships and trust.”
Incongruent cultural practice: This is why it is so vital to carry out business in a face-to-face manner…” |

Cultural practice: “We value the Guan-Shi network before conducting formal businesses.”
FIGURE 1: Analytical Method for Frame Analysis (based on Orlikowski and Gash, 1994)

First level analysis

The Technologist’s View (towards technology introduction)
Frame-induced actions

The Adopters’ View (towards technology adoption)
Frame-induced reactions (resulting in unintended consequences)

The Technologist’s View (towards technology reorientation)
Further frame-induced actions (without reflecting on the entrenched frames)

Second level analysis

The Underlying Frames of the Technologist’s “Technology Strategy”

The Underlying Frames of the Adopters’ View on “Nature of Technology” and “Technology-in-Use”

The Underlying Frames of the Technologist’s New “Technology Strategy”
Time 1: Technology Strategy
(October 1999)

Technologists’ view

Frame-induced actions

Promote B2B e-Marketplace in two steps: (1) offer low cost B2C e-stores (2) these e-stores can be leveraged into setting up B2B e-trading communities.

To make this business model (B2C2B) viable, support is sought from the government (IDA) and trade associations.

To operate effective e-Marketplace, DecisionSys established an e-fulfillment mechanism.

Frame-induced reactions

Four areas of technology fears were exhibited:
  • Lack of familiarity
  • Risk aversion
  • Lack of trust
  • Incongruent cultural practice

Time 2: Technology Adoption
(March 2000)

Adopters’ view

Member adoption dropped from 250 to 14.

Alliances were broken up.

Technology fears still persisted among adopters.

DecisionSys decided to move to wireless Internet access in order to provide faster access and attractive pricing.

Time 3: Technology Reorientation
(September 2000)

Technologist’s view

Frame-induced actions

Need a better business model – DecisionSys decided to combine the ASP model with the e-builder model.

The e-builder model is designed to promote B2B e-Marketplace by building up online communities with trade associations.

To support e-enabler model, DecisionSys enhanced the infrastructure for Internet technology.

Outcome
(January 2001)

Technologists think…

1. To compete in Internet market, success depends on a better business model (B2C and B2B). A solid e-commerce strategy needs to be supported by advanced information technology.

2. To minimize Asian SME’s resistance to technology adoption, we need to provide financial support from government and endorsement from industries.

Adopters think…

1. Technology will dominate and eventually take over my business

2. Technology will risk my existing life security.

3. Technology is always used to cover something bad (sweet poison).

4. Technology will reveal my trade secret and disrupt the current practice in our cultural context.

Technologists think…

1. To improve the adoption rate, we need a more innovative business model.

2. Better technology is needed to support an innovative business model.

3. Better technology can overcome adopters’ fears, but there is nothing we can do about it.