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Mahbubur Rahim
Monash University

Graeme Shanks
The University of Melbourne

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Md. Mahbubur Rahim
Graeme Shanks
Pradipta Sarker
School of Business Systems
Monash University, Australia
mahbubur.rahim@infotech.monash.edu.au

Robert Johnston
Department of Information Systems
The University of Melbourne
Australia
robertj@unimelb.edu.au

Abstract

Inter-organisational systems (IOS) link two or more organisations and enable them to exchange transactions electronically. They have been introduced by different organisations using different adoption processes. Existing literature on IOS adoption however does not explain the variations in the IOS adoption processes initiated by organisations. To overcome this limitation, we have recently developed a theory that offers a satisfactory explanation of the differences in IOS adoption processes followed by different organisations in terms of their adoption motivations in any given IOS project. The theory was tested in the Australian pharmaceutical industry where it received considerable support. In this paper, we now apply the theory to explain the EDI adoption experiences of a large manufacturing company selected from the Australian automotive industry. The findings provide broad support for the theory; thus validating the theory in another industry context and improving the generalisability of the theory. The finding is also useful as it assists IT managers in reducing the uncertainty associated with IOS adoption practices.

Keywords: Inter-organisational systems, adoption, adoption process, motivations

1. Introduction

IOS are a distinctive type of information systems (IS) which cross organisational boundaries (Malone et al., 1989). They enable exchange of information by linking electronically two or more organisations and form the foundation of e-business (Kuljis et al., 1999). Many types of IOS are reported in the literature; we however focus on the type of IOS that is generally used to share processes between the adjacent members of a supply chain. The implicit assumption is that the supply chain members participate in an IOS arrangement based on their predetermined business relationships. We are thus concerned with the 'electronic hierarchy' (Malone et al., 1988) type of IOS, which for example, includes EDI systems and proprietary electronic ordering systems, internet-based supply chain applications among others. This type of IOS is thus different from other related systems such as electronic markets and enterprise application integration (EAI). EAI, which are also known as middleware offers a mechanism by which integration (or data transfer) can be established between enterprise applications within organisations (Altman, 2001), is not considered as an instance of IOS.

IOS have considerable business values; they not only allow organisations to electronically transact more efficiently with their trading partners (Kaefer and Bendoly, 2000), but also provide a platform for entire supply chains to reduce wasteful inventories by reacting more effectively to

customer demand and jointly planning product introductions and promotions (Soliman and Janz, 2004). Appropriate adoption processes need to be followed by organisations to facilitate the achievement of these benefits (Rahim, 2004). However, little is known about how organisations determine IOS adoption processes and why different organisations initiate different adoption processes. Existing IOS adoption literature focuses on the factors affecting the decision to adopt IOS and describes how benefits emerge from adoption processes. It does not offer a satisfactory explanation concerning the variations in IOS adoption processes initiated by different organisations.

To overcome this limitation, we have recently developed a theory, known as IOS Motivation Model (IMM) that relates IOS adoption processes with the organisational motivations for IOS adoption, classifies organisations into four generic motivation scenarios, and predicts different adoption processes to be initiated by organisations representing different motivation scenarios (Rahim et al., 2001a; Rahim, 2004). The model thus offers a comprehensive explanation for the differences in IOS adoption processes followed by different organisations in terms of their adoption motivations in any given IOS project. The IMM model was tested in the Australian pharmaceutical industry where it received considerable support and the findings are reported in (Rahim et al., 2001b; Rahim et al., 2002; Rahim et al., 2004). The model however requires further validation in other industry contexts in order to improve its generalisability across industry segments. To address this, we now apply the IMM to explain the EDI adoption processes in the context of the Australian automotive industry. The automotive industry has characteristics (e.g. industry structure, power distribution among supply chain members, type of product produced), many of which are different from those of the pharmaceutical industry. We want to establish that the model is applicable regardless of the contexts peculiar to an industry. We have thus chosen a large automotive manufacturing company which interestingly has experienced two distinct stages of EDI adoption as a case site. We observed that each stage was driven by the same motivations and followed nearly identical IOS adoption processes. We have thus obtained initial support for the propositions that organisations with the same motivation for adopting IOS initiate similar adoption processes despite significant differences in industry contexts and that the particular circumstances under the motivation is formed do not affect significantly the adoption processes initiated. This additional validation of the IMM model is important for it contributes to the gradual improvement of the understanding of IS practitioners and researchers alike about IOS adoption phenomenon which in turn helps to overcome the uncertainties associated with IOS adoption in industries.

2. Past Approaches to IOS Adoption

The literature on IOS adoption is divided into two broad streams: factor-based research and process-oriented research. Factor-based studies posit that the presence or absence, or perhaps the level, of certain conditions (commonly known as factors) in the adopting organisation, its environment and the adopted technology at some point in time predict adoption. These studies use factors to predict either the formation of an organisation's intention to adopt IOS (Chwelos et al., 2001; Teo et al., 2003) or the decision to adopt IOS (Chau and Hui, 2001; Hausman and Stock, 2003; Soliman and Janz, 2004). There is reasonably strong evidence that such factors are predictive of intention/decision to adopt IOS. These studies are useful as they offer important guidelines facilitating successful IOS adoption decisions. They however do not discuss the conditions relating to initiating IOS adoption processes.

Process-oriented IOS adoption studies, on the other hand, generally describe the processes used in adopting an IOS solution in organisations and explain the benefits achieved as a result of IOS adoption. They suggest that the variation in IOS benefits can be properly explained in terms of the differences in the processes chosen by organisations for introducing IOS. The works of Damsgaard and Lyytinen (1998), Kurnia and Johnston (2000), and Kautz and Henriksen (2002) represent this stream of research. While the connection between process and benefits is often quite convincingly demonstrated, these studies do not discuss how the processes are determined in organisations and why different organisations initiate different processes.

We have recently proposed the IOS Motivation Model (Rahim et al., 2001a; Rahim, 2004) which draws heavily upon concepts from psychology, sociology, and the information systems disciplines to explaining IOS adoption processes. The model recognises the importance of the motives that organisation form for adopting IOS. These motives determine the processes followed in IOS adoption. While recognising the role of traditional factors for the decision to adopt, the IMM rejects factors as predictors of benefits. In our previous papers (Rahim et al., 2001b; Rahim et al., 2002; Rahim et al., 2004), we have successfully demonstrated the predictive power of IMM in explaining single EDI adoption initiatives in selected companies chosen from the Australian pharmaceutical industry. However, as the model is new it needs to be applied in other industry segments in order to improve its generalisability.

3. Theoretical Model & Research Propositions

The term organisational 'motivation' is defined as the 'd*esire of an organisation that prompts it to act in a certain way for adopting an innovative system such as inter-organisational system*' (Rahim, 2004). We argue (Rahim et al., 2001b; Rahim et al., 2002; Rahim et al., 2004) that it is organisational motivations that determine which IOS adoption processes are followed by organisations. This assertion constitutes the foundation of the IOS Motivation Model shown in Figure 1. Therefore, two organisations tend to initiate IOS in a similar manner if they form identical motives. The model is most useful in industries in which supply chains are characterised by a few dominant players and many docile players. In some industries (e.g. airline, banking) organisations participate in an 'electronic exchange' relationship with many partners. The notion of having dominant and docile players may not be observed in those industries. Consequently, the theoretical model cannot be applied to those industry settings. This characteristic of the industry constitutes the boundary of the theoretical model. The IMM model is explanatory in nature and can be used to make predictions about IOS adoption processes that are initiated by organisations. The predictions help business managers in making effective planning for IOS introduction and bringing a reduction in uncertainties associated with IOS adoption.

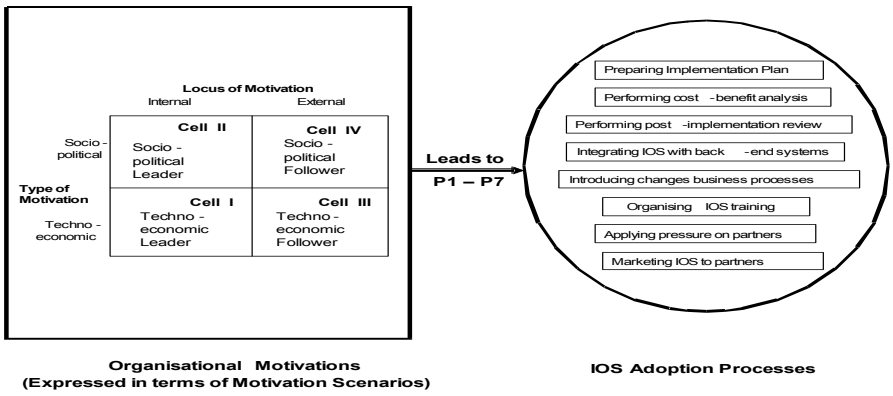

Figure 1: Research model showing relationship between organisational motivations and IOS adoption processes

The IMM shown above has incorporated the notion of 'motivation scenarios' that we proposed in our previous work (Rahim et al., 2001b; Rahim, 2004). In that work, we classified organisational motivation along two dimensions: locus of motivation and type of motivation, and identified a total of four distinct motivation scenarios. The four types of motivation scenarios shown in the left hand side of Figure 1 were proposed in recognistion of the existence of various types of organisational motives (e.g. coercive force, normative relations, economic gains, gaining status) and the source (e.g. internal or external) from which such motives may originate. Cell I defines the "Techno-economic Leader" scenario that is characterised by an internal locus of motivation and a techno-economic type of motivation. This scenario occurs when organisations develop a direct economic motive internally, and invest in an IOS project voluntarily, believing that the investment will improve organisational performance with regard to internal efficiency and competitiveness in the marketplace. Cell II defines the "Socio-political Leader" scenario that is characterised by an internal locus of motivation and a socio-political type of motivation. This scenario occurs when organisations invest in IOS voluntarily to realise their own socio-political motive. In other words, these organisations initiate an IOS project for reasons other than efficiency gains, but nevertheless with a clear intention of perhaps portraying either a "progressive" or "customer caring" image in the industry, or with the realisation that there is no other way forward, given its trading partner's IOS adoption strategies. However, the motivation to adopt IOS is conceived internally. Cell III refers to the "Techno-economic Follower" scenario that is characterised by an external locus of motivation and a techno-economic type of motivation. This scenario occurs when an organisation is approached either by its business partners or by any other influential organisation about IOS adoption and, having evaluated the potential economic benefits of the IOS, invests in it voluntarily. Although the motivation to adopt IOS is generated from external sources (i.e. the locus of motivation is external), the decision is made based on an economic motive. Techno-economic followers generally do not build an IOS, but simply embrace a standard IOS developed either by the business partner that initiated IOS project or by a third party. However, even though techno-economic followers are not the initiators of IOS projects, they remain the proactive users of IOS. Cell IV represents the "Socio-political Follower" scenario that is characterised by an external locus of motivation and a socio-political type of motivation. This scenario occurs when an organisation is approached by its trading partner or a third-party organisation to adopt an IOS, and a decision is made based on

a socio-political motive. Socio-political leaders are the organisations that do not develop an IOS, but embrace an existing IOS solution developed by partners or others parties. These followers are generally the passive users of IOS and introduce IOS for reasons such as legitimacy, compliance, influence or social status.

Based on a review of past IOS adoption literature, we also identified a total of eight key activities that constitute IOS adoption process. These activities which are shown in the right hand side of Figure 1 include: preparing an IOS implementation plan, initiating a cost-benefit analysis for IOS, performing a post-implementation review of IOS, integrating IOS with back-end IT systems, introducing changes in the business practices, organising IOS training, applying pressure on business partners, and marketing IOS concepts to business partners. Detail discussion of these activities is reported in Rahim (2004). We argue that the sub-set of these activities that will be initiated by an organisation for introducing an IOS solution is driven by its motivation scenario for a given IOS project. This relationship is depicted in Figure 1. We hold the view that the relationships between organisational motivations and IOS adoption processes, shown as a solid line, are associative rather than causal in nature (Dubin, 1978). Thus, the model predicts that if two organisations establish similar motives to adopt IOS (and hence belong to the same motivation scenario), they are likely to follow similar IOS adoption processes.

By drawing upon the past IOS literature, we further developed a set of propositions (shown in Table 1) relating to the IOS adoption processes followed by organisations belonging to each motivational scenario. Detail deductions of these propositions can be found in Rahim et al. (2004).

Table 1: Propositions relating to IOS adoption processes

Propositions	IOS Motivation Scenarios				Activities
	Techno-economic leaders	Socio-political leaders	Techno-economic followers	Socio-political followers	
P1	Likely to	Likely to	Likely to	Unlikely to	Prepare an IOS implementation plan
P2	Likely to	Unlikely to	Likely to	Unlikely to	Initiate cost-benefit analysis of IOS
P3	Likely to	Unlikely to	Likely to	Unlikely to	Perform a post-implementation review of IOS
P4	Likely to	Unlikely to	Likely to	Unlikely to	Integrate IOS with back-end IT systems
P5	Likely to	Unlikely to	Unlikely to	Unlikely to	Introduce changes in the business practices
P6	Likely to	Likely to	Likely to	Likely to	Organise IOS training
P7	Unlikely to	Likely to	Likely to	Unlikely to	Apply pressure on partners
P8	Likely to	Likely to	n/a	n/a	Market IOS concept

Note: n/a means not applicable

4. Research Design

A scientific case study approach is selected for two reasons. First, IOS adoption generally takes place in a complex environment because IOS has dependency on infrastructure which my not be within the control of a single organisation (Premkumar et al., 1997). Moreover, the complex interplay of resource dependencies and distribution of power along supply chain members also add complexity to IOS adoption decision making process (Damsgaard and Lyytinen, 2000). Hence, it is critical to capture the experiences of the relevant people and the context of their actions to understand IOS adoption. Case studies are particularly suitable for understanding phenomena within their organisational context (Yin, 1994). We sought in-depth discussions and rich explanations from multiple sources from the case site. Second, we looked for a revelatory case site that has introduced stages IOS solution and is willing to share its rich experience with us. The automotive manufacturing company is selected as a revelatory case site because it has been historically active in adopting new technologies, is reported to have set EDI pace in the Australian automotive industry, and is willing to participate in our research.

The automotive industry from which the case site was selected significantly differs from the pharmaceutical industry within which the IMM was previously tested. The differences can be expressed in terms of industry structure, distribution of power among supply chain members, and type of products produced. Typical pharmaceutical supply chains consist of manufacturing companies, wholesaling companies, healthcare providers (i.e. public and private hospitals) and retail pharmacies. About 100 manufacturing companies, 7 wholesaling companies, 1200 hospitals and several thousand retail pharmacies are known to operate in the Australian pharmaceutical-healthcare industry (Martin, 2000; Anonymous, 2003) . A significant portion of the retail pharmacies is owned by individual pharmacists who run their pharmacies as a family business. The pharmaceutical supply chains are strongly dominated by the wholesaling companies which enjoy enormous purchasing power [More, 2000 #418; Anonymous, 2003 #479. The hospitals and retail pharmacists predominately purchase pharmaceutical items from the wholesaling companies; they generally do not buy directly from the manufacturing companies due to their inability to provide logistical support. Pharmaceutical products are practically considered as research intensive items which are manufactured in mass volume and are sold at a affordable price to the public through a network of hospitals and retail pharmacies.

In contrast, the Australian automotive industry consists of four motor vehicle producers, two hundred motor vehicle component manufacturing companies (i.e. first tier suppliers), five hundred small firms (i.e. second and third tier suppliers) that offer tooling support to both vehicle manufacturers and the first tier suppliers, and a large network of automotive dealerships and sales and service centres. The four motor vehicle producers which are wholly owned subsidiaries of multinational companies dominate and the automotive supply chains. The industry produces over 70 varieties of passenger and light commercial motor vehicles; each of which is assembled from approximately a hundred thousand different parts coming from several hundred different suppliers. The industry operates in a very competitive global market and relies less on government support. In the financial year 2002-03, exports of vehicles were nearly A$3 billion and exports of component parts were nearly A$2 billion. There is a strong inter-dependence between the vehicle producers and their suppliers, and this is often reflected in the participation of the some first tier suppliers in the design of vehicles initiated by the car makers.

The case study was conducted using the rigorous principles of Yin [, 1994 #184] and Sarker and Lee(2000) which are grounded in the positivist tradition. The positivist tradition is used because

of the need to test a theoretical model to explain the behaviour of organisations for IOS adoption. Drawing upon the model, it was also possible to deductively test certain concepts pertaining to organisational behaviour for introducing IOS. In-depth interviews were sought from three senior executives from the company: chief IT manager, materials planning manager, and a senior analyst. Established methodological guidelines were applied in order to generate reliable findings. Reliability was addressed by clearly conceptualising research variables, using previously pilot-tested protocol and using multiple coders. The interviewees on many occasions granted access to company documents relating to the company background, IT profile, EDI characteristics, and EDI implementation, which often helped us to corroborate the information provided during interviews. The interview transcripts as well as a draft report on EDI adoption were prepared and were sent to the interviewees for review. Data collected from the company were analysed using the pattern matching logic (Yin, 1994). This allowed us to compare the pattern of outcomes of dependent variable (i.e. IOS adoption processes) predicted from the theoretical model with the pattern of outcomes deduced from the case data collected from the company. However, consistent with the notion of analytical generalisation (Yin, 1994), we also checked that the expected processes were initiated for the same reasons (as reported by the interviewees) as that used in the logical deduction of the propositions.

5. Description of Case

The participating case is a well-known automotive manufacturing company (i.e. motor vehicle producer) located in a large capital city, in Australia. It wholly designs, develops and builds a range of vehicles many of which are exported to Asian countries. The company has several thousand employees and has assets worth over A$1 billion. Its IT department which consists of about 100 employees has employed a wide range of IT enabled applications in support of all the major business processes. The company uses an ERP system, which is well integrated with materials planning systems.

6. Case Study Findings

This section presents empirical findings concerning the motives of the automotive company for adopting EDI systems and classifies the company into a generic motivation scenario shown in Figure 1. It then discusses the adoption processes (and propositions relating to these processes) initiated by the company in introducing EDI systems over two distinct stages.

6.1 Stage 1: Traditional EDI Systems - Adoption Motivations and Processes

In the late 80's, the automotive industry within which the case company operates had undergone considerable changes. The Australian government decided to withdraw tariff protection as outlined in Button Car Plan in order to make the industry more internationally competitive (Mackay, 1993). The automotive company then took an initiative to adopt a traditional proprietary EDI system to transact electronically with its large suppliers in order to improve its efficiency and develop the ability to effectively compete in the global market.

Within the case company, the idea of conducting electronic transactions through EDI was initially conceived by the IT department. The materials planning department of the company then expressed a strong interest in the idea of EDI-enabled electronic transactions as EDI was considered as a means to become more competitive. The materials planning department prepared a project proposal with the assistance of the IT department to streamline materials ordering

process which later received full support from the senior management of the company. Hence, the locus of motivation for EDI adoption is considered internal.

The materials planning department was attracted to the novelty of EDI technology and established a desire to exploit EDI technology for improving efficiency of the materials ordering process. EDI technology was considered to have the potential for bringing a reduction in data entry errors and order document preparation time. The department wanted to send Material Requirements Schedules (MRS) to the suppliers who would then return Advanced Shipping Notices (ASN). The electronic exchange of these documents was believed to result in substantial time and cost savings. EDI was also expected to take some costs out of the ordering process by reducing mismatched ASNs. In addition, the department looked at EDI as a means of gaining competitive advantages over its rivals by locking-in major suppliers. According to the materials planning manager:

> *"We were at the forefront of the initial introduction of EDI in the automotive supply chain in Australia, and the initiative was directed at efficiency gains (internal operations) and enhancing our competitive advantage in the industry"*

Hence, the type of motivation is techno-economic in nature. Considering the locus and type of motivation, the automotive company can be regarded as an instance of techno-economic leader.

Prior to introducing the EDI system, the company framed a carefully crafted implementation plan to seek an approval from the senior management (P1). The plan included a detailed justification for introducing the EDI technology, a time table for implementing EDI and an overview of the critical issues relating to communication and EDI standards. The company also conducted a cost-benefit analysis (P2) and clearly specified benefits in terms of immediate efficiency gains and long term advantages over its competitors. Furthermore, it reviewed the situation in its internal operations as well as in the supply chain after having undertaken the implementation of the EDI system (P3). According to the chief IT manager:

> *"A thorough implementation (consisting of cost-benefit analysis) review was conducted both before and after the system was deployed. We also undertook a review to find out opportunities for further improvement with regards to our investment into the development of the EDI system."*

The company integrated EDI systems with its back-end materials planning system in order to avoid manual data entry about MRS and ASN (P4). In the words of the materials planning manager:

> *"In the pre-EDI days, our staff in the materials control division had to print out the schedules and fax them out to our suppliers. At the other end, when parts arrived at the gate, if the ASN had already reached the materials handling system via EDI (all the data is pre-populated) when our staff can see the particular conveyance coming in, they can say "yes, I've got this conveyance…the screen's already populated…we've received all those parts". If they don't have that, they'll have to manually key in all the relevant data for those parts which is time-consuming and counter productive."*

The company streamlined its ordering process prior to introducing the traditional EDI system (P5) as indicated by the senior analyst:

"…EDI implementation was preceded by the examination and enhancement of relevant business processes"

The company organised training for its IT staff which enabled them to build an electronic interface between the EDI system and the back-end materials planning systems and greatly facilitated the seamless exchange of MRS and ASN data with its suppliers (P6).

The company took a strong stance in support of forcing its suppliers into joining the EDI network (P7). Suppliers risked losing their business relationship with the car manufacturer if they failed to adopt EDI, while potential non-EDI partners lost out in their competitiveness to the EDI-willing counterparts in their bid to join the supply chain network. The senior analyst commented:

"Our company has an overpowering relationship with all our suppliers as we are far bigger than most of them, and we tend to dictate to them how to run their business."

Suppliers had no choice but to join the network which eventually proved to be an expensive venture for them, both in terms of their own investment in EDI as well as technical proficiency required to send and receive documents through the EDI network. Even though EDI had the potential to provide benefits to suppliers by bringing a reduction in transaction errors, no serious attempt was made by the company to promote EDI based on its technological novelty (P8). Rather, the company indicated that the failure of the suppliers to comply with the company's requirement of doing business via EDI would unfavourably affect their performance ratings.

6.2 Stage 2: Web-based EDI systems - Adoption Motivations and Processes

In the year 2002, the company decided to migrate to the global MRP system which had already been running for about 20 years in its headquarters. This decision was made due to its parent company's desire to standardize and streamline internal operations across its chapters worldwide. The migration to the global MRP, though supposedly an entirely internal issue, however instigated changes to coding patterns and mailboxes in the company's EDI transactions with its suppliers. Thus, an EDI upgrade had to be undertaken, which in turn, called for a revision of coding schemes and mailboxes changes with suppliers. While undertaking the EDI upgrade initiative, the automotive company conducted a survey of its local suppliers to find out more about their EDI capability. The company identified that somewhere down the line its purchasing department had signed-in with suppliers with no EDI capability whatsoever as these suppliers were delivering parts at a low cost. However, the non-compliance of EDI by these small suppliers had an ill-effect on the company which was not identified before. The materials planning manager commented:

"…our purchasing people have not always ensured this requirement (EDI compliance) as they're driven by the prices of the components, and were less concerned with the EDI-capability of the suppliers. So, over the years, we ended with a number of suppliers who were not EDI-capable, which has had an (adverse) impact on the assembly plant."

Therefore, putting these non-EDI enabled suppliers onto an EDI network presented an opportunity of obtaining further efficiency improvement and enforcing a policy of 100% suppliers EDI compliance.

The automotive company further recognised that many of the non-EDI enabled suppliers are small companies with limited financial resources and IT expertise. Taking this into consideration, the company decided to invest in web-enabled EDI application but outsourced its development to a third party service provider. Using the web-based EDI systems, the company could then send MRS to the third party provider via a proprietary network. Suppliers could then log-in and view the list of MRS using a standard web interface. The web application also allowed the suppliers to view a particular MRS and automatically convert it into an ASN at the click of a button, and send it off to the service provider. Upon receiving an ASN from the suppliers, the service provider would then translate it into a traditional EDI format and forward the EDI message to the automotive company via the proprietary network.

The intent of the automotive company to invest in the web-based EDI system was on realizing further efficiency gains by encouraging the small suppliers to adopt an electronic medium. However, the web-based EDI was not considered as a source of competitive advantage nor the system was intended to enhance the company's bargaining power over the small suppliers. Thus, the company was still being driven by its techno-economic leadership motivation, although the circumstances under which this motive was formed were different from those in stage 1.

Prior to the introduction of the web-EDI system, the automotive company framed an in-depth implementation plan in close collaboration of the third party service provider (P1). It also conducted a cost-benefit analysis and decided to outsource the development of the system in order to minimise the development costs (P2). Furthermore, the company reviewed its internal operations after having undertaken the implementation of the web-EDI system (P3). It found out that further manual work was reduced as non-EDI suppliers were now able to transmit documents electronically via the web. The company also integrated web-based EDI systems with its back-end systems to avoid manual intervention for triggering the exchange of MRS and ASN at the company's side (P4).
The company did not streamline its ordering process while introducing the web-based EDI system (P5). This is because the task of translating documents from EDI to web formats and vice-versa is now performed by the service provider. Therefore, the introduction of web-EDI services did not bring about any major changes in the internal business processes of the automotive company as it continued to send and receive documents in the usual EDI format. According to the senior analyst:

> *"No changes in business processes were introduced as a result of the adoption of web-based EDI by certain suppliers. The upgrade was in line with the business processes, which had already been in place."*

As the web solution was actually developed by the third party service provider, the automotive company did not conduct any training programs for its own personnel. However, the company instructed the third party service provider to organise demonstration programs and on-line training programs for the small suppliers in order to train their staff in operating the web-based application (P6).

The automotive company did not exert any pressure on the small suppliers (P7). Instead, it provided financial assistance to the web-EDI provider to develop a web-based solution that was user-friendly, Internet-based, and required lower subscription fees from suppliers. The web-based EDI system also eliminated the need for small suppliers to possess a high degree of

technical proficiency and thus encouraged them to carry out transactions electronically with the automotive company. In the words of the senior analyst:

> *"They looked at the change with dread (when the web-EDI was proposed) but were surprised by the support we provided them in going through the changes (getting to use the web to receive and send EDI messages)."*

The introduction of the web-EDI system was accompanied by a much more cooperative approach from the automotive company. Apart from investing in the development of the web-based solution, the automotive company did not issue any explicit threats to non-EDI suppliers. Moreover, technical assistance and guidance were offered to the suppliers by the third party service provider. In particular, as the translation of documents from the proprietary EDI network into a web-based format and vice-versa was being looked after by the web-EDI provider, small suppliers subscribing to the web services did not have to worry about EDI codes and formats. According to the chief IT manager:

> *"The main benefit (of web-EDI introduction) is the much lower cost to the suppliers than what we've had before with conventional EDI. Another added benefit is the fact that through the same web-based system they are able to communicate with their other trading partners. We have not imposed our own dedicated EDI system onto them."*

7. Discussion

The motivations that have driven the automotive company for the adoption of EDI systems have not changed over the course of the two stages. In the early stage, the desire to gain competitive advantage and efficiency improvement prompted the company to invest in the traditional EDI system. At the second stage, the opportunity of achieving further efficiency gains inspired the company to introduce web-enabled EDI systems. Thus, the motivation in both stages is techno-economic in nature. In the light of these observations, the automotive company has been classified as a techno-economic leader. We however emphasise that the motivations for IOS adoption were not established simply because the company is large and has adequate financial and technological resources available. We did not observe any evidence that supports the notion that organisational size or vision of senior management influenced the process of EDI adoption at the company.

Most of the actions undertaken by the company during the two stages of EDI adoption are consistent with the predictions shown in Table 1; thus providing empirical support to the fact that organisations tend to follow similar adoption processes when they establish similar motivations for IOS adoption, despite differences in both the industry context and the circumstances under which the motivation was formed Table 2 summarises the support received for the propositions at each stage of EDI adoption.

Table 2: Outcomes of the propositions relating to IOS adoption processes

Propositions		Stage 1: Traditional EDI	Stage 2: Web-based EDI
P1	Techno-economic leaders are likely to prepare an IOS implementation plan	Supported	Supported
P2	Techno-economic leaders are likely to initiate cost-benefit analysis of IOS	Supported	Supported
P3	Techno-economic leaders are likely to perform a post-implementation review of IOS	Supported	Supported
P4	Techno-economic leaders are likely to integrate IOS with back-end IT systems	Supported	Supported
P5	Techno-economic leaders are likely to introduce changes in the business practices	Supported	*Not supported*
P6	Techno-economic leaders are likely to organise IOS training	Supported	Supported
P7	Techno-economic leaders are unlikely to apply pressure on partners	*Not supported*	Supported
P8	Techno-economic leaders are likely to market IOS concept	*Not supported*	Supported

It can be observed that a total of six research propositions (i.e. P1 to P6) out of eight has received full support at the initial stage of EDI adoption. In the second stage, all but one proposition were supported. We have however revisited those propositions that did not receive empirical support and found that the deviations between the predictions and actual experience of this company could be satisfactorily interpreted in terms of situational factors unique to the participating case. Hence, the logical arguments used in developing those propositions were not challenged. In this context, we acknowledge that the arguments used in developing all propositions (i.e. P1 to P8) will be revisited if additional studies identify possible deviations.

Table 2 further highlights an interesting finding. The approach followed by the company in diffusing the EDI innovation to its suppliers has shown some differences between the two stages. In the early stage, the company applied a pressure on its suppliers, followed a coercive approach and forced its suppliers to join the proprietary EDI network. However, during the course of EDI implementation, the automotive company became aware of the difficulties for the suppliers to address data mapping and document standards which caused great inconvenience to the suppliers.

The maturity in using EDI and the lessons learned from the initial stage helped the company in changing its attitude towards diffusing a new innovation with its supply chain members. The company understood that a new innovation such as web-enabled EDI needs to be promoted based on its merits to the suppliers. The company thus placed a greater effort in providing a system that not only improves its efficiency but also adds value and improves convenience to its suppliers. As such, the company promoted the web-enabled EDI through a co-operative approach and did not exert any pressure on its suppliers so that the system makes it easy for the small

suppliers to establish electronic exchanges. This realisation eventually provided support for the propositions P7 and P8 at the second stage of EDI adoption.

8. Conclusion

In this paper, we have applied the theory of IOS adoption motivation to explain the IOS adoption experience of a large automotive manufacturing company. We have observed that the company has undergone two distinct stages of EDI adoption and each stage is characterised by tech-economic motivations. We have further observed that there exist considerable similarities in the IOS adoption processes initiated by the company at each stage which in turn suggests that the particular circumstances within which the motivations for EDI adoption are formed do not significantly affect the EDI adoption processes. Therefore, the IMM receives support in the automotive industry at least for the techno-economic motivation scenario. This suggests that the theory of IOS adoption motivation which was initially tested in the pharmaceutical industry may be generalised to the automotive industry as well. This findings contributes to the IS literature by highlighting the role of motivation as a determinant of IOS adoption processes. The practical implication is that, by knowing their own motivations for IOS adoption, the potential IOS adopter organisations can obtain insights about how to initiate adoption processes which in turn can bring a reduction the uncertainty associated with IOS adoption in organisations.

As the EDI adoption at the participating case company represents two instances of 'techno-economic leader' motivation scenario, further work is still necessary to include more case organisations that will serve as the instances of the remaining three generic motivation scenarios (shown in the left hand side of Figure 1). In particular we aim to test the applicability of the IMM model to industrial settings (e.g. the Australian grocery industry) and information technologies (e.g. ERP) other than those for which it was developed. Properly validated thus, the theory would be a major development in understanding theoretically, and predicting in practice, the potential benefits of large scale IT adoption.

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