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Md. Mahbubur Rahim

Stephen P. Smith

Graeme Shanks

Robert Johnston

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UNDERSTANDING IOS IMPLEMENTATION PROCESS IN AN AUTOMOTIVE MANUFACTURING COMPANY: AN ORGANISATIONAL MOTIVATION PERSPECTIVE

Md. Mahbubur Rahim, Monash University, Australia, mahbubur.rahim@infotech.monash.edu.au
Stephen P. Smith, Monash University, Australia, Stephen.Smith@infotech.monash.edu.au
Graeme Shanks, The University of Melbourne, Australia, gshanks@unimelb.edu.au
Robert B. Johnston, The University of Melbourne, Australia, and
University College Dublin, Ireland, robertj@unimelb.edu.au

ABSTRACT

A leading Australian automotive manufacturing company has introduced an internet-enabled electronic data interchange (EDI) system recently that links the company with its small suppliers. In this paper, we use a scientific case study approach to examine the internet-enabled EDI implementation experience of the automotive company, and explain its implementation process by referring to a theoretical model known as the IOS Motivation Model (IMM) which we have developed based on the notion of 'organizational motivation' for IOS adoption [16]. The case study findings highlight the key role of organisational motivation as a determinant of IOS implementation process undertaken by the company. This finding is useful to e-business practitioners because it provides them with a means of assessing IOS implementation related activities, and for researchers, because it provides a theoretical framework for understanding the role of motivation in the activities conducted when implementing a system.

Keywords: EDI, interorganizational systems, electronic commerce

INTRODUCTION

Interorganizational systems (IOS), which automate boundary-spanning activities of organizations, form the foundation of business-to-business e-commerce operations in many firms. The adoption of these systems in Australia is particularly widespread in the automotive industry, where the number of companies implementing IOS, and the capabilities of those systems have been increasing progressively over the past 25 years [9]. Over that period, a substantial body of research into IOS-related issues has accumulated, with most studies focusing on either the adoption decision [2] [4] [5] or the identification and measurement of benefits associated with using these systems [19]. Despite the volume of research into those topic areas, surprisingly little is known about how companies determine their IOS implementation processes. For example, it has been reported in the IOS literature that different organisations follow different implementation processes even for introducing similar types of IOS technologies [6] [8]. Factors identified as being related in some way to the decision to adopt do not, however, provide a satisfactory explanation as to why companies implementing similar systems may use a different implementation processes. An improved understanding of the IOS implementation process is important, partly because it is fundamental for strategic IOS planning, but also because the process almost certainly has a direct impact on the capabilities and effectiveness of the system implemented [3] [11].

To address this gap in the literature, we study the IOS implementation process of a large Australian automotive company that in recent years has initiated an internet-based EDI solution to trade with its small suppliers. We explain that implementation process by drawing upon a theoretical model of 'organisational motivations' for IOS adoption, known as the IOS Motivation Model (IMM) [15] [16]. By applying that model, we are able to demonstrate that motivation, interacting with intra-organizational and extra-organizational forces, not only influences IOS implementation practices in predictable ways, but that any departure from expected behaviour is a mismatch between intentions and behaviour, and so represents a potential problem in implementation procedures. This study therefore contributes to the IOS literature by highlighting organisational motivation as a driver of the IOS implementation process in organisations, thereby enhancing our understanding of the IOS implementation phenomenon.

IOS MOTIVATION MODEL

The IMM, which we apply in this research, predicts the adoption processes likely to be initiated by an organization in response to that organization's leadership position within the supply chain network (leader or follower), and the type of business benefit sought from the relationship (techno-economic or socio-political). The IMM (Figure 1) is based on two arguments: (1) motives determine many of the activities performed by an organisation when introducing a given IOS application, and (2) conditions within the organization (e.g. existing technology, organisation size) and external to the organization (e.g. available technology and legal requirements and social norms) may constrain some aspects of IOS implementation activities.

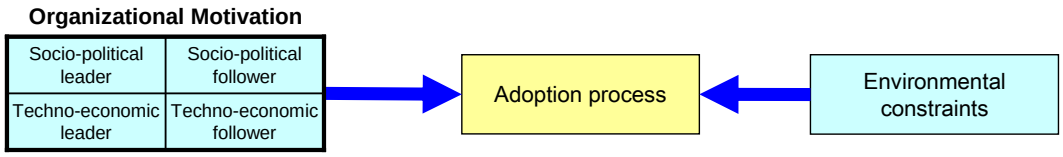

Figure 1: The IOS Motivation Model

The leadership position and business benefit dimensions interact to create four motivation scenarios in which the organization is either a leader or a follower and the primary business benefit sought is either economic or socio-political. It is argued that the leader and follower relationship is actually rooted in the notion of locus of motive. An organisation is motivated to play the role of IOS leader in a supply chain when its motive for IOS adoption (i.e. economic or socio-political) originates within the organisation. In contrast, an IOS follower is motivated by the desires of an external entity (e.g. business partner).

Economic aims include saving costs and increasing efficiency. Socio-political aims include a desire to increase status, control, or security in the relationship. Together, these aims combine with the relationship position (locus of motive) to create four motivational scenarios: techno-economic leader, techno-economic follower, socio-political leader, and socio-political follower, each of which is associated with a specific pattern of activities likely to be performed when an IOS application is introduced.

The IMM is partially based on the principles underlying emergent process (EP) theories [10] [12] which assert that, although systems are generally implemented to achieve specific goals, the actual outcomes observed often do not match those goals exactly due to interactions between forces within and external to the organization. The IMM and EP theories do differ in some important ways, however. For example, EP theories are conceptual lenses that help us analyze past events in terms of motivations and institutional forces without making specific predictions about how either should influence outcomes. Markus and Robey [10], actually refuse to acknowledge a dominant cause of change in their EP theory, claiming that behavior cannot be predicted *a priori* either by the intention of individual actors or by the conditions of the environment. The IMM, in contrast, asserts that different configurations of implementation activities are likely to be observed for each motivation, with the caveat that the external environment and organizational capabilities sometimes moderate the relationship between motivation and outcomes (i.e. implementation process). The high-level schematic overview of the IMM in Figure 1 shows these relationships between intentions, outcomes, and moderating forces (both intra-organizational and extra-organizational). This difference in emphasis means that the IMM, like EP theory, can be used to explain outcomes in terms of goals, influences external to the organization, and organizational (internal) factors. Unlike EP theory, however, the IMM can also be used explore the likely impact of alternative motivation scenarios (what would we expect as outcomes had the organization used a different motivation) and the likely strengths and vulnerabilities associated with each implementation process.

Research Model

In this section we describe the research model. Specifically, we describe the four IMM 'motivation scenarios' (shown in Figure 2), and discuss the propositions relating to the implementation activities associated with introducing a given IOS solution by organisations representing techno-economic motivation scenario. Cell I is the "Techno-economic Leader" scenario, characterized 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 is 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 motives. These organisations initiate an IOS project for reasons other than immediate 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 characterized 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, 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 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 followers are the organisations that do not develop an IOS, but embrace an existing IOS solution developed by partners or others parties. Unlike techno-economic followers these organisations are passive users of IOS and introduce IOS for reasons such as legitimacy, compliance, influence or social status. Note that in the IMM two-by-two motivation matrix (left hand side of Figure 1) such scenarios as 'internal-follower' and 'external-leader' because in relation to IOS

adoption, internal motivation is always assumed to be associated with leadership role in the supply chain. Likewise, for organisations where the locus of motivation is external, the adoption of IOS is often initiated by others and are assumed to follow IOS adoption pace set by others. Hence, they remain as IOS followers.

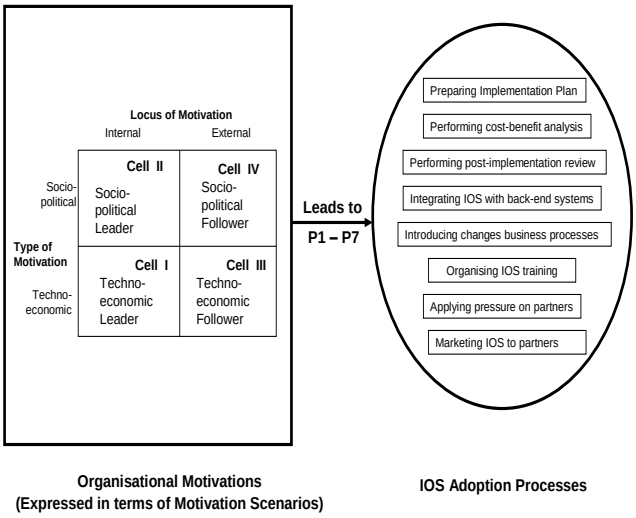

Figure 2: The Research Model

Based on a review of past IOS adoption literature, we also identified a total of eight key activities that constitute the IOS adoption process (see [14] for a detailed discussion of these activities). These activities which are shown in the right hand side of Figure 2 are: (1) preparing an IOS implementation plan, (2) initiating a cost-benefit analysis for IOS, (3) performing a post-implementation review of IOS, (4) integrating IOS with back-end IT systems, (5) introducing changes in the business practices, (6) organising IOS training, (7) applying pressure on business partners, and (8) marketing IOS concepts to business partners. We argue that the sub-set of these activities that will be initiated by an organisation for introducing a given IOS solution is driven by its motivation scenario for that particular IOS solution. In Figure 1, this relationship is depicted as a solid line linking the motivation scenarios with the IOS adoption activities. These propositions are summarised in Table 1, which shows the activity pattern for each motivational scenario just described **(s**ee [16] for details).

Table 1: Expected IOS adoption processes for each motivation

Prediction	Activities	Techno-economic Leader	Social-political Leader	Techno-economic Follower	Social-political Follower
P1	Prepare implementation plan	Yes	Yes	Yes	No
P2	Cost-benefit analysis	Yes	No	Yes	No
P3	Post-implementation review	Yes	No	Yes	No
P4	Integrate IOS with back-end IT systems	Yes	No	Yes	No
P5	Change business practices	Yes	No	No	No
P6	Organize IOS training	Yes	Yes	Yes	Yes
P7	Apply pressure on partners	No	Yes	Yes	No
P8	Market IOS concept	Yes	Yes	n/a	n/a

Drawing upon the IMM, we posit that techno-economic leaders will seek an improvement in efficiency and competitiveness in the marketplace and therefore use an IOS as part of an efficiency strategy directed at transforming of key business processes. Their IOS projects will therefore tend to be strategic with a much greater focus on integrating systems (P4) and improving the depth and quality of information available to business managers [18]. Because improving the depth and quality of information with partners is considered to be a priority, the focus of techno-economic leaders will be on using data management capabilities of an IOS as the basis for transforming key processes by eliminating non-value adding activities (P5). Introducing changes to their business processes help them to set apart from their competitors. Hence, such business initiatives as Just-in-Time (JIT) and Vendor Managed Inventory (VMI), in which one company uses the IOS as a means to transfer responsibility for some operational inventory management functions to a business partner [1] [7], are often initiated. These leaders will tend to invest substantial resources in building an IOS, and hence are expected to prepare a careful implementation plan to secure support and funding from their senior management (P1). Such a plan enables the management to monitor the progress of the IOS project.

Techno-economic leaders do not rush into an IOS development due to industry hype rather they make a judgement based on a

financial analysis before proceeding with IOS adoption (P2). Techno-economic leaders generally recognise the need to introduce control mechanisms to help them achieve their goals through IOS. This view is consistent with the recommendations of such organisational scientists as Kirsch [7] who argued that organisations often introduce controls to ensure that their information systems projects meet their business objectives. Hence, techno-economic leaders are expected to initiate a post-implementation review of IOS (P3). These leaders also recognise training as an important facilitator to enable their IT staff to successfully complete an IOS project (P6). They are also expected to aggressively promote the notion of IOS to their partners as the lack of the participation of partners would seriously constrain the achievement of their expected economic goals (P8). The promotion of IOS is however based on its perceived economic advantages to the entire supply chains. Hence, these leaders are unlikely to exert any coercive pressure on their partners (P7).

Research Design

We use a scientific case study approach, in which in-depth observations are compared against theory-based predictions, in our analysis. This approach has been selected for two reasons. First, IOS adoption generally takes place in a complex environment because IOS is dependent on infrastructure which my not be within the control of a single organization [13]. Moreover, the complex interplay of resource dependencies and distribution of power amongst supply chain members also adds complexity to the IOS adoption decision making process [6]. 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 [20]. We sought in-depth discussions and rich explanations from multiple sources from the case site. Second, we looked for a revelatory case site that had introduced recently a web-enabled EDI system and was willing to share its experience with us. The automotive manufacturing company we report next is selected as a revelatory case site because it has been historically active in adopting new technologies, is reported to have led EDI implementation in the Australian automotive industry, and is willing to participate in our research.

The case study was conducted using established principles [17] [20] to guide both data collection and analysis. Specifically, in-depth interviews were sought from three senior executives of each company: the chief IT manager, the materials planning manager, and a senior analyst, and additional interviews were sought from the automotive company's third party EDI service provider (and who was closely involved in the development of a web-enabled EDI solution). To ensure transcription and interpretation accuracy, each interviewee reviewed the transcript of the interview and a draft report on the EDI implementation project of the firm.

Reliability was addressed by conceptualising research variables clearly, using a previously pilot-tested protocol and using multiple coders. The interviewees on many occasions granted us access to company documents relating to the company background, IT profile, EDI characteristics, and EDI implementation, which let us corroborate the information provided in interviews. Data collected from the company were analysed using pattern matching logic [20] in which observations were compared to the implementation activity pattern predicted by the IMM.

Description of Case

The participating organisation is a well-known Australian automotive manufacturing company that wholly designs, develops and builds a range of vehicles. The company has several thousand employees who are structured along eight divisions. The IT division, which consists of 13 senior managers and 55 IT developers/analysts, is split into business applications and IT architecture. The company uses an in-house developed material planning system that is integrated with both traditional EDI systems (introduced in the early 1990s) and a web-enabled EDI solution (introduced in 2004 and maintained by a third party service provider).

The core application used by the manufacturing company is known as the Common Materials Management System (CMMS). The CMMS is an in-house global Materials Planning System (MRP) system which was implemented in the assembly plant in the year 2004. The company decided to introduce the global MRP system which had already been running for several years in the parent company's assembly operations in North America and Europe. The decision for moving to the global MRP system was made due to the parent company's desire to standardize and streamline internal operations across its chapters worldwide. The company enters into the CMMS system information about what vehicles it is planning to build in the next 12 months based on actual orders and forecast orders received from a network of dealers. The CMMS then calculates parts requirements associated with those planned vehicles (which form the basis of forecasting at the company) and then automatically generates the schedules for the respective suppliers. This is done with no manual intervention because the CMMS can determine which parts each supplier can deliver. These schedules, which are known as Materials Requirement Specifications (MRS), are produced in flat files and are sent to the in-house EDI hub (on EDI X400 server) where they are translated into a corresponding industry standard EDI format. The translated EDI messages are in turn sent to the suppliers through a proprietary AANX communication network. The CMMS also produces receipts file based on the Advanced Shipping Notices (ASNs) sent by the large tier-one suppliers which are then sent to the accounts payable system. The payment is made at the rate negotiated by the purchasing division.

The introduction of the global CMMS MRP instigated changes to coding patterns and mailboxes in the company's EDI transactions with its large suppliers. Thus, an EDI upgrade was undertaken, which in turn, called for a revision of coding schemes and mailboxes changes with suppliers. According to the chief IT manager:

"We wanted to ensure that our suppliers adhere to certain disciplines with codes they use in their EDI messages. Hence, we had to change all our EDI programs related to materials handling at the assembly plant in order to enable them to communicate with the newly implemented global CMMS system."

The successful introduction of the global CMMS MRP system however required that all the suppliers of the company were EDI-capable. Therefore, while undertaking the EDI upgrade initiative the automotive company conducted a survey of its local suppliers to find out more about their EDI capability. To the surprise of the company, it discovered that the purchasing department had contracts with many small 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 brought to the attention of the senior management 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."

The non-compliance of EDI by many suppliers was affecting the efficiency of the assembly plant operations. The efficiency was affected due to the delayed arrival of ASNs issued by the suppliers. The CMMS runs over-night batch processing to calculate the usage of all the parts in the plant for the next day in relation to the quantity of parts. When the data entry was not completed by the end of the day, CMMS would show a negative inventory balance. According to the materials planning manager:

"When our inventory analyst looks at the negative figures he usually panics straight away! In actual fact, there are parts available in the plant, but they have not been booked off. So, we experience delays like this when suppliers are not EDI-capable."

Senior management initially did not understand the impact of non-EDI compliance on the assembly plant operations. However, the introduction of the CMMS system provided the materials planning department with an opportunity to convince senior management about the significance of total EDI adoption by suppliers. Senior management understood and strongly supported the idea of putting these non-EDI enabled suppliers onto an EDI network because it presented the company with an opportunity of obtaining further efficiency improvements and enforcing a policy of 100% suppliers EDI compliance.

The EDI survey conducted by the automotive company helped it to recognise that many of the non-EDI enabled suppliers were small companies with limited financial resources and IT expertise. The company further understood that these small suppliers would be extremely reluctant if they were asked to trade with the company through the traditional EDI network which would require considerable investment on the part of these suppliers. The materials planning manager remarked:

"One of the things that I wanted to do was have each and every supplier EDI-capable. I however noticed that some suppliers were pushing back and saying that they were not willing to invest in EDI systems. There is an EDI committee in our company, and I discussed with them about the possibility of a web-based EDI offering."

Taking into consideration the reluctance of the small suppliers and to reduce the learning curve associated with traditional EDI, the company decided to invest in a web-enabled EDI application that was to be maintained by a third party EDI service provider. The automotive company invested in the web-based EDI system in order to realize further efficiency gains by encouraging the small suppliers to adopt an electronic medium.

The web-enabled solution has several attractive features. First, it no longer ties suppliers to one desktop. It could be used from any desktop that has access to the Internet. The web solution thus greatly improves supplier flexibility. Second, suppliers can automatically "reuse" part of the information from the MRS which the suppliers receive from the automotive company. Using the web-based EDI system, the company could send MRS to the third party provider via the AANX network. Suppliers could then log-in, view the list of MRS using a standard web interface, 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 AANX network.

Empirical Findings

In this section, we first confirm that the motivation in the case was techno-economic leader and then evaluate each of the eight propositions.

Classifying IOS Adoption Motivation

The opportunity of achieving productivity gains by ensuring 100% EDI compliance of suppliers motivated the automotive company to introduce a web-enabled EDI system. The productivity gains were achieved due to the reduction in time spent by the procurement staff in resolving inaccurate ASNs resulting from the manual receipt of ASNs sent by the small suppliers. Further productivity gains were achieved because the innovative integrated web-enabled EDI system helped the inventory analysts to make improved decisions about the correct level of inventory needed to maintain daily assembly operations. Hence, the motive of the company for introducing the EDI solution can be interpreted to be techno-economic in nature because the company clearly wanted to exploit the novelty of a web-based EDI solution to make further cost savings and improve supply chain efficiency. Furthermore, the notion of introducing a web-enabled EDI solution was conceived during a discussion between the materials planning manager

with the company's EDI committee members. There is no evidence to suggest that the third party service provider has played a role in helping the automotive company in conceiving the EDI solution. The EDI project leader remarked:

"We were approached informally by the automotive company for this. Historically, when the AANX was set up, one of the things the automotive company looked at from an EDI perspective was some sort of web solution. ... So, when we were approached by the car company, we demonstrated the product to them, and they were impressed."

Thus, the web-enabled EDI adoption initiative of the automotive company is an instance of techno-economic leader scenario.

Analysis of Propositions

Techno-economic leaders are expected to prepare an IOS implementation plan (P1). This prediction was supported because prior to the introduction of the web-EDI system, the automotive company was found to have framed an in-depth implementation plan in close collaboration of the third party service provider. An important component of the plan required the company to prepare the key requirement specifications of the web-EDI solution in rigorous consultation with several suppliers. The plan also identified the need to introduce major changes in the interfaces and business rules to be supported by the solution. This was achieved through a consultation process involving selected suppliers. The implementation plan further included an option for testing a prototype. According to the materials planning manager:

"A formal decision-making process was followed before committing our resources to this project. We also prepared an implementation plan (in consultation with the service provider) which called for the need of a pilot test…."

Techno-economic leaders are also expected to conduct a cost-benefit analysis of their IOS projects (P2). This assertion received empirical support as the automotive company conducted a cost-benefit analysis and decided to outsource the development of the system in order to minimise the development costs. The cost structure proposed by the service provider was quite attractive and required a commitment of A$50,000 from the automotive company and an annual fee to the provider based on the volume of EDI transactions. The benefits were identified in terms of a reduction in the amount of discrepancies in ASNs and subsequent follow-ups, as well as increased efficiency of the entire process of data transmission. A quantitative assessment of the expected gains resulting from improved data quality and faster data transfer was performed which outweighed the cost proposal of the service provider. According to the EDI project leader:

"We have made an attractive commercial proposal to the automotive company and they were convinced based on their own assessment that the resulting productivity benefits from the despatching of ASNs and accuracy of data flows would far exceed our cost proposal."

Techno-economic leaders are likely to initiate a post-implementation review of their IOS projects (P3). This proposition received support as the automotive company had reviewed its internal operations after having undertaken the implementation of the web-enabled EDI system. The review was intended to address three specific issues: a) impact of EDI solution on procurement staff, b) supplier feedback on EDI performance, and c) analysis of suppliers' delivery performance. The company found that manual work was reduced as non-EDI suppliers were now able to transmit documents electronically via the web. Furthermore, once the EDI solution system was up and running, the automotive company sought feedback from the suppliers about the performance of the system. Based on the feedback, the company then worked with the service provider to make further modifications to the solution. The company also reviewed (on a monthly basis) supplier performance which is strongly influenced by the timely and accurate arrival of EDI messages from the suppliers. This sentiment is highlighted by the materials planning manager as follows:

"We are in a better position to analyse their delivery performance. This is because we now receive ANS electronically and no longer receive incorrect data. This has a positive effect on the monthly performance ratings for suppliers. The performance metric is an indicator of how well they shipped parts to us in relation to what was required."

Techno-economic leaders are expected to integrate their IOS projects with their back-end applications (P4). This view is supported because the company integrated web-based EDI solution with its back-end CMMS system to avoid manual intervention for triggering the exchange of MRS and ASN. This integration was essential to help the inventory analyst of the company to make informed decisions upon viewing the up-to-date inventory balance.

Techno-economic leaders are also expected to streamline their business processes (P5), although this proposition was not supported 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."

Techno-economic leaders are expected to organise training on IOS (P6). 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 participated in designing online training programs which the third party service provider organised for the small suppliers in order to help their staff in operating the web-based application. The EDI project leader commented:

"Of course, we have equipped the product with online demos and tutorials. Personally, I have provided assistance to many suppliers in the usage of the web system."

Training was also given informally by the automotive company which had held supplier information session at its own premises. Explanations were offered about how suppliers should address issues relating to the enforcement of certain unique business rules which are enforced through the web-based EDI solution. Thus, proposition P6 received empirical support.

Techno-economic leaders are unlikely to apply pressure on partners (P7). This assertion is supported. The automotive company did not exert any pressure on the small suppliers. It did not issue any explicit threats to non-EDI suppliers. It made the web-based EDI solution known to those suppliers that were not EDI-capable, but did not impose it on them. This sentiment is supported when the materials planning manager made the following comments:

"We have not imposed our own dedicated EDI system onto them. I've seen large organisations do such a thing, and I reckon it's a bad way of doing things with trading partners. The web-based system is an open architecture…. no impositions or restrictions are placed on them."

The non-coercive strategy is further highlighted by the easy to use and low-cost system developed for suppliers to trade through the web-based EDI solution. The EDI project leader commented:

"The automotive company demanded some predictability with the cost of the web-based EDI solution. Hence, we modelled the cost structure in such a way that suppliers would not have an unpleasant surprise with paying extra for EDI messages."

As well as investing in the development of the web-based solution, the third-party service provider offered technical assistance and guidance to suppliers. In particular, while 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."

Techno-economic leaders are likely to market IOS concept (P8). This assertion received support from the automotive company. The introduction of the web-EDI system was accompanied by a cooperative approach from the automotive company. It was marketed through carefully planned promotional initiatives which emphasised a win-win situation. The company highlighted that the web-enabled EDI solution when accepted by the small suppliers would help them experience an immediate improvement in data accuracy. At the same time, the prompt dispatching of ASNs by the suppliers positively impacted the suppliers' delivery performance (measured in terms of supplier rating). In short, the web-based EDI solution was promoted as a tool to improve supplier rating and productivity improvement. According to the EDI project leader:

"It is very much a win-win scenario. The small suppliers that have been using the web product noticed the productivity improvement, which then improves the relationships between the suppliers and the car company, and the supplier rating. Suppliers are very much driven by the supplier-rating, and the prompt dispatching of the ASNs and the accuracy of data within the ASNs has a great impact on the suppler-rating."

This sentiment was also supported by the materials planning manager:

"We promoted the system based on its merits for the suppliers. The main benefit is the much lower cost to the suppliers than what we've had before. Another added benefit is the fact that through the same web-based system they are able to communicate with their other trading partners."

In addition, the company invited the EDI service provider to participate in the promotion of the web-based solution. The launching ceremony was held at the premises of the automotive company and was attended by many small suppliers. During this ceremony, trial runs of the EDI solution were organised and all security features embedded into the solution including encryption and authentication were explained to attract supplier acceptance of the solution. The business analyst commented:

"It is hard to introduce new technologies to suppliers because they claim not to see the advantages. So, it was a challenge for us to show them what the advantages actually are and in what form they come. I invited a number of small suppliers to attend the web-enabled EDI product launching and explained to them how the system could fix their data entry problems for sending ASN. "

Discussion

Figure 3 shows the pattern of activities observed with the patterns of activities expected for each of the four motivations in the IMM. The pattern observed is very close to the techno-economic patterns, and quite dissimilar to both of the socio-political patterns. Of the two techno-economic motivation patterns (leader and follower), the observed pattern is closest to the techno-economic leader (TEL) pattern, except that business processes were not changed as part of the implementation project.

This question of why processes were not changed becomes important here. Proposition P5, suggests that techno-economic leaders

will make significant business process changes to exploit the capabilities of IOS technology. Three possible reasons why processes were not changed are (1) changing processes was not seen as a priority, (2) the change was not possible due to constraints in the external environment or within the firm, and (3) the requisite changes had already been made as part of an earlier project.

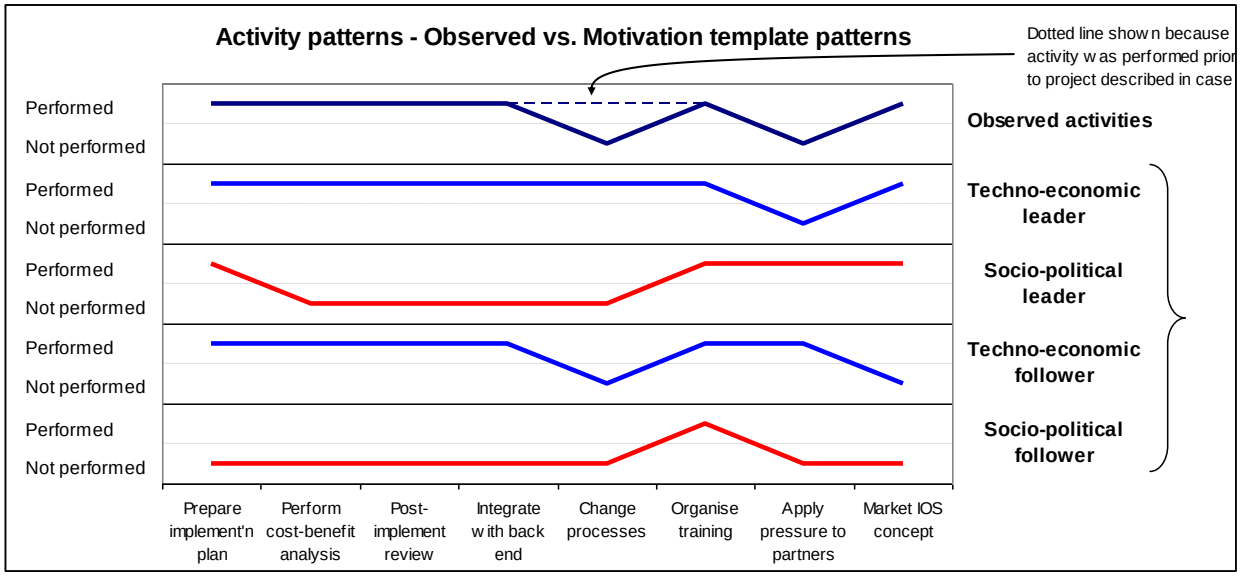

Figure 3: Comparison of observed activity patterns with IMM predicted patterns

Determining the reason for the difference is important. A finding that either of reasons (1) or (2) are true would indicate a potential misalignment of activities with objectives, while a finding that reason (3) holds would indicate that the difference is simply a result of pre-existing affordance in the environment making the activities unnecessary, and that no misalignment has occurred.

Further investigation indicates that reason (3) explains the difference between the observations and the typical TEL activity pattern. That is, because the company had already streamlined its procurement and inventory management processes in a previous EDI initiative — which was undertaken in early 1990s when traditional EDI systems were introduced with large tier-one suppliers. Therefore, extensive redevelopment of processes was unnecessary (although informants indicated that process redesign is an ongoing priority to meet longer-terms goals). In addition, because the task of translating documents from EDI to web formats and vice-versa had been transferred to an external the service provider, the introduction of web-EDI services did not require any major changes in the internal technical capabilities of the automotive company as it was able to continue to send and receive documents in the usual EDI format. We therefore argue that the deviation between the prediction for the proposition P5 and actual experience of this company can be satisfactorily interpreted in terms of situational factors unique to this company. This in turn implies that the logical arguments used in developing those propositions were not challenged.

Regarding generalizability of results, we argue that while a single case does not support statistical generalisation, the logic of analytical generalisation was applied in interpreting evidence for evaluating the research propositions. The IMM was used as a template with which the empirical results were compared. In making comparisons, not only was the prediction offered by each research proposition matched against the empirical evidence obtained from the case data, but the underlying logic for supporting or refuting the research propositions was also considered. Additionally, the arguments that were used to derive the research propositions from the literature made no reference to any specific properties (e.g. organisation size, IT budget) of organisations operating within the automotive industry. Because the research propositions are not organisation-specific, the findings should be applicable to other similar companies.

Conclusion

In this paper, we have reported the IOS implementation experience of a large automotive manufacturing company and found that most of the activities initiated by the company for introducing an internet-based EDI can be described in terms of its motive to adopt the EDI solution. Therefore, the empirical findings offer broad support to the notion that organisational motivations could describe how IOS implementation processes are initiated. This finding 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.

We are currently engaged in a large scale research program that aims to evaluate the IOS implementation phenomenon in the Australian automotive industry, and are interested to determine whether IMM succeeds in successfully explaining IOS implementation processes of multiple supply chains regardless of industry segments within which they operate.

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