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ADOPTION OF SUPPLY CHAIN MANAGEMENT TECHNOLOGIES BY SMALL AND MEDIUM ENTERPRISES IN THE MANUFACTURING SECTOR

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Abstract

SMEs today are under pressure to better manage the supply chain and to improve efficiency and logistics operations while remaining responsive to changing market conditions and customer demands. As a result, organisations might need to adopt Information and Communication Technologies (ICT) to support their supply chains and increase their efficiency by achieving tighter cooperation relationship over the supply-chain. This paper explores the area of ICT adoption in The Taiwanese IT manufacturing sector based on multiple case study research. The findings suggest that SMEs are still not able to achieve a high degree of ICT automation over the supply chain. One the reason is their inability to recognise the benefits of supply chain automation thus we list an exhaustive list of benefits as they derive from our findings. In addition, seven types of ICT connections used by case companies to support their supply chains were identified and showed that the most of the companies stayed in the lower level of SCM adoption without exploiting the benefits of ICT in full. We support that our results can help organisations and researchers to better understand the ICT adoption for supply chain integration by SMEs in real practice.

Keywords: Adoption, ICT, Supply Chain, E-commerce, SMEs, Case Studies.

1. INTRODUCTION

The emergence of the Internet has allowed SMEs to compete effectively and efficiently in both domestic and international markets. It is a well-known fact that Internet-based computing and communications has emerged as a key enabler to help organisations achieve greater coordination and collaboration among supply chain partners and automate the supply chain process (Akkeren and Cavaye, 1999). This has created competitive pressures as manufacturers and distributors are forced to become more responsive to the retailers and consumers. These pressures are forcing manufacturers/buying organisations to reduce costs, decrease order cycle times, and improve their operating efficiencies. As a result, manufacturers are under pressure to better manage the supply chain and to improve manufacturing efficiency and logistics operations while remaining responsive to changing market conditions and customer demands. The increasingly complex global relationships among suppliers, manufacturers, distributors, retailers and consumers compound these pressures (Kalakota and Robinson, 2001). Nowadays, the use of technologies help the organisations to better manage their supply chains, as supply chain management applications built on technology platforms have enhanced the ability of organisations to integrate their processes through collaborative information sharing and planning (Charles et al., 2001; Kalakota and Robinson, 2001). For retailers and manufacturers alike, a company's competitive advantage depends in large measure on the adaptability and agility of its supply chain (Dass, 2002).

A competitive firm has to have the ability to acquire the goods and services it needs just when and where it needs them, at a favourable price, and with acceptable payment and delivery terms. A competitive firm needs to directly manage the flow of goods through its distribution networks in a cost-effective manner. Organisations have come to realise that they can achieve this by integrating their supply chains. Implementing ICT to support supply chains can be cost saving for the company in many ways. It can lower the costs of labour, increase flexibility, achieve faster response times and cut down the occurrence of errors on paper based operation, reduce unauthorised buying outside preferred supplier agreements, and reduce stocking, hence achieve competitive advantage (Essig and Arnold, 2001; Lee and Whang, 2001). Automation process also can shorten the cycle time from ordering to distribution, thus resulting in enhanced production ability and increased efficiency. For suppliers, they can also benefit from ICT adoption as this will shorten business transaction cycle, lower capital cost in stocking, lower labour cost, increase efficiency, enhance accuracy and faster handling time and delivery speed (Chen et al., 2003).

Although many efforts have been made by companies to use ICT to support their supply chain strategy, problem still exists. This is due to that most of their suppliers are SMEs and their ability and resources are limited, therefore, integrating their systems with their buying organisations seems to be a significant problem for them. For SME suppliers, using new technology to support their supply chains is harder than the larger organisations due to (1) their characteristic weaknesses e.g. lack of financial resources and technology ability (Burns, 2001; Carter and Evan, 2000), and (2) the lack of cases in ICT adoption in SMEs. In accordance with these, there is a need to explore this area by studying how small suppliers adopt ICT to integrate their supply chains with their trading partners or customers, and identify what benefits can be obtained in doing so.

The remaining paper is structured as follows. In the next section of our paper, we provide a brief review on theoretical basis to examine the ICT adoption in SMEs. We then proceed to present and discuss the research methodology used in this study. This leads us to the fourth section of our paper, in which we present findings obtained from case studies. Finally, we conclude by providing limitations and future research direction of the research on this topic.

2. ICT ADOPTION BY SMES

In a challenging global society, effective use of ICT is critical for the success of businesses especially SMEs. The definition may vary among countries or institutions, based on the differences in economic levels or the wealth of the countries (Gibson, 2001; Storey, 1995). Since the case studies were conducted in Taiwan, SMEs definition given by Taiwan Economy Affair is adopted. This classifies SMEs as using a sales turnover less than US$5 millions (Gibson, 2001). Despite advances in IT and the acceptance by large organizations of such technologies, the same level of adoption is not evident among SMEs (Marshall et al., 2000). It is expected that there are more barriers to the adoption of ICT in SMEs than there are for large businesses (Hughes *et al.*, 2003;
Tagliavini *et al.*, 2002). This is partly due to the high capital investment costs and the skilled manpower required to implement and operate integration technologies, and partly due to SMEs' characteristic limitations. Iacovou *et al.* (1995) report that SMEs differ from large companies in many ways that affect the adoption of EDI: (a) the lower levels of resources available for adopting integration technologies (Iacovou *et al.*, 1995; Kuan and Chau, 2001); (b) the substantially less sophisticated IS management (Kagan *et al.*, 1990; Tagliavini *et al.*, 2002); (c) the needs for integration and their characteristics; and (d) the quantity and quality of the available environmental information (Pearce et al., 1982).

It is widely acknowledged that innovation plays a central role in the competitiveness of firms and countries. Innovation is understood to be a key driver of productivity. Innovation helps businesses to improve the way that products and services are made and delivered, or to introduce entirely new ones.

Evidence suggests that innovating companies sustain a higher performance and grow faster than noninnovators (Stokes and Wilson, 2006). Small and large firms appear to have different roles to play in the innovation process (Acs and Audretsch, 1990). The small firm today is seen as playing an important role in the innovation of new products and processes. Larger firms have an advantage in capital-intensive, concentrated industries where substantial resources and converging technologies are present. Smaller firms appear to have the advantage in emerging industries with high levels of innovation. Smaller firms also contribute more innovations than larger firms (Audretsch, 1995). Davis (1990) claims that SMEs are often regarded as being more innovative than large ones because of their flexibility and willingness to try new approaches. In practice, there are advantages and disadvantages for the small and large business involved in innovative activity. In summary small firms have advantages in management, internal communications and marketing, stemming from their flexible and opportunist behavioral patterns, especially influenced by entrepreneurial owner-managers. They have the disadvantages of lack of in-depth resources of qualified people and finance. Larger firms have greater material resources which gives them advantages in attracting the necessary staff and funding the growth and other activities to which successful innovation can lead. Another reason that small companies tent to hesitate over ICT adoption is the lack of awarness about the benits technology can bring to their business. Benefits is the variable that has been consistently identified as a critical adoption factor, and as the most important factor for IT growth in small organisations (Cragg and Zinatelli, 1995; Kuan and Chau, 2001). Thus, when organisations understand these benefits, they will be more likely to facilitate organisations' integration technologies' adoption decision-making.

Therefore, there is a need to study the benefits of supply chain integration. According to Themistocleous and Irani (2001), they have identified some benefits upon the implementation of Application Integration. Trkman and Groznik (2006) also suggest how the performance of the supply chain can be improved with the integration of various tiers in the chain. Thus, in this paper we conducted a long term case study to identify such benefits for SMEs as explained in the next section.

3. RESEARCH METHODOLOGY

Multiple case studies (15 cases) were conducted to investigate the adoption of ICT to support supply chains approach followed by Taiwan IT industry. Fifteen enterprises and some of their suppliers in the IT manufacturing industries were selected for in-depth case study research. Case study research is employed due to that this research method generally answers one or more questions, which begin with "*how*" or "*why*". The questions are targeted to a limited number of events or conditions and their interrelationships (Yin, 1994). Case study approach has been successfully employed for in-depth investigation of variety of IS issues including adoption of IS/IT (Mustonen-Ollila and Lyytinen, 2003; Caldeira and Ward, 2002), IS and organisation change (Avgerou, 2001), IS development (Gallivan and Keil, 2003), IS implementation (Amrani *et al*., 2006) and IS evaluation (Irani *et al*., 2005). The successful use of case study to examine a number of IS issues provided further support to employ case study for conducting this research. Since not much is known of adoption of integration technologies by SMEs for supporting supply chain integration, case study approach was considered applicable to undertake this study. One of the most important sources of case study information is the interview (Yin, 1994). Interviews are considered to be the main tool of the qualitative researcher for data collection (Denzin and Lincoln, 1998), and one of the frequently used data collection tools (Amrani *et al*., 2006; Avgerou, 2001; Caldeira and Ward, 2002; Currie and Willcocks, 1998; Gallivan and Keil, 2003; Irani *et al*., 2005; Mustonen-Ollila and Lyytinen, 2003), also used for this research.

In the context of this research, interviews constituted the main data source in the cases. The very important source of evidence of this study has been the mixture of structured, unstructured and semi-structured, in-depth interviews with the parties involved in the activities under investigation. In this research, the structured interviews were based on the interview agenda and survey questionnaire. By the interview agenda, the interviewees replied to specific questions regarding the adoption of ICT to support their supply chains. The interview agenda focuses on collecting data from the following areas:

(1) general background, (2) business information in SMEs, and (3) business information in large organisations. Semistructured interviews took place, using a semi-structured interview agenda. Unstructured interviews were also used, which dealt with discussions that the authors had with interviewees, but without using a structured or semi-structured type of interview. The main purpose of such an interview was to corroborate certain facts that the authors already thought had been established. In addition, using this type of interview helped to clarify some issues derived from structured interviews.

The collection of the data took place over a period of two and a half years. The authors first interviewed the members of the case companies in 2001, using structured and semi-structured interviews (the project had just begun). After that, the interviews took place again with the same case companies in 2002, using semi-structured interviews. In 2004, the authors revisited some of the case companies again (the project is now complete and mature). The adoption activities that took place in a different period of time, but were organised by the same parties, gave the authors the possibility to discuss the same issues with the same people in a different time context. Consequently, the results of the study go well beyond a snapshot of a specific activity in a given time frame, but take into consideration events that took place over a long period of time, as well as views about the past and future of the activities under investigation (see Figure 1).
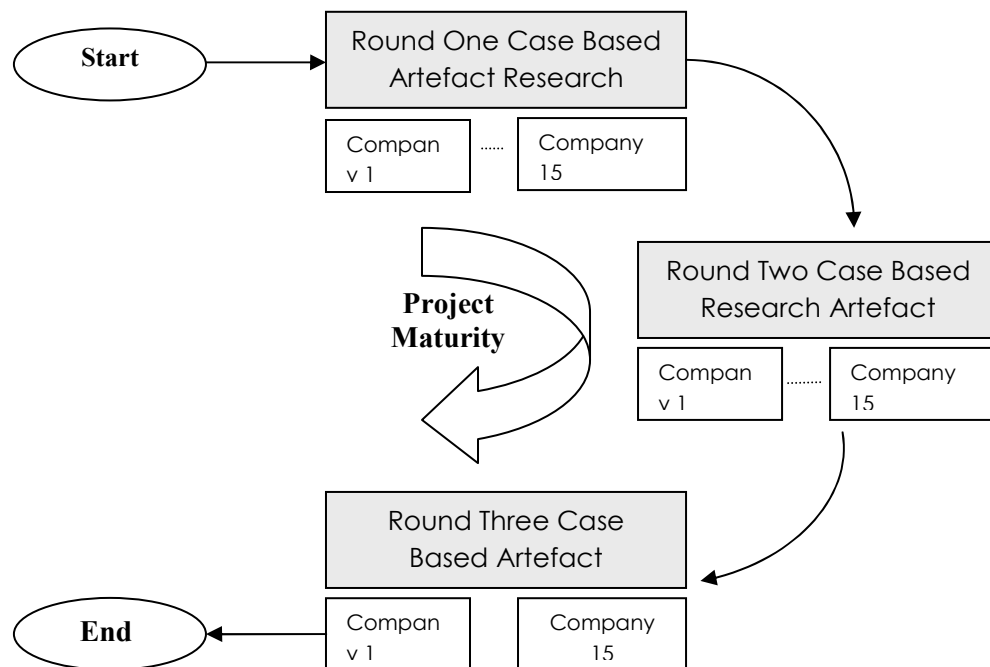

Figure 1. Case-Based Artefact Research

In all the case studies, interviewees selected for structured interviews were mainly: (1) project manager, (2) MIS department manager, (3) a consultant (internal or external), all of whom have been directly involved in a project supported by the Taiwanese government. This project was called the Industry Automation Programme and was executed in Taiwan by the Ministry of Economic Affairs, Technology Department, and started on 3rd June 1999. The main goals of this programme are to establish Business-to-Business (B2B) e-commerce operation capability in the IT industry to enhance Taiwan IT industry's core competence, and to push forward 2,500 SMEs in the IT industry, to establish operation capability; meanwhile, to overcome the problems while promoting e-commerce in the IT industry and serve as the reference for promotion in other industries.

4. RESEARCH FINDINGS

4.1 Benefits of Adopting ICT to Support Supply Chain

Based on the empirical data, the interviewees reported some benefits of adopting supply chain integration. These benefits derived from the Industry Automation Programme were validated by the companies through Key Performance Indicator (KPI) analysis to examine the performance of integrating case companies' supply chains. This section is therefore reporting the analysis of the performance and its effect, based on the KPI analysis data provided by the case companies. A KPI is linked to a business goal, and in general, every KPI will have a target value that may change over time. The actual value of the KPI is compared to the target value to determine how much progress has been made towards achieving the business goal (RIS, 2002). KPI data can be entered manually, extracted directly from the attached real-time databases, or as the result of complex calculations implemented using the Recalculated module. The KPIs here on which the overall performance is judged are the volume of purchase, types and numbers of connection, speed, and capital cost. The summary of the KPI analysis is shown in Table 1.

Table 1.Summary of KPI Analysis (Source: Industry Automation Programme Report)

(KPIs) Key performance indicators	Average value before E-purchasing Adoption	Average value after E-purchasing Adoption	Calculation	Improved Ratio (%)
Process from receiving orders to delivering goods (Purchasing Process)				
From B-Plan manufacturers to customers (%)	82.9	95.9	1-(95.9/82.9)*100%	15.7
From suppliers to B-Plan manufacturers (%)	73.25	92	1-(92/73.25)*100%	24.2
Order Handling Process				
Response time for purchasing order (Days)	4.38	1.38	1-(1.38/4.38)*100%	68.49
Process cycle for purchasing (Days)	12.13	5.07	1-(5.07/12.13)*100%	58.2
Stock Capital Cost				
Period stock stored in warehouse (Days)	31.86	20.57	1-(20.57/31.86) *100%	35.4
Stock capital cost (hundred million N.T.)	33.4	22.95	1-(22.95/33.4) *100%	31.29
Unused raw material stock (%)	15.27	3.45	1-(15.27/2.45) *100%	77.41
Purchasing Capital Cost				
Labour used for purchasing process (Days)	9.86	5.86	1-(5.86/9.86) *100%	40.6
Required time for whole purchasing process (Days)	7	3	1-(3/7) *100%	57.1
Purchasing arrangement and handling times (Days)	15.99	6.92	1-(6.92/15.99) *100%	56.7

According to the figures given by the case companies involved in the Industry Automation Programme, in the purchasing process from the manufacturers to their customers, the average speed, in percentage, has improved by 15.7% from 82.9% before using e-purchasing to 95.9% now. For the suppliers to the B-Plan manufacturers, the process speed has improved by 24.2% from the average of 73.25% before, to 92% now. However, the response time for purchasing order has improved by 68.49% from the average of 4.38 days before to 1.38 days now, and the process cycle for purchasing has improved by 58.2%, from the average of 12.13 days before to 5.07 days now. The period of stock stored in the warehouse has shortened by 35.4%, from the average of 31.86 days before to the average 20.57 days now. The stock capital cost has dropped by 31.29%, from the average of 33.4 hundred million N.T. dollars before to 22.95 hundred million N.T. dollars now. The unused raw material stock has decreased 77.41%, from the average of 15.27% to 3.45% now. The labour used for the purchasing process has decreased by 40.6%, from the average of 9.86 days per month before to 5.86 days per month now. The required time for the whole purchasing process has shortened by 57.1%, from the

average of 7 days before to 3 days now. The purchasing arrangement and handling times have dropped by 56.7%, from the average of 15.99 days before to 6.92 days now. Based on the findings above, the benefits of integrating the supply chain have been identified by the authors as:

- **Standardised production**, including improved quality control, shorter production time, greater efficiency.

- **Simplified supply chain process**, including control over suppliers, improved process cycle time, close cooperation relationships, improved supply chain efficiency, raw materials on time for suppliers.

- **Process automation**, including reduced errors, capability to obtain and exchange real time information.

- **Improved purchasing process**, including reduced arrangement and handling times, shortened response time for purchasing, improved order process speed, reduced labour costs.

- **Reduced stocking including reduced risk**, reduced stock capital costs, reduced unused raw material stock.

- **Improved payment process** including faster payment operation, lower interest rate, lower credit risk.

- **Improved distribution process**, including delivering on time, reduced delivery enquiring time, improved distribution management.

- **Improved global competitiveness** including global order opportunities.

4.2 Seven Types of ICT Connections

For case companies' internal IT systems to exchange data automatically, they need not only to have explicit agreement on data format and communication network, such as XML documents over the Internet, but also explicit agreement on the step-by-step process for data exchange. Referring to the Industry Automation Programme, case companies and their suppliers employed different types of interconnections based on the EDI over Internet technology and RosettaNet standards. RosettaNet has developed a comprehensive set of standards and guidelines for automatic, system-to-system exchange of business information and transaction between partners through Internet connection. It is important to understand such interconnection between large companies and their suppliers, as for technology companies collaborating across a broad-based supply chain, true global connectivity is usually difficult.

The vast majority of communications taking place among partners and providers still depend on traditional phone, fax, or limited extranet connectivity. Because these organisations have little or no access to their partners' systems and data, the ability to coordinate purchasing, trading, logistical, and financial functions among multiple companies remains complex and time-consuming. Even with extranet connections, they often involve isolated, proprietary pipeline links between individual companies. Thus, based on the information provided by the companies, the authors have identified several different types of interconnection that large companies and their suppliers have established during the implementation of the Industry Automation Programme. In total, 7 types of interconnection were identified, including 3 main types, A, B and C, and their subtypes. The types of connection between the suppliers and the core manufacturers were classified into three main types: Type A (Application to Application, i.e. AP-to-AP), Type B (e-Commerce (EC) Turnkey), and Type C (Browser). Those main types were further classified into subtypes which are A, A+, A-, B, B+, C and C+, depending on their level of automation.

Type A - AP to AP. This type of process is to integrate the systems using a standard language, RosettaNet standard. Similar to the Web Services standard, the RosettaNet standard is an XML-based standard built for use in the IT industry (RNT, 2001). A standard is necessary so that data and ecommerce and other transactional processes operate well across the Web. The XML standard should ease the development of Web pages for EC and other activities that rely on pre-formatted data (Abreu, 2001). XML is the universal format for structured documents and data on the Web (W3C, 2002). XML schema allows Web developers to use a common method for identifying Web data. It also allows developers to transfer more easily formatted data, such as prices, dates and numbers, which are all key to EC, as well as video and audio. Unlike the existing standard, HTML (Hypertext Markup Language), which rigidly defines how Web page elements are displayed with predefined data tags, XML can be used to define what data the elements contain. Developers can write XML tags for specific purposes, allowing Web pages to function like database records (Abreu, 2001). AP-to-AP connection integration testing can be categorised into three layers: the first is whether the enterprises have established PIP (Partner Interface Process), i.e. the public process between enterprises. PIP™ is to define business processes between supply-chain partners, providing the models and documents for the implementation of standards. PIP includes two enterprise processes: Private Process and Public Process. Private Process means the enterprise internal business process, whereas Public Process means the process between enterprises. The second layer is the enterprises which have not only established PIP, but can also proceed to receiving messages, and the messages are readable. The third layer is the process automation (MOEATD, 2001). For example, once the supplier receives an order called 3A4, this can be translated automatically into a sales order. Type A can be further categorised into three sub-types, A+, A- and A, according to their degrees of automation. The main difference between them is based on whether there are people involved between the EC platform and Enterprise Resource Planning (ERP) when accepting an order. These connection types are further categorised into A+, A and A-, according to their degree of automation. The optimum connection is type A+ which has no labour involved, and all the processes are performed automatically. However, in real practice, none of the case companies or their suppliers has adopted this type of connection. This shows that the adoption of EDI by SMEs to support their supply chains is not what we expected as the EDI to EDI (i.e. system to system) connection; instead, they have different ways of using EDI to interconnect with their customers. These types of interconnections used by SMEs have been identified in this research, and are defined as types B and C.

Type B - EC Turnkey. The suppliers install Turnkey software. The core manufacturer (i.e. buyers) can then push its purchase order to the supplier's Turnkey system. Once the supplier's server has received the purchase order, two actions will be taken. First, the sales department will be informed about this order, simultaneously it will manually perform the auto-check function in the ERP system to check the database and process the order. The invoice will then be generated by the system, but the system will not reply to the manufacturer automatically. Turnkey's output is converted or transferred manually to the supplier's back office system, and the core manufacturer will inform the supplier about the purchase order by e-mail. The important point for type B connection is that the 'Push' method is used. This method does not consider the internal customers' needs. Rather, after processing a batch of units, a given workstation will push the batch to the next workstation, whether needed or not. The supplier's operating interface is unitary, and many buyers' orders can be manipulated in this single interface. For type B+, this has provided an information format which can convert or transfer the information into the ERP format in the back office system. However, the data transfer is still manipulated manually. The main difference between type B and its subtypes is whether there is a need to re-type the information into the back office system.

Type C - Browser. The core manufacturers set up a one-to-one supplier Web page. All the process information about the sales orders, delivery information and invoices, etc. can be looked up through the browser. This type of connection is normally used when there is a small amount of orders. The manufacturers need to log on to the Internet to check the order information approximately once a day.

In addition, the Purchasing Order (PO) information can be downloaded from the browser and saved in Excel or other formats for verification purposes or workflow process. Table 2 is a summary of the different types of connection.

Table 2 Summary of Different Types of Connection

Type	Differences between Types		Sub-Type	Differences between Sub-Types
A	Suppliers use 'PUSH' method to handle PO.	Connect to back office system using Rosettanet's PIP.	A+	No labour involved.
			A	Labour involved before confirmation
			A-	Labour involved between EC and ERP
B			B+	Information format provided which can convert or transfer information into ERP format in back office system, but data transfer still manipulated manually.
			B	Information cannot be converted or transferred automatically into back office system, needs to be re-typed into system.
C	Suppliers use 'PULL' method to handle PO, driven by customer. Customer workstation will pull units from its supplier workstation. This, in turn, will authorise production of next batch at supplier workstation.		C+	PO information can be downloaded from browser and saved in Excel or in other formats for verification purposes or workflow process.
			C	Manufacturers can check order information through browser.

According to the Industry Automation Programme report, there were a total of 3948 suppliers forced to follow the main manufacturers to adopt the e-commerce management style, and the majority of them adopted the type C connection (3375 suppliers) to connect with their main manufacturers (see Figure 2). The case companies found that the accuracy of electronic transactions through the supply chain has reduced the amount of stock the companies return to suppliers. With inventory levels lower, they are now more agile and able to respond to new technologies by using the latest most up-to-date components in their products, instead of having to consume inventory they have already acquired but cannot return. Electronic transactions are also consuming less human resource to key or re-key manually into the companies' systems. Additionally, adapting to the e-supply chain has also created a 15000 million US Dollars procurement (i.e. order opportunity) from the important international buyers each year.
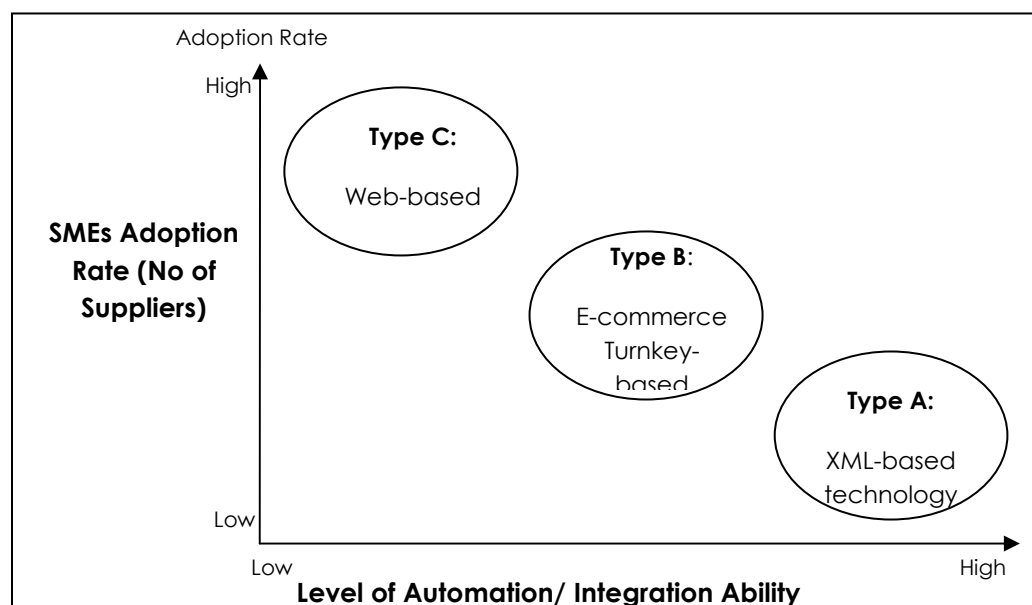
Figure 2. SMEs' Adoption Rate and Level of Automation

Figure 2 shows that type C connection (Web-based technology) is the most popular technology for inter-organisational connection among SMEs (i.e. suppliers). Different types of interconnection that have been applied by the suppliers to support their integration technologies' adoption were identified by the authors. These interconnections indicate the integration ability among suppliers (SMEs). Thus, *the results here show that most of these SMEs are still not able to achieve a high degree of automation (i.e. high level of integration).* The reasons for this are: (1) suppliers are small-sized enterprises, their technology ability and application level of B2B e-commerce are limited, and the volume of business is smaller (or the product variety of the company is little), (2) most of the raw material productions from the suppliers are not key-production, (3) most of the suppliers produce standard products so they have goods in stock, and (4) the benefit of using this type of connection is conspicuous, and it does not affect the beneficial results of case companies' computerisation. For those suppliers which were able to fully automate their business processes (i.e. able to adopt Type A connection), most of them are larger in size compared to other SMEs' suppliers.

As shown in Figure 2, companies with higher level of IT ability often adopt type A or B connection, and with lower level often adopt type C. Thus this indicates that small suppliers' IT abilities tend to be lower than those of the larger ones. This also has impacted on SME suppliers' decisions for ICT adoption to support their supply chains. The suppliers report that planning for the new technologies adoption is essential for SMEs and is time-consuming. Therefore, this indicates that it takes a longer time for SMEs to consider adoption compared to large organisations. Higher level of automation was selected by the larger suppliers for the heterogeneous inter-working which was required to address the range of their current applications estate. Unlike these larger suppliers, smaller suppliers report that they have not yet considered type A adoption due to: (1) the benefits of using such technologies are inconspicuous, (2) lack of resources like time, finance, and expertise, and (3) lack of supports.

5. CONCLUSIONS

In this paper we set to explore issues related to ICT adoption for the automation of the supply chain with SMEs. We realised that the benefits of integrating supply chain have not been widely investigated. The adoption of integration technologies to support the supply chain management can be seen either as a way to provide efficiency savings, or as a strategic response either driven by necessity or due to competitive pressure. Therefore, we have identified many benefits like standardised production, simplified supply chain process, and automated process, upon the implementation of supply chain integration by the case companies involved in the study. Thus we have expanded the body of knowledge in the area of supply chain integration by identifying and classifying the supply chain integration benefits, which has not been well-studied before.

Additionally we used the case study results to define the different categories of interconnections between companies on the supply chain as a way to indicate the level of integration ability of the companies and their suppliers. We believe that such classification of different types of interconnections between the large companies and their suppliers can contribute to a better understanding in the adoption of ICT to support supply chains area. The seven different types of interconnection of ICT considered as important, as they not only indicate the IT ability of suppliers and the large companies, but also suggest that SMEs tend to adopt integration technologies later than large organisations. Although this study shows the willingness of the participating companies to explore new technologies such as SCM the adoption rate even in Taiwan is relatively low due to the limited resources and knowledge existing in the SMEs. Unless they get continue support by the government (such as the project presented in this paper) SMEs can only adopt new technologies up to a certain extent while fining difficult to exploit them in full.

This case studies took place in Taiwan where the political and cultural environment is unique and is predominantly high-technology oriented. Additionally, the SMEs under investigation were involved in the IT manufacture sector which is naturally technology oriented. Thus, our results are more relevant to similar context, but can be useful for national settings where technology is still in development but there prospects for future advances in this area. We believe that this research can be used as a starting point for future studies in Supply chain management adoption by SMEs. This is an exploratory case study and we believe that our results could be used by researchers involved in the area of supply chain integration by SMEs and could conduct similar studies in different geographical, economical or cultural settings.

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