The importance of being local? Learning among Taiwan's enterprise solutions providers

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Abstract

Purpose – Seeks to explore how perceptions of an ERP system-requirement misfit in Taiwan have been construed as business opportuni4ties by domestic vendors in their response to competitive pressures from international vendors.

Design/methodology/approach – Qualitative data were collected through interviews with three leading foreign ERP vendors, four leading domestic ERP vendors, the ERP trade association and a number of consultants in Taiwan to explore the perceptions of Taiwanese enterprise system providers and the business and design strategies through which such perceptions were enacted.

Findings – In comparison with leading Western ERP providers, the software technologies, resources and global market experience of Taiwan's domestic ERP vendors are weaker. Nevertheless, the analysis of the interviews and associated documentation shows that there are four areas in which domestic ERP vendors perceive themselves as having a competitive advantage over foreign vendors. The four areas are: the ability to meet special requirements, the ability to support the flexibility and speed of domestic small and medium-sized firms, the benefits of direct implementation, and the ability to learn from their engagement with local customers.

Originality/value – While the literature on learning and innovation on East Asian manufacturing firms has stressed the important role of incremental improvement on borrowed technology, the role of government and the strategy and structure of domestic firms, there has been little research on the sources of competitive advantage of East Asian firms in sectors with services components. This paper contributes to one's understanding of the development of technological capabilities by East Asian firms in services.

Keywords Manufacturing resource planning, Taiwan, Competitive advantage, Localization, Transfer processes

Paper type Research paper

Introduction

The ERP market in East Asia continues to expand. According to Gartner Research (Steenstrup *et al.*, 2003), China's ERP market grew by 20 per cent in the face of a global decline in the ERP market in 2002. IDC (cited in *Financial Times*, 27 October 2003) predicts China's ERP market will grow at a CGR of 37 per cent, from US$85.5 million in 2002 to US$402.2 million in 2007. While much has been written about problems of implementation of ERP systems developed by large multinational firms (such as SAP, Oracle, J.D. Edwards) in new commercial and institutional contexts (Soh and Kien, 2000; Wu and Wang, 2002; El Sayed and Westrup, 2003) there has been relatively little

research on the strategies and technological capabilities of "latecomer" vendors in the ERP market and the influence of very different local conditions on ERP development by these domestic vendors.

A literature on technological capabilities in newly industrialising countries argues that such countries cannot be regarded as mere recipients of technology from developed countries, and that attention needs to paid to the "localisation" (Walsham, 2001) efforts required to adapt imported technologies to local conditions (Katz, 1976; Katz, 1987; Lall, 1987). In the case of the successful East Asian countries like Korea and Taiwan, many detailed analyses are available of the role of incremental improvement on borrowed technology and foreign connections as the means through which domestic firms have successfully overcome technological and market barriers in manufacturing sectors (Hobday, 1995; Amsden, 1989). However, there is comparatively little research on the sources of competitive advantage of East Asian firms in sectors such as software, which exhibit important differences from traditional manufacturing sectors, including the need for advanced skills and close interaction with industrial users.

It is by now something of a commonplace that many of the systems provided by international vendors such as SAP emphasise planning, standardisation and elaborate procedures (Kallinikos, 2004). They therefore place an onerous burden of adaptation and reengineering on organisations in many Asian countries where business practices often vary markedly from Western ones, often resulting in "misfits" between systemic demands and local needs and requirements (Soh and Kien, 2000). Against this background, the role of, and the development of new capabilities by, local ERP software vendors is of particular interest. The paper thus focuses on how particular perceptions of ERP system-requirement misfits in Taiwan have been construed as business opportunities by domestic vendors in their response to a competitive landscape dominated by large Western ERP vendors. Whilst the technological and financial resources and global market experience of Taiwan's domestic vendors are relatively meagre, there are nevertheless four areas in which domestic ERP vendors perceive themselves as having a competitive advantage over foreign vendors: the ability to meet special requirements, the ability to support the flexibility and speed of domestic small- and medium-sized firms (SMEs), the benefits of direct implementation, and the ability to learn from their engagement with local customers. Drawing upon a preliminary study of Taiwan's ERP industry, the paper investigates the important role of learning for Taiwanese ERP vendors.

The concerns that motivated this study are twofold. Firstly, research on the ongoing ERP diffusion to ever-new national and institutional contexts has overwhelmingly focused on implementation issues. The activities of domestic developers and vendors and the influence of local factors upon those activities have, so far, received scant attention. Secondly, the paper aims to make a contribution to the understanding of technology transfer and the development of technological capabilities of "latecomer" firms in the software sector in East Asia. We shall not therefore attempt to provide a comprehensive picture of the ERP sector in Taiwan, but rather to sketch out a preliminary representation of the issues that inform the strategic concerns of firms involved in the design and delivery of ERP systems.

For that purpose, the paper is organised as follows. The first section draws upon the literature on technology and learning in manufacturing in East Asia to outline some of the challenges for understanding the development of technological capabilities in the software sector in Taiwan. Second, taking the literature on technological diffusion as a

starting point, we explore the controversies surrounding the development and implementation of ERP systems. Third, we set out briefly the methodological approach followed by this investigation. The next section reviews the differences in technology, market, customers, implementation and product strategy between foreign and domestic ERP vendors. This is followed by a brief examination of the trends in ERP in Taiwan. Then we examine the different notions of competitive advantage and disadvantage that underpin Taiwanese ERP providers' strategic positioning *vis-à-vis* foreign vendors. Some broader implications of this discussion for our understanding of international technology transfer and the consequent tensions between globalisation and "localisation", standardisation and difference are sketched out. Finally, the last section draws some tentative conclusions from the discussion.

Technology and learning in East Asia

Research on the role that international technology transfer may play in facilitating the emergence of new capabilities at the industry, economy, or individual firm level has persistently indicated that technologies do not transfer smoothly to entirely new institutional and organisational contexts (Howells and Michie, 1998). International technology transfer involves not only the transfer of hardware or software but also, crucially, of knowledge and skills. Clearly the transfer of explicit knowledge – that is knowledge codifiable in manuals and blueprints – is relatively straightforward compared with the transfer of tacit knowledge which is an altogether more complex affair (Brown and Duguid, 2000; Bhagat *et al.*, 2002). As Von Hippel (1994) and others have noted, such knowledge tends to be "sticky" and its effective transmission requires the institution of complex processes of learning at the economy, industry and organisational levels.

It is worth noting that East Asian firms have become players in knowledge-intensive industries through technological and organisational learning by firms and institutions (Amsden, 1989; Wade, 1990; Hobday, 1995). East Asian countries have not built their capabilities on conventional foundations through product-development R&D (Mathews, 2001). Nor were they able to tap global markets and technology simply by opening up. Only part of the technology required by these countries is codified in blueprints and machine manuals and much of it is tacit and requires a painstaking and difficult process of learning (Dahlman *et al.*, 1985; Katz, 1987; Lall, 1982). Learning is highly technology-specific, and capabilities built in one activity are not easily transferable to another (Lall, 2001).

The engine of Taiwan's remarkable industrial success has been a flexible decentralised network of SMEs focusing on the export trade in consumer goods characterised by agility and adaptability (Orru *et al.*, 1997; Whitley, 1992). These concentrated initially on production, depending on US and Japanese partners for the technology and the marketing, including brand names. They soon became subcontractors of US multinationals or medium-sized Japanese firms, and suppliers of international commercial networks (through Japanese trading companies and US department stores) (Castells, 1992). Such firms had traditionally developed their own technological capabilities on the shopfloor, with a focus on engineering efforts to adapt foreign technology (Amsden, 1989).

Studies on East Asia have often illustrated how firms have utilised foreign connections to overcome technology and market barriers in sectors such as electronics. Foreign buyers, multinationals, original equipment manufacturing (OEM)[1]

arrangements and joint ventures and licenses where exploited by domestic firms to progress from simple assembly tasks to more sophisticated product design and development capabilities. East Asian firms travelled backwards along the product life cycle, from the standardised market and technology stages to the more uncertain, early design-intensive complex innovation stages. Hobday (1995) shows that East Asian firms graduated from supplying labour-intensive assembly services to exporting advanced goods in foreign markets. This involved linking the process of technological assimilation and marketing development – involving a transition from OEM, to own design manufacturing (ODM), and to own brand manufacturing (OBM). In this process, the state had an important role in providing subsidies to domestic firms in exchange for monitorable performance standards (Amsden, 1989). Also, East Asian countries have created institutional structures to accelerate the process of technological diffusion (Lall, 2000; Teece, 2000). Underpinning the success of firms in knowledge-intensive sectors, are public sector research and development institutes and R&D consortia that have helped to overcome the disadvantages of Taiwan's small firms (Mathews, 2001).

A new industry in which Taiwanese firms are making inroads is software. Software is a young sector characterised by rapid change in market structure and rapid growth in output. It is characterised by high fixed costs, relatively "nonrivalous" output and strong intellectual property rights that create significant monopoly power. Nevertheless, despite the important presence of US multinational firms, there are a number of features that suggest that international differences will be preserved in the software sector (Mowery, 1996). First, given the low physical-capital intensity and high human-capital intensity, domestic systems of higher education may create opportunities for country-specific niches. Second, because of close user-producer links (Lundvall, 1988) and interaction in software development, the custom and even applications segments of the packaged software sector appear likely to provide country-specific niches for entrants and incumbents. This is because there is an important service component in software. The delivery of the software and the interaction between vendors and consultants is an important part of whether software packages run and perform adequately. Therefore, not only may there be country-specific niches for firms from different countries but physical and cultural proximity to customers may well play an important role developing the technological and organisational capabilities of these firms.

The ERP revolution and since
Ever since the "Enterprise Resource Planning Revolution" (Ross and Vitale, 2000) of the late 1990s, ERP has come to be seen as the solution to a range of business problems. These include the integration of major business functions (including production, finance, sales and human resource management) across the organisation; the coordination of business operations across geographically dispersed sites (Davenport, 2000); and the provision of connectivity between business activities located along a firm's supply chain. As is well known, ERP represents an understanding of organisations as containing common elements and having generic business needs which can be met by standardised packages. By combining the various ERP modules, an organisation can (in theory) – with the assistance of the appropriate consultancy expertise – create its own solution. In practice, most end-user organisations are required to engage in substantial re-engineering of their business processes in order to conform to what is required by the template. An organisation therefore does not so much buy, but rather buy into, an

ERP system. That is to say, it enters into a long-term relationship with the vendor while at the same time sacrificing a significant amount of control over its processes and practices. While a standard ERP system can (in theory) meet all the information needs of an organisation replacing a wide range of legacy systems, the amount of business process re-engineering and software configuration required by the alignment process can lead to a loss of flexibility. It is therefore hardly surprising that there has been ample opportunity to both revel in, and to be appalled by, an ever-lengthening list of stories of ERP implementation-related calamity. For example, some years ago it was suggested, by the Standish Group, among others, that up to 90 per cent of ERP implementations resulted in cost and schedule overruns (see Calogero, 2002; Westrup and Newman, 2002). The benefits of a well-run ERP system may well be compelling, but high profile failures such as FoxMeyer serve as stark reminders of a potential downside[2].

Vendors and consultants have reacted to hints of market saturation with moves to develop enterprise systems for new categories of end-users (including non-profit organisations or SMEs), evolving new types of ERP (for example Web-enabled, or CRM and SCM products which link with and extend existing ERP systems), as well as extending their sales efforts outside the traditional ERP core markets into new regions such as India and China. These are but the most obvious manifestations of a recent tendency towards decreasing the perceived rigidity of ERP systems. This is mirrored by a tendency among many end-user organisations to try and modify standard packages in order to meet better their individual needs. These developments amount to some kind of halfway house between standardisation and customisation that has important consequences for system implementation and upgrades and also for the need of (in-house or consultant) expertise to manage the associated costs and risks.

There is no doubt then, that ERP systems have come a long way indeed from their origins in material requirements planning. At the same time, each new ERP extension and migration is the source of new tensions between the global and the local and between standardisation and difference. Implementation teams in SMEs for instance, may find themselves overwhelmed and end up with little choice but to implement default settings. Similarly, non-Western firms may find out that ERP systems from the major vendors encode alien institutional assumptions and modes of practice that do not "fit well" with their own (Soh and Kien, 2000). To take a simple example, ERP systems sometimes presuppose Western name formats (first, middle, last) and therefore have had problems with Indian, Chinese or Malay names (Markus and Soh, 2002). Misfits may have troublesome business consequences. In a study of ERP use in an Egyptian manufacturing company, for instance, El Sayed and Westrup (2003) found that haggling over prices was commonplace and valued customers expected prices not to be fixed until after the receipt of goods. Clearly, this was not a notion of business that could be supported by the company's Oracle system so accountants only entered sales order data after payment was received so that they could then create an invoice that satisfied the Oracle system. Company accountants, in other words, had to figure out innovative ways of smoothing over any disjuncture arising between the procedural demands imposed by the system and the demands of the local business environment.

The literature on technology transfer has long highlighted the critical role performed by institutional and organisational factors in impeding or facilitating successful technology transfer (e.g. Walsham, 2001; Bhagat et al., 2002; Lin and Berg, 2001; Sahay and Walsham, 1997; Austin, 1990). We could in fact identify something

approaching a consensus along the lines that: "It is less likely that an organisation will be able to successfully transfer a technology to another organisation operating in a considerably different normative context than to an organisation in a similar normative context" (Munir, 2002, p. 1416). Adopting organisations are said to be faced with a trade-off between attempting to adapt the technology to fit the context, or re-create the context to fit the demand of the technology. Clearly, tensions between globalisation and localisation (Walsham, 2001) and re-engineering and customisation are experienced particularly acutely in the case of enterprise systems, the very rationale of which is that they should work across multiple settings.

The research approach

The tensions between standardisation and difference, global technological imperatives and local business needs and the attempted resolutions of such tensions are here investigated in the context of ERP expansion in Taiwan. More specifically, we focus on the ways in which such (potential) tensions were viewed among Taiwanese ERP providers. Were such tensions construed as problems or as opportunities? And what were the commercial strategies underpinned by these perceptions?

To explore these questions, a collective case study (Eisenhardt, 1989) of 14 organisations involved in the design, manufacture and delivery of enterprise systems in Taiwan was conducted. This comprised three leading foreign ERP vendors, four leading domestic ERP vendors, the ERP trade association, and a number of consultants in Taiwan (see main features of major ERP vendors operating in Taiwan in the Appendix). As outlined in Table I, these organisations represented a reasonable cross section in terms of industry groups, size, maturity and range of products and services. Since this project sought to explore the perceptions of Taiwanese enterprise system providers and the business and design strategies through which such perceptions were enacted, a research approach was required that permitted the articulation of these subjective perceptions and interpretations. An interview-based qualitative data collection approach was therefore adopted. A considerable amount of secondary data collection was undertaken in preparation for, and in parallel with, visits to companies

Firm	Main activities	Position of main interlocutor
SAP	ERP vendor	Business manager
Oracle	ERP vendor	Business manager
JDEdwards/PeopleSoft	ERP vendor	Business manager
I1	E-Business	Product manager
Symbio	CRM consultant	Senior consultant
DSC	ERP vendor	Sales manager
ProYoung	ERP vendor	Ex-senior consultant
IEMIS	ERP vendor	Director
Ching Hang	ERP vendor	R&D manager
Enlight	ERP platform developer	Senior engineer
ARES	ERP customisation and localisation service	Senior consultant
SYSCOM	Integration service provider	Senior engineer
AdvancedTEK	ERP consultant	President
ERP Association	ERP association	Director
MXIC	ERP user organisation	IS manager

Table I.
Firms interviewed

and case study research. While access was being negotiated a comprehensive review of the extant literature on, and annual reports of, ERP vendors in Taiwan was carried out. Press reports and email exchanges in Taiwanese ERP-related web discussions were also monitored. This assisted the identification of topics of debate and areas of concern among Taiwanese enterprise system practitioners. A pilot questionnaire was constructed on the basis of this information and circulated to a small number of potential participants for their initial feedback, suggestions and criticisms. On the basis of their comments the interview structures were finalised. A series of semi-structured interviews were then conducted with representatives of the aforementioned organisations. Interviewees were selected predominately on the basis of their position and ability to inform or influence organisational strategy.

Interviews were face-to-face and generally lasted between one-and-a-half and three hours. In the first part of the interview, interlocutors were invited to comment and reflect upon the following subjects: the ERP experience in Taiwan; the importance (or otherwise) of the local institutional and business context for ERP providers; the comparative advantages and disadvantages of international vendors; the comparative advantages and disadvantages of domestic vendors; the strategies through which international and domestic vendors attempted to overcome disadvantages and press home advantages; and the consequences of those strategies. The second part of the interview focused more narrowly on the interviewee's own organisation, its pattern of relationships with other corporate actors (suppliers, clients and competitors) and the strategies it employed in the pursuit of competitive advantage. In the final part of the interview, interlocutors were encouraged to comment more freely and to speculate on any topic they considered relevant to the discussion. Interviews were supplemented by follow-up telephone interviews and email contacts and also the continuing analysis of documents, press reports and web discussions. Preliminary conclusions were presented at an ERP industry colloquium in Taiwan as a way of generating feedback and checking the authors' interpretations against those of enterprise systems practitioners. The analysis of the interviews and the associated documentation produced a fairly consistent picture. In short, domestic vendors would put much emphasis on their geographical and – more importantly – institutional and cultural proximity to their clients while representatives of foreign vendors might acknowledge this proximity, but deny its importance in an increasingly globalised marketplace. More specifically, the potential competitive advantages that domestic vendors might enjoy over foreign vendors were articulated by our interlocutors in terms of four interrelated themes, namely, the ability to meet special requirements; the ability to provide support for the flexibility of domestic SMEs; the benefits of direct implementation; and the ability to learn quickly from their customer. We consider these issues in more detail below.

Differences between foreign and domestic ERP vendors in Taiwan
Taiwan's IT industry has traditionally been dominated by low cost hardware producers. By 2000 the country had become the world's third largest hardware producer slipping to fourth place since 2001 after having been overtaken by China (Chen, 2002). The slippage in ranking is likely to continue as the migration of hardware manufacturing to continental China continues to gather momentum. On the other hand, this decline cannot but strengthen the importance of the software sector in general, and of enterprise solutions and services, in particular. First, whilst the Taiwanese ERP market may not be

particularly large by global standards, it has been growing rapidly. To a significant degree this is a response to the pressures of globalisation. As Taiwanese enterprises become geographically dispersed through the relocation of low-value labour intensive activities to the mainland and/or pursue stronger links with global business partners, there is increasing reliance on enterprise systems as a means of achieving "virtual" integration (Wu and Wang, 2002). Second, there is sustained government effort to promote the vision of a knowledge-based economy to supplement the country's successful manufacturing sector (Chen, 2002). Third, there is a shift of focus within the software sector itself towards higher value-added products such as ERP and CRM.

Foreign ERP vendors like SAP, Oracle, and PeopleSoft not only have a longer history, but also larger scale and more resources than domestic ERP vendors. Table II summarises the main differences between foreign and domestic ERP vendors. These differences include: technology, market, types of customers, modes of implementation and product strategy.
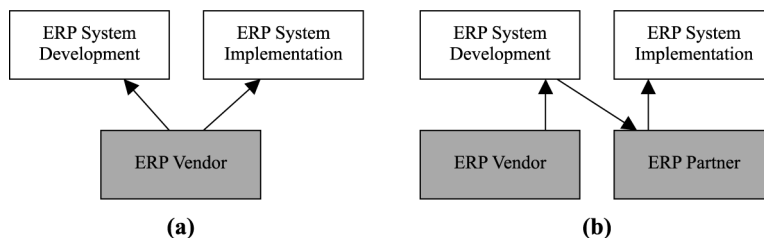
Indirect vs direct implementation

ERP vendors can be classified into direct and indirect implementation vendors. As can be seen in Figure 1, direct implementation vendors are those that implement their system for the customers by themselves, while indirect implementation means the ERP vendors train their partners such as consultant firms to use and configure the ERP system and thus the ERP partners do the ERP implementation.

While domestic ERP vendors adopt direct implementation, indirect implementation has been a successful strategy used by foreign ERP vendors to deploy their systems in the global market for two reasons. Firstly, software product and professional services businesses are very different and therefore be very difficult to manage simultaneously. Secondly, the relationship network of partners enables an increase in the range of products and service offers through the partner know-how (Hoch *et al.*, 1999). By contrast, Taiwan's domestic ERP vendors decide, or are forced, to choose direct implementation for three reasons. First, the professionalisation of the "consultant" in Taiwan is weaker than in Western countries. An independent ERP consultant argued:

	Foreign ERP vendors	Domestic ERP vendors
Technology	Leaders	Followers
Market	Global	Local
Customer	Large enterprises	SMEs
Implementation	Indirect	Direct
Product strategy	Top-down	Bottom-up

Table II.
Differences between
foreign and domestic
ERP vendors

Figure 1.
Direct (A) and indirect (B)
implementation

It's a cultural difference between Western and East Asian countries. In Taiwan, when customers have any problem with their ERP systems, they prefer to ask the designers rather than the consultants to solve their problems.

Second, consultant firms prefer to implement foreign ERP systems rather than local ERP systems for a number of reasons. First, foreign ERP systems are more standard than local ERP systems. Consultants are then more easily trained to implement foreign ERP systems. In addition, foreign ERP vendors are able to provide comprehensive training. Second, the market of local ERP systems is rather limited, but foreign ERP systems have a global market reach. Choosing to implement foreign ERP systems makes the business extendable. Finally, in Taiwan, foreign ERP vendors focus on the market of large-scale enterprises, while domestic ERP vendors focus more on SMEs. Generally speaking, implementing foreign ERP systems can lead to higher profits. As the director of the Taiwan ERP association argued:

There haven't been a lot of collaborations between domestic ERP vendors and consulting firms so far. Consulting firms have the will to invest time and consultants only if the ERP vendors can prove that the local ERP systems are stable enough and can be sold widely. Moreover, the traditional consulting firms are not really capable of providing advice on e-business since they have put emphasis on ISO and workflow management etc, but not IT consulting and e-business. However, the trend of moving to IT consulting is more and more obvious recently.

Third, since Taiwan's ERP market is rather limited, the revenue from implementation is relatively important for domestic ERP vendors so they prefer direct implementation.

Globalisation vs localisation: top-down vs bottom-up strategies
Another difference between foreign and domestic ERP vendors is the product strategy they use to extend their respective market. Foreign ERP vendors tend to use a top-down strategy while domestic ERP vendors seem to follow a bottom-up strategy. The different strategies are thus different approaches in striking a balance between the local and the global and between the particular and the universal. As shown in Figure 2, foreign ERP vendors have grown in the major markets, and have developed their "best practices" with major customers.

After that, they extend their market down to different regions, different industries and different companies by using these "best practices". By contrast, domestic ERP
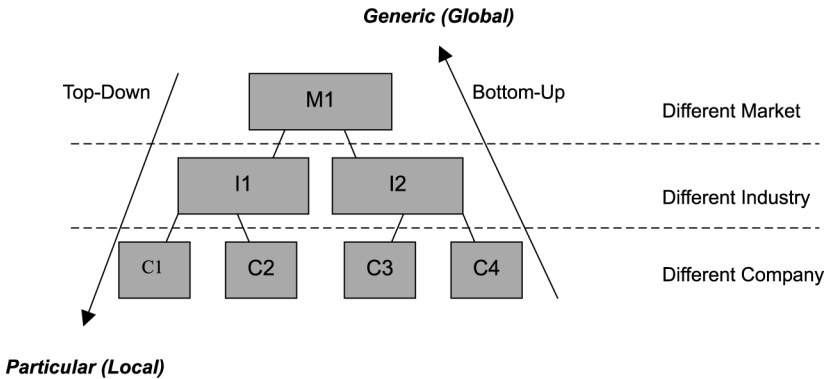
Figure 2.
Different product strategies of foreign and domestic ERP vendors

vendors began their business from small projects with different companies. After that, they "generalised" the specific requirements to build generic ERP systems. This allows them to extend their markets to different industries and to different geographic markets such as China. (The top-down strategy is thus one of adding-on particularities while the bottom-up is one of shedding them.)

Market segmentation: large firms vs SMEs
Foreign ERP vendors such as SAP, Oracle and PeopleSoft established themselves early on as the chief suppliers of the top 1,000 enterprises in Taiwan, with market shares of 38 per cent for SAP and 16 per cent for Oracle. Domestic ERP vendors, such as DSC and ProYoung managed a share of 10 per cent and 4 per cent respectively, with domestic ERP vendors accounting for under 20 per cent of the large-scale market (IT IS, 1998 cited in NetTrade Company Report, 2001). The price of foreign ERP solutions is between US$0.6 million (NT$20 million) and US$1.4 million (NT$50 million), this is much higher than the local ERP products. Large enterprises, especially multinationals, are the major customers of the foreign ERP vendors.

The medium- and small-scale markets still remain today the main customers of domestic ERP vendors. The major vendors of medium-scale market are DSC, ProYoung, FastTech and IEMIS. The price of their solutions is between NT$1 and NT$5 million. The small-scale market consists of various small enterprises. Many small software houses are able to provide their solutions for this market. However, the major domestic ERP vendors also have solutions with lower price to compete with other providers. The price of the solutions is under NT$1 million and the selling mode is mainly via distributors.

ERP market trends in Taiwan
The ERP market in Taiwan has been growing rapidly. The main trends include a move to Wide Enterprise Systems in terms of the platform itself and a shift in clients from hi-tech manufacturing to traditional manufacturing and from large enterprises to SMEs. Taiwan's ERP market has moved from the growth stage (during the period 1996 to 1999) into the maturity stage of the product life cycle (MIC Report, 2001 cited in *CNET News*, 2002a, b). However, this may not be the case if we include the EERP market, the next generation of ERP. The Senior Manager of SAP in Taiwan argues: "The information systems requirement of enterprises has shifted from internal information integration to external information communication with their suppliers and customers. That means the IS expenditure of enterprises has also moved from ERP to EERP" (*CNET News*, 2002a, b). While increasing numbers of large enterprises in Taiwan have implemented ERP systems, foreign ERP vendors such as SAP and Oracle are slowly targeting the medium-sized firms market. Indeed, both SAP and Oracle have entered the medium-size market, which is defined as the enterprises with less than 50 employees and the revenue around NT$1000 billion. This trend marks an increasing ferocity in the competition among ERP vendors. It forces domestic ERP vendors to double their efforts to explore the domestic market among small- and medium-sized businesses – a pattern common to many countries.

Developments in Taiwan's Enterprise solutions industry are of course heavily influenced by trends in China. IT investment in both public and private sectors has played an important role in China's recent economic growth. According to CCID

Consulting statistics, the growth rate of the China's ERP market has nearly doubled from year 2000's US$69 million (RMB 570 million yuan) to 2001's US$105 million (RMB 870 million yuan) (TechInfo News, 2002). China is seen as a particularly important market that is changing the business for software firms in Asia (Greenberg, 2001). There are three driving forces for the growing ERP market in China, namely, government support, accession to the WTO and the demand of enterprises for competitive advantage. Currently, international vendors play the major role. Although there are a few local software packages, they are mainly accounting and financial applications, and are small and low cost. For instance, the software product of YoungYou, one of the biggest software companies in China, has been widely utilised, but it is an accounting package rather than a real ERP system. The Eastern, Northern and Southern regions of mainland China are currently the major ERP markets for business application software. However, the "Great West Development Plan" is likely extend the market further to the Western region.

Five major modes of collaboration have been used by Taiwan's ERP vendors to enter China's market. These include setting up R&D centres, distribution collaboration, research consortia, joint venture and investment (MIC Report, 2000). In addition, the branches they have set up in China are located in several major cities such as Beijing, Shanghai and Nanjing as well as some cities in southeast provinces such as Dongwan, Xiamen, Shenzhen and Guangzhou which are provinces closest to Taiwan. Many of Taiwan's vendors have set up R&D centres in China because China provides cheap and skilled software engineers. Moreover, management and communications seem easy to handle because of the similarities in language and institutions. Nevertheless, obstacles to the establishment of R&D centres remain. Firstly, the cost of setting up R&D centres in China is increasing constantly. The expenditure of R&D centre as well as the salary of software engineers in major cities such as Beijing and Shanghai has grown dramatically in recent years. Secondly, software engineers in China are considered to lack loyalty to their firms. In the case of ATTN, one of Taiwan's ERP vendors, a whole group of well-trained R&D team left the company to set up their own new business (MIC Report, 2000). This kind of practice could make a great impact on software firms since skills seem to be the most important asset. Third, China's taxation system is complex and subject to many changes. On the one hand, there are difficulties in keeping up with the legislation. The taxation system has been reformed and a new system came into effect on 1 January 1994, applicable to enterprises with foreign investment and foreign enterprises. Foreign companies have to pay many kinds of taxes such as value-added tax, business tax, income tax and land appreciation tax. On the other hand, the system is changing, with the introduction of many exemptions and preferential treatment rules to encourage foreign companies' investment or the setting up of their R&D centres in special zones. Taiwan's ERP vendors have to be familiar with the regulatory and taxation system before making their investment. Finally, it is rather difficult to find suitable local managers. Therefore, managers are mainly flown in from Taiwan, increasing the Taiwanese firms' costs (MIC Report, 2000).

Learning in Taiwan's ERP industry

In comparison with large Western ERP leaders, the software technologies, resources and global market experience of Taiwan's ERP vendors are weaker. However, there are four areas in which domestic ERP vendors perceive themselves as having competitive

advantages over foreign vendors: their ability to meet special requirements, the ability to support the flexibility and speed of domestic SMEs, the benefits of direct implementation, and the ability to learn from their engagement with local customers. These advantages are said to derive from the knowledge of, and close(r) interaction with, their customers and the industry in which they operate.

We have already discussed how Enterprise System implementations in Europe and North America were often plagued by gaps between the requirements of the user organisation and the functionality provided by the system (Van Everdingen *et al.*, 2000). Any such functionality-requirement gap can only increase the further the system is removed from its original context of development and whatever institutional-specific notions of "best practice" the system is designed to enact (Soh and Kien, 2000; Skok and Döringer, 2001; Swan *et al.*, 1999). As Wu and Wang (2002) note the functionality-requirement "misfit" is "worse in Asia because the business models underlying most foreign ERP packages reflect European or US industry practices".

Meeting special requirements
Our research suggests that foreign ERP vendors in Taiwan are unwilling to modify their ERP programs to meet special requirements. The only way to customise these ERP systems is to add-on the programs for special requirements to the original system. For example, SAP's "user exits" are exit points of SAP transactions, where custom codes can be added to perform the required business functions without modifying the original source code. Nevertheless, the disadvantages of using add-on functions are similar to the problems of customisation. Some of these problems are illustrated in our interview with the MIS manager of MXIC:

> The standard functions of the SAP SD module cannot entirely fulfil our order taking requirements. We tailor the RFQ process of the SD module to become our pre-order taking process, and integrate it with the standard order-taking process of SAP seamlessly…Technically speaking, we add our own code in several user exits to fulfil our pre-order taking functions. During the process, however, to understand fully what data could be impacted, in addition to the standard documentation, we leverage the comments of ABAP source codes. Under these circumstances, the German-English translator becomes our best friend.

Since the method of add-on functions is problematic and can have serious limitations, ERP customers tend to take the risk of reengineering their business processes in order to reduce the gap between virtual "best practice" and the real practices. As suggested by the business manager of SAP:

> During the blueprint phase of an implementation process, certain reengineering will be done in most projects. Reengineering during implementation is the value that the SAP solution provides to the customer. A SAP solution is more like a managerial concept in methodology than an IT tool to our customers.

However, this can conceivably raise questions about the potential drawbacks of reengineering the client's business process, which may already be appropriate to the client's local business needs in order to fit a "best practice" blueprint as determined in a different place and time.

Despite the needs for customisation or reengineering, the market shares of foreign vendors such as SAP and Oracle have been consistently much higher than those of

domestic ERP vendors. When the MIS manager of MXIC was asked about the reason to choose the foreign vendor SAP, he argued:

> We didn't consider local ERP products at that moment. We hired ... [a major international supplier] to help the ERP evaluation process, and they didn't recommend any local products. From my personal perspective, we wouldn't recommend local ERP products, due to the following reasons: (a) lack of multi-national, multi-lingual and multi-currency functionality-they normally support only two to three languages; (b) most of them could experience difficulty when globalisation requirements arise, such as global financial consolidation, etc. (c) product vendors normally have a lack of experience in project management of large-scale system integration ... However, they do have good understanding of local requirements and local regulations. This is their strength.

The reason we include these comments is that the MXIC case has acquired some local celebrity as a particularly successful case of a SAP implementation. By contrast, in 2000, Chinese Petroleum Corporation (CPC), which is the biggest national enterprise in Taiwan, decided to spend about US$0.9 million (NT$33 million) and three years to implement SAP R/3. Nevertheless, SAP systems were seen as unsuitable to the needs of their biggest client in Taiwan, and the project has been suspended.

Domestic vendors have introduced innovations to meet the local special requirements. For example, FastTech differentiates itself from other firms by providing many industry-based ERP systems. It developed 12 industry-based ERP systems, including Machinery, Shoe Factory, Metalworking Industry, Weave Cloth, Dyeing, Texturising, Leather, Pret-a-Porter, Printed Circuit Board, Steel Industry, Passive Component and Technology Service ERP Systems. For instance, in order to solve the special material requisition problem in machinery industry, FastTech provides product-full-structure management to help real-time material requisition checking and modification. Similarly, in order to meet the special requirement in the wearing apparel industry, ProYoung collaborated with China Textile Institute to develop a wearing apparel industry ERP system in 2001 and the system was issued in 2002.

Supporting the flexibility of SMEs

The major market of domestic ERP vendors in Taiwan are SMEs, famed for their speed and flexibility. According to the sales manager of DSC, these characteristics of SMEs hinder the application of foreign ERP systems and have protected domestic ERP vendors:

> Apart from the language barrier, the characteristics of Taiwan's SMEs have been the major barrier that foreign vendors could not support. Planning is undoubtedly a good concept for production and has been embedded in foreign ERP systems. However, the competitive advantage of Taiwan's SMEs is their flexibility which is characterised by small-scale production, variety and modifiability in production. Everything is changing all the time. For example, the total amount, the date of delivery and the lead-time are changeable.

The director of the ERP association in Taiwan argued along similar lines:

> Some foreign ERP systems are very well designed because a lot of situations have been considered and some best practices are included. These ERP systems are more suitable for the international firms or firms that are growing and going to become an international firm. However, they are certainly not the most suitable system for most of the firms in Taiwan because of the rigid rules that should be followed when using these systems. For the medium-

and small-sized companies, the most important thing is how to fulfil their task by using minimal manpower and time and no strict auditing. These kinds of requirement provide opportunities for domestic ERP vendors because they are willing to meet the requirements even by modifying their software systems.

This reinforces the idea that domestic ERP systems which support the SMEs' practical needs are more suitable for them. Again, it does not seem appropriate to change their processes to match theoretical "best practice" processes. Indeed, domestic vendors have developed specific products especially for SMEs. These include DSC's TIP-TOP and SmartERP, and FastTech's Quick MAT IC (92-95), Netup Q1 (95-98), Netup Q2 (99-01) and Date 8 (02-).

Perceived benefits from direct implementation
Although indirect implementation has been seen as a successful strategy used by foreign ERP leaders to expand their market quickly, direct implementation seems critical for Taiwan's domestic ERP vendors to learn from their customers (see Table III).

As shown in Figure 3, the dotted lines indicate the implementation processes, while the solid lines indicate the domain knowledge feedback from customers. In the Figure 3, in (A), the feedback from customers can be used to reinforce ERP vendors' domain

Firm	Forms of implementation
DSC	Direct implementation
	190 (24 per cent) implementation consultants in 2001
FastTech	Direct implementation;
	105 (40 per cent) implementation consultants in 2000
ProYoung	Direct implementation
SAP	Local implementation partners: Com2B, EIS, Intellisys, ITTS, Soetek, Wistron ITS, IVAN Information
	Global implementation partners: Abeam, Andersen Consulting, Accenture, Cap Gemini Ernst & Young (CGEY), CSC, Deloitte & Touche Consulting, EDS, HP, IBM Global Services, KPMG, Atos Origin, Plaut, PwC, Siemens Business Services
Oracle	Local implementation partners: AdvancedTEK, AlphaTEK, Apdex, Intellisys, DSC
	Global implementation partners: Accenture, DeloitteTouche, CapGemini, IBM Business Consulting Services

Table III.
Forms of implementation

(a) **(b)**
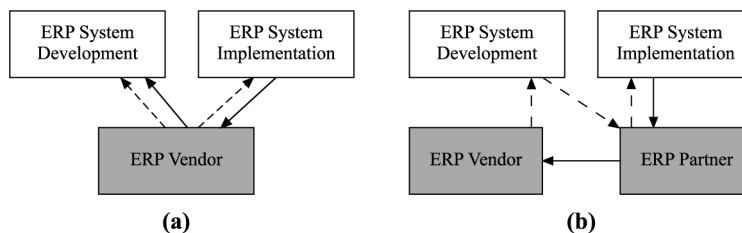
Figure 3.
Domain knowledge
feedbacks via direct (A)
and indirect (B)
implementation

knowledge and then used to improve their ERP system. By contrast, in (B), the feedback from customers appears able to reinforce the ERP partners' domain knowledge, but is unlikely to pass back to ERP vendors.

A consultant of Chung Yuan Christian University ERP research centre argued:

> When some modules of the ERP system have been done and some software developers seem to be redundant, domestic ERP vendors are likely to move their software developers to play the consultant role in order to reduce the redundant software developers. However, most importantly, the real requirement of their customers can then feed back to the system design through these moving software developers (consultants).

This process reinforces the domain knowledge from customers and strengthens the domestic ERP vendors' capabilities to meet their real requirements.

IV. Role of customers' suggestions and complaints

For domestic ERP vendors, learning from customers, including the ability to respond to suggestions or even complaints seems to be the most significant input for system improvement. As argued by the R&D manager of Ching Hang:

> In the early stage, interviews with our customers were the major source of learning what they need. Currently, the suggestions and complaints of our customers and learning from competitors' ERP systems seem to become more and more important to reinforce our domain knowledge.

For example, DSC has developed a CRM (customer relationship management) system. The system provides E-Service platform by integrating computer and telephone integration system (CTI) technology to serve their customers. All of the problems or requirements from their customers are recorded and managed by the CTI system. On the one hand, the system can help DSC's consultants to serve their customers. The sales manager of DSC argued:

> Before picking up the phone, CTI has already shown information about the customer such as customer's basic information, past problems list, the status of each problem.

One the other hand, the system can help DSC's managers not only analyse their service performance, such as response time, but also to keep track of customers' problems. As this example shows, the feedback from customers reinforced the firm-specific and industry-specific knowledge of domestic ERP vendors.

Conclusions

ERP systems have often been called the "price of entry" into the global marketplace (e.g. Wu and Wang, 2002). The experience of globalisation is typically described in terms of tensions; tensions between the global and the local, the international and the domestic, the standardised and the idiosyncratic. The design, implementation and use of ERP systems could therefore be seen as processes through which such tensions are worked out in practice. There is by now a fairly extensive literature highlighting the causes and consequences of the functionality-requirements gap. The possibilities for a misfit are increased as enterprise systems reflecting business models have spread into other regions of the world, which may have very different business practices. Soh and Kien (2000) have described functionality-requirements misfits as being among other things gaps in knowledge. "Fundamentally, the misfit analysis reveals the severity of

the knowledge gap in ERP implementation" (Soh and Kien, 2000, p. 51). The key parties to this process, they argue, have different and specific knowledge(s) that cannot be easily integrated.

The paper discusses how perceptions of such an ERP system-requirement misfit in Taiwan have been construed as business opportunities by domestic vendors in their response to competitive pressures from international vendors. Domestic providers, while at a disadvantage in many respects, we have argued, identified this "gap" as a business opportunity, as potentially a source of competitive advantage. Taiwanese ERP vendor's geographical and, importantly, institutional and cultural proximity to their clients, allows, in their view, for a more effective learning to take place, allowing ultimately for a better requirements-functionality fit. We can therefore identify a number of relevant differences between foreign and domestic enterprise system vendors. While the former have more resources, large client firms and are involved in indirect implementation and top-down product strategy, the latter focus on small and medium-sized firms, are involved in direct implementation and in bottom-up product strategy. However, foreign ERP leaders are now entering the small and medium-sized market heightening the competition for domestic ERP vendors.

While foreign ERP leaders have tried to apply the "best practices" embedded in their system to their clients all round the world, the ERP systems of domestic ERP vendors are built based on the experience from the requirement of many small cases. This study suggests that there are four areas in which domestic ERP vendors have a competitive advantage over foreign leading ERP firms: the ability to meet special requirements, the ability to support the flexibility and speed of domestic SMES, the benefits of direct implementation, and the ability to learn from their engagement with local customers. These have been the most important source of learning for Taiwan's ERP vendors to reinforce their core competencies and to compete with foreign ERP vendors. Although domestic "latecomer" ERP vendors have rather limited resources and older technology in comparison with foreign vendors, knowing the customers and the industries in which they operate and providing fitted ERP systems rather than expecting client firms to change their business processes to match theoretical "best practice" processes have been very important in protecting their market. Whether this strategy does indeed ensure higher user satisfaction, is not yet entirely clear (see, for example, Wu and Wang, 2002; Chen and Quo-Ping, 2003).

While the literature on learning and innovation in East Asia (Amsden, 1989; Hobday, 1995) has stressed the role of incremental improvement on borrowed technology, the role of the government and strategy of domestic firms in overcoming technology and market barriers in manufacturing sectors, this study casts light on the sources of competitive advantage of East Asian firms in sectors with services components. Because of the service component in software implementation, close user-producer linkages (Lundvall, 1988) and customer interaction may create country- and sector-specific niches that have been used by domestic ERP firms in Taiwan to their advantage. Despite their weaker technologies, resources and global market experience, the structure and strategy of domestic Taiwanese firms afford them the ability to meet their customer's specific business requirements and support the particular features of customers' strategy and structure in the region.

Notes

1. Hobday defines original equipment manufacturer as a specific form of subcontracting. Like a joint venture, it requires a close connection with the foreign partner. Under OEM deals, the domestic firm produces a good to the exact specification of the foreign company. The foreign firm then markets the product through its own distribution channels, under its own brand name. OEM often involves the foreign partner in the selection of equipment, training of managers, engineers and workers. It is to be contrasted with ODM (own-design manufacture), where the local firm designs the product to be sold by the multinational (Hobday, 1995).

2. After investing two-and-a-half years and over $100 million in its ERP system implementation, FoxMeyer failed to make it work, went bankrupt in the process and was acquired for $80 million.

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Appendix

	Established	Employees	R&D expenses (US$million)	Customers	Revenues (US$ million)					Growth rate % 1999–2001	Growth rate % 1999–2003
					2003	2002	2001	2000	1999		
SAP	1972 (GERMANY) [1997 in Taiwan]	29,098 (2003) 29,054 (2002) 27,072 (2001) [70+ in Taiwan]	995.9 (2003) 909.4 (2002) 898.3 (2001)	17,500 [22+ in Taiwan]	7024.6	7412.8	7,340.8	6,264.6	5,110.2	43.7	37.5
ORACLE	1977 (USA) [1991 in Taiwan]	40,650 (2003) 42,006 (2002) [190+ in Taiwan]	1180 (2003) 1076 (2002) 1139 (2001)	12000+ [300+ in Taiwan]	9475	9673	10961	10,130.1	8,827.2	24.1	7.3
PEOPLESOFT	1987 (USA) [1998 in Taiwan]	12,163 (2003) 8,293 (2002) [25+ in Taiwan]	433 (2003) 341,2 (2002) 299 (2001)	12,200+ [18+ in Taiwan]	2267	1948.9	2119	1,736.5	1,429.1	48.3	58.6
DSC	1982 (TAIWAN)	846 (2003) 816 (2002) 830 (2001)	2.7 (2003) 2.3 (2002) 2.4 (2001)	12,000+	77.5	79.8	76.7	45.5	32.6	135.2	137.7
FASTTECH	1989 (TAIWAN)	239 (2003) 259 (2002) 286 (2001)	0.89 (2003) 1.01 (2002) 0.87 (2001)	N/A	9.3	7.7	10.8	10.8	7.3	47.9	27.4
PROYOUNG	1987 (TAIWAN)	188(2001)	0. 3 (2003) 0.64 (2002) 0.64 (2001)	N/A	3.65	5.27	13.4	17.0	13.3	1	−72.6

Source: Data from Forbes.com, yahoo.marketguide.com, biz.yahoo.com, udnemoney.com, www.fcwin.com.tw, www.edgar-online.com, newmops.tse.com.tw, www.sap.com, www.oracle.com, www.peoplesoft.com, www.dsc.com.tw, www.fast.com.tw and company reports

Table AI.
Major ERP vendors operating in Taiwan

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