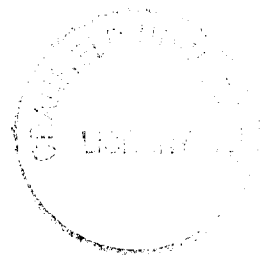




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**SWP 9/94 A METHODOLOGY FOR THE STRATEGIC
MANAGEMENT OF INTERNATIONAL
MANUFACTURING AND SOURCING**

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A METHODOLOGY FOR THE STRATEGIC MANAGEMENT OF INTERNATIONAL MANUFACTURING AND SOURCING

ABSTRACT

Little previous research has been carried out on the issues to be considered when choosing between manufacturing at home, offshore or sourcing from an offshore third party supplier. As a consequence, few concepts or frameworks have been developed to help determine how the manufacturing and sourcing resources of a business should be configured to create or sustain a competitive advantage. The offshore production or sourcing of manufactured products is usually organised to lower costs. However, such a strategic move can constrain an organisation's capability to satisfy other critical market needs. Many manufacturing companies must now adopt strategies that deliver both a time-based and a price competitive advantage. There is therefore a need to develop strategic management frameworks for determining how the use of both international production and sourcing resources can enable the adoption of both least cost and differentiation competitive strategies. This was the objective of the study detailed in this paper.

INTRODUCTION

Many British and foreign-owned multinational companies, in their search for a competitive advantage, look beyond their national boundaries for a source of components or finished products. Miller and Roth [1] have reported that many manufacturing businesses consider global sourcing to be a competitive weapon and some firms have already used it to their advantage [2,3]. However, little research has been carried out to examine the cost and service reasons for manufacturing offshore instead of using a third party supplier or whether it would ever be advantageous to return internationalized production to the United Kingdom.

Adam and Swamidass [4] identified the international context of manufacturing strategy as a "missing theme" in the operations management literature and Anderson, Cleveland and Schroeder [5] make no mention of it in their review of the current literature on manufacturing strategy. These literature reviews have confirmed that there is a need for more research on the strategic management of international manufacturing and sourcing.

The objective of this research was to identify the product and market characteristics that influence the choice of location and the type of manufacturing source to be used to improve the competitiveness of international production operations. This research design has therefore precluded a study of investment decisions made to gain access to targeted offshore markets as these decisions are taken for a different although an obviously related strategic purpose.

PREVIOUS RESEARCH

An explanation for the diffusion process of products across national boundaries has been given by Vernon [6,7,8] and Wells [9,10]. Their international product life cycle hypothesis describes the relationship between the stage of the product in its life and the location of its production. They reason that the characteristics of a product stabilize as a product matures and then industry competition shifts to price. This is the motive for moving its production offshore because the manufacturers now seek to reduce costs by engaging in low labour-cost production. Hence, foreign direct investment or other forms of international involvement (licensing or subcontracting) will begin to occur.

Grunwald and Flamm [11] have also studied the reasons for the overseas production of manufactured products for the American markets. They also claim that this strategy allows firms to retain their cost competitiveness after their products have entered the later stages of the product cycle. The firms that developed the product are able to continue producing economically by eventually relocating to or subcontracting assembly production to low-wage developing countries. This arrangement is referred to as "production sharing" in which

production activities are coordinated vertically across national boundaries in order to withstand foreign competition [12].

McGrath and Bequillard [13] carried out a study of fifty-six electronics companies and identified four types of international manufacturing strategies. These were as follows:

Home country manufacturing: A centralized strategy consisting of almost all manufacturing taking place in the company's country of origin with a high degree of global sourcing taking place through third parties.

Regional manufacturing: For the adoption of this strategy, the world is viewed as a number of regions that comprise similar markets, common distribution requirements and government policies. The strategy consists of developing manufacturing operations in these areas at the product and component level.

Coordinated global manufacturing: This is the classic strategy for taking advantage of low labour cost areas. This strategy typically leads to the firm having separate manufacturing facilities for lower level components and subassemblies. Outputs are then transferred to other facilities for final assembly.

Combined regional and coordinated global manufacturing: This involves a mix of the second and third strategies with component and subassembly manufacturing in low cost regions and final assembly in regions close to markets.

DuBois and Oliff [14] used the McGrath and Bequillard classification of international manufacturing strategies and researched the objectives for the adoption of each type of manufacturing configuration. Their conclusion was that the configuration of international manufacturing operations is the result of giving a differential emphasis to each of the four key manufacturing performance priorities [15,16]. Their findings were that "cost-based

competition encouraged the use of coordinated global manufacturing; the flexibility imperative encouraged a combination strategy of regional and global manufacturing; dependability required regional and home country strategies; while quality as a manufacturing imperative required either home country or regional manufacturing". This research has found evidence to show that offshore manufacturing plants in low labour cost countries also produce high quality products. It is unlikely that any manufacturing organization would enter into a joint venture or invest in an offshore manufacturing facility unless it had confidence in the ability of local or expatriate management to oversee the production of high quality products. DuBois and Oliff also concluded that the level of industry technology and the type of market served, that is whether it is a consumer or an industrial market, is relevant to the international configuration decision.

Finally, Moxon [17,18] found a positive relationship between the value-to-weight ratio of products and the likelihood that the product would be produced offshore. A high value and light weight product is less likely to incur transportation cost penalties to offset the lower cost advantages gained from manufacturing offshore [19].

RESEARCH METHODOLOGY

The research method used was a longitudinal study of two companies and their policies for the management of international manufacturing operations and sourcing. Through regular contact with the senior management teams, it was possible to become familiar with all the cost and service improvement reasons for their chosen manufacturing and sourcing strategies.

These data were gathered from attendance at the manufacturing strategy meetings held within the collaborating firms. An investigation was also made of the critical product and target market characteristics in an attempt to identify where a consistency of approach was adopted by the two strategic management teams. These data and previous research findings were then used to create frameworks designed to aid decision making for strategic international

manufacturing and sourcing reasons. The frameworks were then tested by their use at subsequent manufacturing strategic meetings in order to evaluate how well they fulfilled their design purpose.

The two collaborating firms manufacture apparel and electronic goods. These two types of business were chosen because of their contrasting competitive environments. In the United Kingdom the apparel manufacturing industry is in decline and the electronic goods industry is a growing but mature market.

The selection of the collaborating firms was also based upon an additional set of sought-after contrasts. These were the characteristics of their manufactured products, their life cycles and the significance of manufactured cost, delivery speed, delivery reliability and product technology upon the selection of an appropriate competitive strategy.

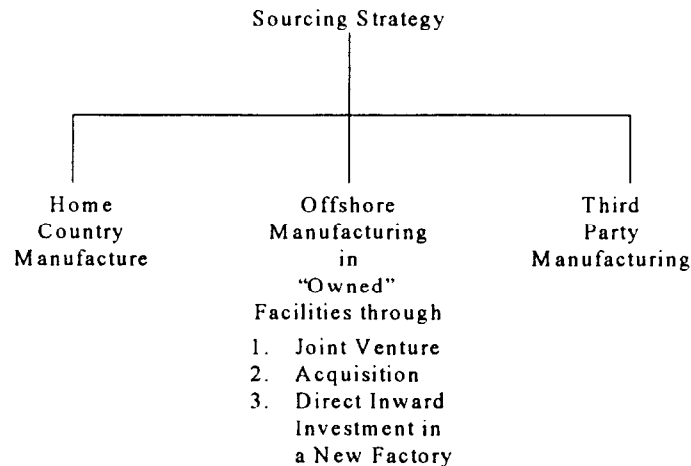
The reason for the careful selection of collaborating firms was an attempt to produce a generic framework for the strategic management of international manufacturing and sourcing even though it is based upon a small sample size. The philosophy adopted was that recommended by Eisenhardt [20] "...given the limited number of cases which can usually be studied [because of cost and time constraints], it makes sense to choose cases such as extreme situations and polar types in which the process of interest is "transparently observable"[21].

MANAGING THE MANUFACTURING CONFIGURATION

Competitive manufacturing is only accomplished by ensuring that the sourcing strategy of a firm, for raw material, components and product supply, fully supports the longer-term vision for competitive strategy [22,23,24,25]. Any change made to competitive strategy will therefore require a review of the current combination of make and buy operations to determine their compatibility with the revised competitive strategy. As Chandler [26] put it " Structure follows strategy".

Figure 1 shows that there are three types of sources of manufactured product. These options are home country manufacturing, direct inward investment and third party supply.

Figure 1
Product Sourcing Options



The choice of sourcing strategy to use is dependent upon the competitive advantage that each offers. Home country manufacturing is often adopted because of proximity to the market and it ensures absolute control over manufacturing performance and supply. Offshore "owned" production provides the opportunity to minimize labour and material costs, when both are locally supplied, and the retention of responsibility for manufacturing control. Third party manufacture is a competitive source of product supply when capacity limits have been reached or when the complexity of production control has significantly reduced the cost competitiveness of the firm. The contracting out of lower volume or lower margin product manufacture to smaller specialist producers can allow the contractor to focus on its core manufacturing business. Consequently, the determination of a product sourcing strategy requires the same degree of care and attention as choosing the competitive strategy that it must support.

Figure 2 shows the types of competitive strategy adopted by manufacturing companies, some by design and one by default. The concept of a focused strategy, as detailed by Porter [27],

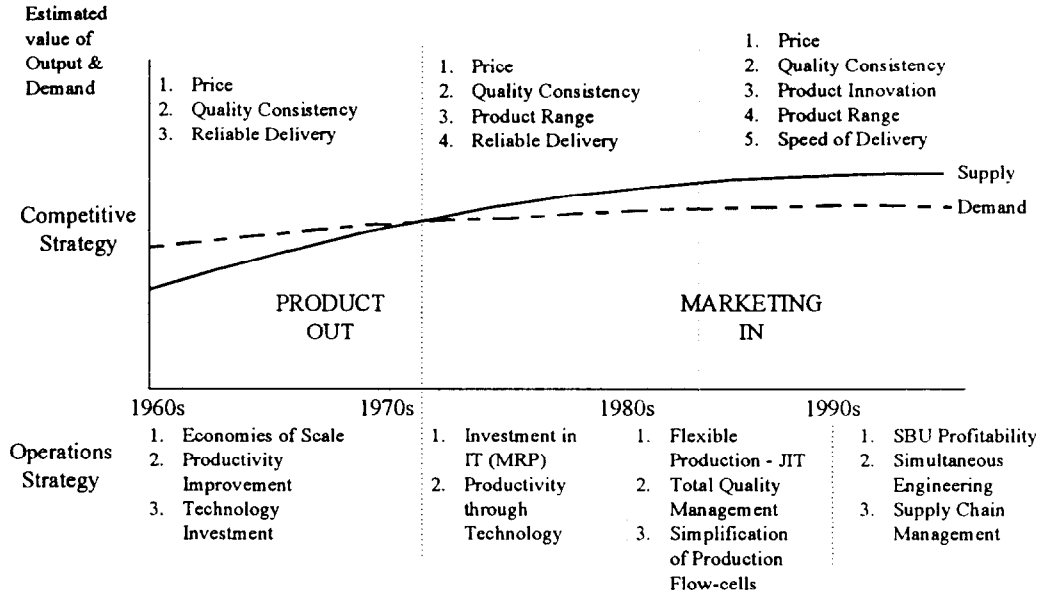
has not been included on the matrix but can be used, as Porter has stated, in combination with each of the three generic competitive strategies shown.

Figure 2
Competitive Strategy Options

Relative Degree of Differentiation	Low	Least Cost	Uncompetitive
	High	Least Cost and Differentiation	Differentiation
		Low	High
		Relative Cost of Production	

A firm can achieve a competitive advantage through differentiating its products, its quality of customer service or by both of these competitive strategies. The recent changes to international trading agreements, for example the single European market, has induced a greater emphasis on improving both of these competitive edge criteria. Figure 3 [28] shows the evolution of competition for manufactured goods in the United Kingdom and some examples of the additional customer service offerings made to gain a competitive edge. This progressive enlargement of the customer service concept is also representative of the actions taken by competitor manufacturers in other developed economies. Figure 3 also shows the manufacturing strategy and structure designs needed to deliver each type of service package. As Stalk [29] has predicted, manufacturing companies are now using the speed of delivery as a weapon for gaining a competitive edge by offering both a least cost and a service speed differentiation strategy.

Figure 3
The relationship between supply and demand for manufactured goods
in the UK (aggregated for each decade)



From studying the practice of international manufacturing management, three frameworks have been developed that detail the product manufacturing and sourcing strategies that are compatible with each of the three generic competitive strategies shown on Figure 2. They are also intended as models to facilitate the strategic management of international manufacturing and sourcing.

THE STUDY FINDINGS

Both the apparel and the electronic goods manufacturers have established overseas production facilities that supply finished products. Both firms are experiencing intense competition and both are finding it increasingly difficult to provide a quick response to customer demand and to cope with product range proliferation. The strategic problem for both was to increase their time-based competitiveness and maintain a low manufacturing cost capability.

Figure 4 shows a break down of the electronic goods customer delivery lead time. Excluding the production order release queue and the dice stock delay, (an in-process buffer stock), the lead time is still 88 days plus or minus 19 days. Of this total time, the logistics of delivering parts to the assembly plant and dispatching the finished product to the customer takes 25 days or 28 per cent of the time.

**Figure 4
Customer Delivery Lead Time**

<u>Elapsed Time</u>	<u>Operation</u>
Up to 5 days	Order Entry Production Scheduling
0 to 10 weeks	Production Queue
21 days +/- 2 days	Wafer Fabrication Photolithography Etching Diffusion Metallisation
15 days +/- 5 days	Ship to Assy Plant
2 days	Wafer Probe & Sort
0 to 8 weeks	Dice Stock
35 days +/- 7 days	Assembly & Test
10 days +/- 5 days	Ship to Customer

For this reason and others that include international trading tariffs (the 14 per cent European market import duty), the dependability of delivery and the flexibility to respond to changing market demand, the firm has decided to relocate the final assembly of the product to the home country of the firm, which in this case is in the United Kingdom. As a consequence, a higher cost of assembly is considered to be an acceptable trade-off for a reduction to the customer delivery lead time and an increase in flexibility to satisfy market demand. An additional benefit gained from this move is the increased speed of the technology transfer needed when new versions of the product are released to the market. The frequency of product innovation has increased, as predicted in the hypothesised model of competition shown in figure 3, and

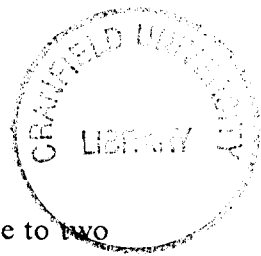
therefore the need to improve product performance quickly to remain competitive was another factor to be considered when determining where the product should be assembled. All these findings support the Dubois and Oliff research conclusions on the objectives for the configuration of international operations detailed previously in this paper. The most interesting finding is that when there is a choice between incurring a higher manufacturing cost and creating a customer service differentiation strategy for a technology-based product, then an incremental increase in manufactured cost was accepted. The size of this increased cost of product assembly was to be minimised by engineering the product for ease of assembly.

For the least cost apparel manufacturer, the capacity to cope quickly with changes to both the quantities required and the product mix were very difficult for manufacturing management to establish when their source of supply was a distant offshore manufacturing facility. Margins for this type of business are much smaller than for the higher value-added product manufacturer, as figure 5 shows. Consequently, the propensity to accept a higher manufacturing cost to improve customer service is lower.

**Figure 5
Comparative Costs of Production**

<u>UK Manufacture</u>	<u>Overseas Manufacture</u>
6%	Margin 16%
Transport 1%	Transport 11%
Overheads 33%	Overheads 23%
Labour 25%	Labour 15%
Materials 35%	Materials 35%

Their solution to this supply chain management problem was to accept delays in the supply chain to the factory because of a limited choice of quality fabric supplier. The 4 to 5 week transport time to obtain fabric was a supply requirement that had to be fulfilled without incurring a high raw materials inventory investment. The key management tasks were therefore to reduce the product manufacturing cycle time and the customer delivery lead time. The logistics management policy currently adopted to provide a quick response to customer demand, for products that are sourced from an "owned" distant offshore manufacturing facility, is to produce and ship the more predictable higher volume products and supply these from finished goods stocks in the home country. For the more unpredictable or unexpected



customer orders, air freighting is the means of collapsing a 4 week transportation time to two days. This approach is similar to the strategy that Moxon [30,31] and Haug [32] discovered. These products are low weight but they are not relatively high margin. However, the margin is sufficiently high to warrant an acceptance of a higher transport cost to enable an increased capability to respond quickly to the customer's demand.

How these decisions were taken formed the basis for the construction of the planning frameworks that are recommended as an aid for determining a strategy for product supply.

SUPPLY MANAGEMENT STRATEGIES FOR LEAST COST

The choice between manufacturing or sourcing to minimize the unit cost of production is the classic dilemma for manufacturing management. It is sometimes possible to purchase lower cost materials from suppliers within low labour cost regions and these opportunities must be found. However, international manufacturing operations have usually been established or used, as Vernon [33] and Wells [34] have explained, to gain a competitive advantage by also minimising labour costs.

This was the international manufacturing strategy implemented by the apparel manufacturer that agreed to collaborate with this case study research. The production unit studied was an owned facility in the Far East.

The framework designed to aid the strategic management of international manufacturing or sourcing must therefore include an examination of the opportunities to minimise labour costs as Vennon and Wells have suggested. It must also include an assessment of market demand and the opportunities that exist to exploit any economies of scales that could arise. For these reasons, the framework developed for the management of a least cost supply of products is designed to incorporate both the direct labour content of product cost and the forecast production volume required. These are shown in Figure 6.

Figure 6
Framework for a Least Cost
Manufacturing Strategy

	Low Volume	High Volume
High Labour Content	Offshore Third Party Supplier or "Owned"	"Owned" or Offshore Third Party Supplier
Low Labour Content	Home Country or Third Party Supplier (Offshore but Near)	Home Country Manufacture

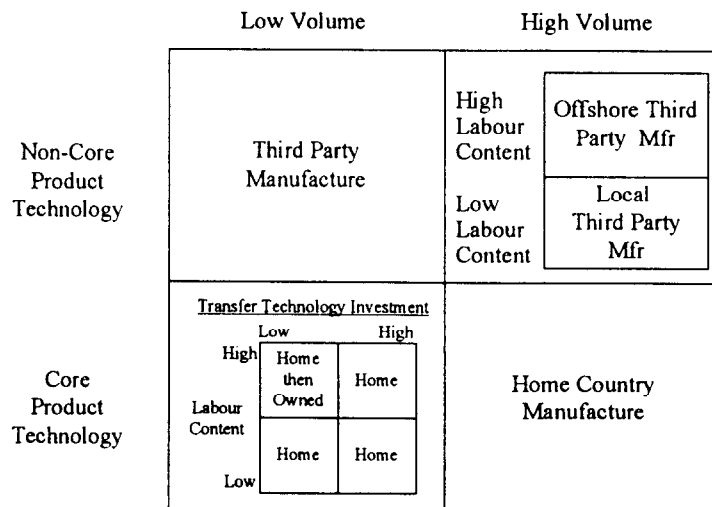
Figure 6 shows that offshore manufacturing or sourcing is recommended when the production process is more labour than capital intensive. The criterion used for the switch to offshore supply is when the incremental costs of establishing an international sourcing operation can be offset by the potential labour cost savings of overseas supply. An organizational design change is required to allocate responsibility for resolving the "management grief" issues of controlling quality and delivery reliability. Therefore, offshore supply is a strategy more suitable for the sourcing of the higher volume products. It can also be a viable strategy for sourcing lower volume products that are mature and not subject to frequent design changes.

Home country manufacture is competitive when investments in product and process engineering can be made to establish a lower labour cost per unit of production (direct and indirect) than the competitors. It is also usual for firms to carry out all product development work in the home country manufacturing plants until "owned" manufacturing facilities are well established overseas.

SUPPLY MANAGEMENT STRATEGIES FOR PRODUCT TECHNOLOGY DIFFERENTIATION

A manufacturing business can gain a competitive edge by offering to the customer a product that has better performance capabilities created by a unique technological innovation. To manufacture such a product requires an expertise in the core technology that distinguishes it from its competitors. All manufacturing companies will try to restrict the transfer of this manufacturing expertise to their competitors because it clearly constitutes the kernel of their current competitive edge and an entry barrier to other businesses that are outside that market. They therefore prefer to manufacture in-house and only subcontract the manufacture of non-core technology parts and subassemblies to preferred suppliers. If the final assembly process does not require a specialist knowledge of the core technology then this operation too may be subcontracted. This was the strategy adopted by the electronic goods manufacturer that collaborated with this study. Figure 7 shows the range of options open to the manufacturer of a product that is differentiated from its competitors by leading edge technological innovation.

Figure 7
**Manufacturing Strategy Framework for Product
Technology Differentiation**



This framework recommends that an examination of the opportunities to take advantage of economics of scale should be made to lower the labour cost of manufacture, specifically when managing the supply of the higher volume non-core parts, subassemblies or final assembly. One further consideration needs to be made by the management of a manufacturer of a technology-based product. This is whether to establish additional production capacity for a product offshore after increased volumes of export sales have been gained. The critical issue to assess when making this decision is the scale of the management "grief" to be managed to effect a technology transfer to an offshore site. The capabilities of the local people to learn the technology of the product and its manufacture are the factors that must be assessed when computing the expected size of the technology transfer investment. Both of the additional strategic considerations, which should be made when planning the international manufacture and the sourcing of a technology-based product, are shown on Figure 7.

SUPPLY MANAGEMENT STRATEGIES FOR LEAST COST AND CUSTOMER SERVICE-BASED COMPETITION

Until the recent lowering of the trade barriers between Eastern and Western Europe, there was a considerable distance between the low labour cost regions of the world and the markets in the developed economies that they served. This lengthy logistics pipeline has created a flexibility of response problem that has grown in significance to the traders of those products sourced from these regions. The need to be able to respond rapidly to customer demand is a recent development and was predicted, by Stalk [35], to be the additional means of gaining a competitive advantage during the current decade.

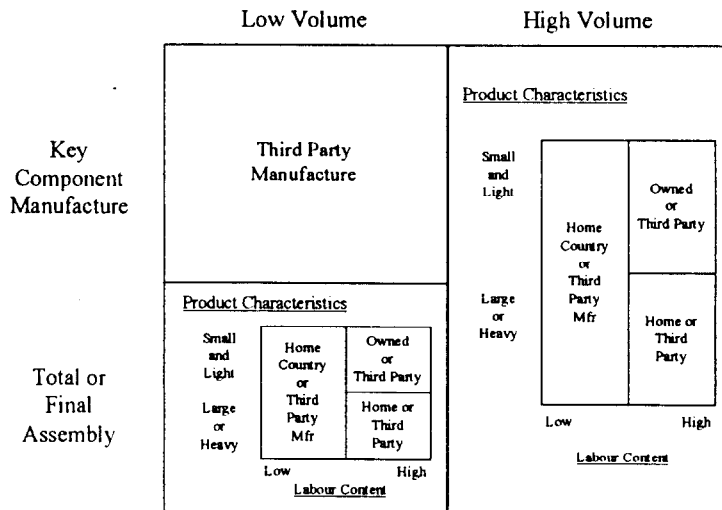
This study of the two firms striving to compete by reducing their customer delivery lead times has shown that a viable strategy to increase the flexibility of response to customer demand is to relocate manufacturing capacity closer to the markets that they serve. In the case of the electronic goods manufacturer, assembly operations were reinstated within home country

manufacturing facilities and the higher cost of assembly was incurred for a reduced product supply lead time.

In the case of the apparel manufacturer, new low cost manufacturing opportunities have been found within Europe and these new sources of product have reduced the supply lead time from 4 weeks to less than 5 days. However, this company has also accepted a marginal increase in the manufacturing cost to reduce the product supply lead time.

The use of time as a potent competitive weapon has forced a review of the way that manufacturing and sourcing resources should be configured to enable a competitive customer service to be offered. A framework, derived from the study of the two collaborating firms wrestling with this problem, is shown in Figure 8.

Figure 8
Manufacturing Strategy Framework for Least Cost and Customer Service-Based Competition



The impact of time-based competitive strategies has induced the electronic goods manufacturer to relocate the high labour content final assembly operation to a higher labour cost region. This is contrary to established theory and practice.

Another recent development, the reducing cost of air freighting, is also being exploited by manufacturers to transport small and/or light products from low labour cost regions in order to increase their flexibility of response to customer demand. Although these costs are considerably greater than transportation by sea, the overall combination of low cost production at a distance and the contingency strategy of air freighting product when necessary appears to be a transition strategy for a closer clustering of manufacturing and sourcing resource to the triad of major markets around the globe.

CONCLUSIONS

Three strategic management frameworks have been developed to provide a guide for determining the use of international manufacturing and sourcing to gain a competitive edge. The research findings are based upon a study of eight strategic business units and therefore the number of case studies carried out is small. However, the collaborating firms were selected because of the contrasting characteristics of both their markets and their products. The reason for this research design was to make transparently observable any consistency or difference between the strategic objectives for the use of international manufacturing and sourcing.

The most significant finding is that the international product life cycle hypothesis does still accurately describe the actions taken by manufacturing organizations that are striving to gain a least cost competitive advantage. In addition, for those firms that produce a low weight and a higher value-added item, flexibility of response to market demand can be accomplished by offshore manufacturing in low labour cost areas but at the expense of higher logistics costs.

For a manufacturing business that competes by product differentiation, that has in the past adopted a low cost strategy for final assembly, the international product life cycle hypothesis cannot be relied upon to explain the strategic management of international manufacturing operations. This is because the rationale for transferring production offshore has been to

lower costs. However, for some mature markets, the customer desires a fast response after making an order and satisfying this specific customer need has taken precedence over low price. It can therefore be strategically prudent to locate or relocate the final assembly of such products close to their targeted markets even though this is a higher labour cost area.

These study findings have been incorporated in the three strategic management frameworks developed to aid the management of international manufacturing and sourcing operations. To date they have only been used by the senior management of the two firms that collaborated with this study. The choice of firms for the study was made in an attempt to provide sufficient breadth of strategic management considerations to enable the development of generic models. The test of whether this has been achieved will require a greater number of practitioners to use them and further research on how well they meet a greater diversity of strategic international manufacturing and sourcing management needs.

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