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The True Costs of Overseas Sourcing

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Abstract

There has been a dramatic increase in sourcing from China over the last 20 years. Cost savings are frequently stated to be a major reason for this sourcing, however the actual cost savings may not be as great as expected. This paper reports a study which investigates the true total cost of sourcing from China and relates this to the quoted purchase price.

This research is based on six detailed case studies in UK manufacturing companies with experience of global sourcing from China. The findings provide a comprehensive framework for the analysis of the total costs of outsourcing from China. Empirical data suggests that it is necessary to add (on average) 50% to the quoted price to arrive at a reasonable estimate of the total cost. The variation in this figure is large which provides an indication of the risks involved.

Key words: total acquisition cost, global sourcing, China, case studies, framework

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1 INTRODUCTION

It is a widely held view that sourcing components from overseas, particularly from China can result in huge cost savings, when compared with sourcing in the UK. However, overseas outsourcing can be costly. The actual cost savings may not be as great as expected (Gilley and Rasheed, 2000). “It is generally agreed that manufacturing cost is significantly lower in developing countries; however, the extended distance, the coordination between the partners, and numerous other problems related to international trade often complicated the profit picture...In addition, outsourcing to China involves the increased difficulties associated with differences in culture, language, poor inland transportation and antiquated customs procedures” (Zeng and Rossetti, 2004, p.792&786).

In order to calculate the real cost of global sourcing, consideration of all the costs involved will be necessary (Bergman, 2006; Ting, 2004). However, the systematic utilization of cost measurement in global outsourcing is quite rare in practice (Lindholm and Suomala, 2004). The methodologies for evaluating the total cost of global sourcing are also sparse in the academic literature (Zeng and Rossetti, 2004).

Hence, this research aims to investigate the true costs of global sourcing from China by identifying and measuring the breakdown of the different costs contributing to the total acquisition cost. The following sections of this paper discuss the relevant

academic literature, present and justify our research methodology, and then introduce and discuss the results of six case studies. We conclude by presenting a total acquisition cost framework showing indicative costs of sourcing from China.

LITERATURE REVIEW

Much research has been carried out in the field of global sourcing, on subjects such as the use of global sourcing as a strategic tool (Carter and Narasimhan, 1996; Kotabe and Swan, 1994; Murray, et al. 1995; Samli et al. 1999); the forms and effects of the international buyer-supplier collaboration (Andersen and Christensen, 2000; Helper and Kiehl, 2004; Sako and Helper 1998; Zeitlin, 2004); location selection (e.g. Burpitt and Rondinelli, 2004; Chadee, et al 2003; Pongpanich, 2000); the factors determining whether an item should be sourced globally or locally (Meredith Smith, 1999); the effect of protection of Intellectual Property Rights (IPR) during global sourcing (e.g. Javorcik, 2004; Seyoum, 1996; Smith, 2001); the functions and benefits of setting up an international purchasing office (e.g. Cavusgil, 1993; Nassimbeni and Sartor, 2006); the considerations on host environment, government, infrastructure and so on during decision making for global sourcing (Grant and Gregory, 1997); the selection of globally competent managers for global supply chain management (Harvey and Richey, 2001); how global sourcing influence customers' product evaluations in quality (Li et al., 2000) and so forth.

The potential limitations and negative consequences of global sourcing have also been well documented (e.g. Arnold 1999; Herbig and O'Hara, 1996; Kotabe and Murray, 2004; Meixell and Gargeya, 2005; Meredith Smith, 1999). Herbig and

O'Hara (1996) suggest the disadvantages of global sourcing include: exchange rate fluctuation and political risks; cash flow issues and paper work concerns (e.g. letter of credit costs); extra cost of travel and communication, brokers' and agents' fees, etc. Meixell and Gargeya (2005) argue that "substantial geographical distances not only increase transportation costs, but complicate decisions because of inventory cost tradeoffs due to increased lead-time in the supply chain. Different cultures, languages, and practices diminish the effectiveness of business processes such as demand forecasting and material planning. Similarly, infrastructural deficiencies in developing countries in transportation and telecommunications, as well as inadequate worker skills, supplier availability, supplier quality, equipment and technology provide challenges normally not experienced in developed countries. These difficulties inhibit the degree to which a global supply chain provides a competitive advantage. (p533)"

Cost savings are found by many researchers as a major reason for global sourcing, especially sourcing from developing countries (e.g. Cavusgil et al. 1993; Davis 1992, Overby and Servais, 2005; Monczka and Giunipero, 1984; Quintens et al. 2005; Rexha and Miyamoto, 2000; Salmi, 2006; Scully and Fawcett, 1994). Kotabe and Murray (2004) contend that the cost saving justification for international procurement in the 1970s and 1980s was gradually supplanted by quality and reliability concerns in the 1990s. Mol et al. (2005) find that international outsourcing is a balancing act between lower production costs abroad and lower transaction costs locally. Zeng and Rossetti (2004) also argue "it is generally agreed that manufacturing cost is significantly lower in developing countries; however, the extended distance,

the coordination between the partners, and numerous other problems related to international trade often complicated the profit picture....In addition, outsourcing to China involves the increased difficulties associated with differences in culture, language, poor inland transportation and antiquated customs procedure. (p. 792&p786)”

In order to calculate the real cost of the products bought abroad, a total cost model is necessary (Bergman, 2006; Ting, 2004). However, the methodologies for evaluating the total cost of global sourcing are sparse in the academic literature (Zeng and Rossetti, 2004). The few exceptions include contributions from Davis (1992), Zeng and Rossetti (2004) and Song et al. (2007). Davis (1992) proposes that the cost elements of global sourcing include: unit price, export taxes, international transportation costs, insurance and tariffs, foreign exchange rates, brokerage costs, inland freight cost, risk of obsolescence, cost of rejects, damage in transit, inventory holding costs, technical support, employee travel costs, etc. However, this list is far from comprehensive. For instance, the setting up costs, such as supplier selection and negotiation, cost of technical data transfer, etc. are not covered.

In 2007 we proposed a total acquisition cost framework for global sourcing, indicating about 50 cost items that may occur during the global sourcing process (Song, Platts and Bance 2007, see Table 1). This paper reports further research, based on our 2007 framework and is aimed at testing the comprehensiveness of the framework in more case companies and investigating the breakdown of each cost items contributing to the total acquisition cost of sourcing from China.

TABLE 1
A FRAMEWORK OF TAC OF CHINA SOURCING ^a

<p>1 Set up costs</p> <ul style="list-style-type: none"> ● Cost of collecting information to search for suppliers (e.g. participate trade fairs, pay for agent, etc.) ● Cost of engineering time involved for transfer (e.g. gather information, modify the design due to different environment and IP concern, etc) ● Postage for sending technical data, samples, etc. ● IP registration fee in the host country ● Payment to the previous supplier for the design ● Quality audit and validation cost ● Staff's time cost for searching for, visiting and negotiating with supplier, preparing contracts, adding the supplier to internal IT system etc. ● Travel expenditure (transport, food and hotel) ● Tooling cost ● Invest in suppliers' IT systems (e.g. MRP, ERP) ● Cost of expanding warehouse ● Personnel recruit and training ● Cost of removing redundant capacity and labour ● Cost of sending employees to work overseas for a long term (e.g. costs of settlement, children's international school, insurance, etc.) <p>2 Extended Price (ongoing)</p> <ul style="list-style-type: none"> ● Price ● Tax and import duty ● Loss from payment terms changes ● Loss from currency exchange rate fluctuation <p>3 Administrative costs (ongoing)</p> <ul style="list-style-type: none"> ● Extra cost of forecasting/ordering process ● Extra cost of payment/billing process ● Bank charges <p>4 Logistics costs (ongoing)</p> <ul style="list-style-type: none"> ● Transportation by sea, by road or by train (including cost for transportation agents) ● Expediting by airfreight ● Insurance ● Loss of sales due to late deliveries or longer lead time ● Loss from production line downtime due to late delivery ● Holding and administrative costs related to unexpected early delivery ● Compared with before China sourcing, extra costs for receiving (e.g. handling the products into warehouse, disposal of the heavy packaging) ● Compared with before China sourcing, extra costs for inspecting the products (labour and equipment) 	<p>5 Inventory costs (ongoing)</p> <ul style="list-style-type: none"> ● Extra warehouse costs due to sourcing from China (rent, rate, light, heating, maintenance, insurance, etc.) ● Obsolescence ● Capital cost of increasing inventory <p>6 Quality issue (ongoing)</p> <ul style="list-style-type: none"> ● Rejection, returning and re-receiving ● Rework ● Cost of disposal or discarding of defective products ● Loss from scrap, including labour cost of handling scraps ● Loss from production line downtime ● Cost of staff's time of analyzing quality problem, re-arranging schedule, asking for compensation ● Cost of handling warranty and customer complaints ● Loss of sales because of quality <p>7 Supplier management (ongoing)</p> <ul style="list-style-type: none"> ● Ongoing travel expenditure (transport, food and hotel) ● Cost of engineering time for technical support ● Cost of staff's time of performance review and, meeting and renegotiation ● Costs of phone calls, faxes, video conferences with the supplier ● Costs resulting from culture and language differences (translators, gifts, social events, etc.) ● Cost of litigation with the supplier ● In case of buying other parts from the previous supplier, the loss because of the increasing prices of other parts supplied by this supplier due to the reduced order volume <p>8 Other costs related to <i>China</i> sourcing</p> <ul style="list-style-type: none"> ● Impact of "made in China" on customers ● Cost of dealing with inferior infrastructure (e.g. road, power supply, internet) ● Cost of dealing with special regulations or even corruption from local government ● Cost for dealing with counterfeit products or IP infringement
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^a Adapted and revised from Song et al. (2007)

METHODOLOGY

Our research methodology was case-based. In order to quantify accurately the value of around fifty cost items in each China sourcing project, it was necessary to carry out in-depth investigations in case companies, understanding the detail of the whole global sourcing process and collecting all the data necessary for calculation. Because most of the information required was not directly available from the accounting systems within the companies, interviews with the relevant staff were needed to collect information. Therefore, only through case studies could all the requirements be satisfied. Eisenhardt (1989) points out that qualitative methods often provide a good understanding of the dynamics underlying the relationship, which is crucial to the establishment of internal validity. In addition, the use of a case study design allows the researcher to use a range of data collection methods and thus enables triangulation of data and increases the validity and reliability of the research findings (Yin, 1994).

Eisenhardt (1989) recommends using between four and ten case studies for the theory building process. This research carried out six case studies. All the case companies started sourcing from China within the last ten years. The methods for data collection were interviews and reference to documents. Interviewees included: managing directors, buyers, operations managers, purchasing managers, accountants, product engineers and sales managers. Each interview lasted one to three hours.

All the interviews were tape recorded and extensive notes were taken. After each

interview, a transcription of the interview was written. Additionally, following the suggestions of Eisenhardt (1989) and Miles & Huberman (1994), short memos were written immediately after the case interviews and follow-up phone calls were made to clarify any misunderstandings. A report on the interview was then sent back to the interviewee for verification. This improved the internal validity of the case study research (Eisenhardt, 1989; Voss et al 2002).

To facilitate the conversations and for the ease of comparison, a research protocol containing a checklist of questions was developed based on the TAC framework. This protocol was used to guide data collection in each case company. This practice is advocated by several researchers for case studies (Handfield and Melnyk, 1998; Miles, 1979; Yin 1993).

Relevant documents were also referred to in order to collect information. “Triangulation” is suggested by Flick (1998) and Yin (1994) by using different sources of information in each case study in order to minimize subjectivity. In this investigation, triangulation was achieved by interviewing at least two people for one issue or gaining consistency between information from interviewees and documents.

CASE STUDIES

Table 2 summarizes the situations of the six case companies. Company A is a high-tech printer manufacturer. For one of its products, Company A has been buying in kits and parts from more than 100 suppliers and doing the assembling work in its own factory. By the end of 2005, 95% of its suppliers were in UK. In order to reduce costs, Company A was planning to re-source 80% of its components from China. As a

pilot of this China Sourcing project, the company has been sourcing one of its product components, cabinets, from China since October 2004.

TABLE 2
SUMMARY OF SIX CASE COMPANIES

	A	B	C	D	E	F
Sector	High-tech printers	Control panels	Tape measures	Electronic parts	Agricultural equipment	Electronic switches
Turnover (£)	190 million	2.5 million	6.5 million	30 million	10 million	6 million
Length of China sourcing ^a	1 year	2.5 years	0.5 year	10 years	3 years	1.5 years
Purchased product	Cabinets of printers	Circuit breakers, contactors, etc.	Un-labelled tape measures	Fused terminal blocks	Post drivers	Metal parts
Headquarter	UK	UK	UK	UK	UK	UK
Host country	China	China	China	China	China	China

^a The length is from the beginning of China sourcing to when the research was carried out in the companies.

Company B manufactures electrical control panels and used to purchase most of its components from UK suppliers. Since May 2004, the organization began to source some of the components from suppliers in China in order to pursue cost reduction. By the end of 2006, there had been six kinds of components sourced from China. From the six kinds of components, this research selected the circuit breaker, the enclosure and the contactor for investigation. The supplier of the circuit breaker, the first Chinese supplier to Company B, also served as the agent of the suppliers of other components (except for the enclosure) from China. The contactor and the enclosure were suggested by the company for investigation because there had been certain difficulties related to their China sourcing processes.

Company C is a tape measures manufacturer. The company manufactures a range of self-branded and custom-branded tapes, rules and spirit levels to customers in Europe and Asia. In June 2005, in order to reduce cost significantly, Company C began to transfer the design and manufacturing of two types of tape measure to two manufacturers in China and purchase the finished products from them. After the products were sent to the factory of Company C, inspection was carried out and labels were attached to the products before they were sent to customers. The two types of tape measure were of new design and had not been manufactured previously by Company C or any other suppliers. The first type (Product C1) was produced with the best quality materials. It would replace an old product manufactured in Company C. The other type (Product C2) had simpler internal mechanism and was produced with cheaper materials for a lower price. For product C1, Company C's brand name was attached; while, for Product C2, the customers used their own brand names.

Company D was founded in 1986 as an electronic piece parts manufacturer. A new owner bought this company in January 2006 and the company has been under new management since then. This research investigated one product sourced from China, fused terminal blocks (FTB). Company D first purchased seven component parts of FTBs in Europe and then sent them to a Chinese supplier. The Chinese supplier manufactured another two parts and then assembled the nine components to produce finished products, FTBs. In order to analyze the total acquisition cost of sourcing from China and make this case comparable with other cases, this research considered the process of sourcing the finished FTB from the Chinese supplier

(including the cost of two components made in China and the cost of assembly) and transporting the seven parts from the UK to China and sending the finished FTBs back to the UK. This is because if FTBs had been sourced and assembled in the UK, the transportation costs to and from China would not have occurred. The costs of the seven components from Europe were not considered in this research.

Company E is a British manufacturer of agricultural equipment. Since 2004, in order to reduce costs and remain competitive, the company has been purchasing sets of piece parts from a Chinese supplier for one of its products—post drivers. Before 2004, the company manufactured the parts in house.

Company F designs and manufactures a range of KVM (Keyboard, Video monitor, Mouse) switches, which enable the control of local, remote and global IT systems. It manufactures products under its own brand, as well as for a number of well known OEM customers. The main markets are Europe and the US. The case study was focused on a simple metal part sourced from China since 2005. The part covers the switches and has 5 variations. The basic design for all variations is similar. The main difference between the variations is the print on the metal cover. The whole product family is sourced from the same supplier in China.

Set up costs

The set up costs were investigated in line with the framework shown in Table 1. The findings are summarised in Table 3, which shows the breakdown of set up costs in the case companies. The setup costs were not available for Company D, because the current supplier for FTB was selected ten years ago and the information on

transferring the design and supplier selection/negotiation was no longer available in the company.

TABLE 3
BREAKDOWN OF SET UP COSTS ACROSS CASE COMPANIES

Set up costs	A	B1	B2	B3	C1	C2	E	F	ave	stdev
Collecting information to search for suppliers	0%	0%	0%	0%	0%	0%	0%	14%	2%	5%
Cost of engineering time involved for transfer	9%	0%	8%	9%	20%	33%	21%	11%	12%	11%
Postage for sending technical data	0%	0%	0%	0%	0.3%	3%	0.2%	0%	0%	1%
Costs for IP registration	0%	0%	0%	0%	13%	6%	0%	0%	2%	5%
Quality audit & validation cost	6%	1%	17%	6%	3%	4%	0%	1%	5%	5%
Staff's time cost for searching for, visiting supplier	45%	58%	49%	55%	5%	13%	36%	13%	35%	20%
Travel expenditure	37%	41%	26%	30%	6%	15%	28%	0%	23%	15%
Tooling cost	0%	0%	0%	0%	53%	27%	15%	61%	20%	26%
Personnel recruit and training	3%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Total set up cost (£)	20,100	19,251	2,438	2,183	118,453	32,108	11,372	15,240	n/a	n/a

The cost of collecting information to search for suppliers only occurred in one case company (Company F); it was a fixed fee paid to an agent and accounted for 14% of the total set up cost. The agent was hired to deal with Chinese suppliers. His work included providing a list of potential suppliers, auditing the quality of the first sample, visiting and managing the relationship with the Chinese supplier. No one in Company F had ever visited this particular supplier in China due to the work done by the agent.

The cost of engineering time involved for transfer occurred in all the case companies (except one product in Company B) and varied from 8% to 33% of the total set up cost. The two products transferred to China in Company C (tape measures) and the product in Company E (post drivers) were more complicated than the items in Company A (cabinets), Company B (standard electronic parts) and Company F (metal

parts). This explains the variation of the % of this cost among different cases.

Postage for sending technical data occurred in Company C and E, representing 0.2%~3% of the total set up cost.

IP registration fee only occurred in Case Company C (Product A 13% and Product B 6%), where they decided to register their patents and designs in China. None of the other components were thought to contain any IP worth protecting.

Payment to the previous supplier for the design did not occur in any of the case companies, because all the case companies owned the design of the items sourced from China.

The cost of quality audit and validation also varied a lot from 1% to 17% of the total set up cost.

In some of the case companies, the cost of staff time for searching for, visiting and negotiating with suppliers represented a significant, but widely variable, % of the set up cost. Although the modal range was 45%~58%, in Companies C and F it was significantly less. In Company C, this was because of the significant value of tooling cost and cost of engineering time involved for transfer. In Company F, it was because the company hired an agent for selecting and visiting the supplier and hence much of the staff's time was saved.

Travel expenditure was significant in Case Companies A, B and E (26%~41% of total set up cost). In Company F, the cost did not occur because of the work of the agent.

There were no significant costs of overseas phone calls and faxes at the set up

stage of China sourcing projects all the case companies either visited the supplier in China, or used emails for communication.

Tooling costs did not occur in Company A and B but varied from 15%~61% of the total set up cost in other case companies.

Costs of expanding the warehouse only occurred in Case Company C. A container was rented as an additional warehouse at the beginning of sourcing from China. The one-off delivery of the container cost was £200. The operations manager suggested that 90% of the cost be allocated to Product A and 10% to Product B, reflecting the purchasing volume of the two products.

The cost of recruitment only occurred in Company A and represented 3% of the total set up cost. Costs of removing redundant capacity and labour, Costs of expatriating employees and Costs of investing in supplier's IT system did not occur in any of the case companies.

Ongoing costs

Table 4 shows the breakdown of total ongoing cost across all the case companies. The last two columns show the average and standard deviation of the % across all the cases.

TABLE 4
BREAKDOWN OF ONGOING COSTS ACROSS CASE COMPANIES

Ongoing cost	A	B1	B2	B3	C1	C2	D	E	F	ave	stdv
Price	81.1%	39.9%	88.3%	27.3%	83.6%	60.0%	59.1%	73.0%	78.0%	65.6%	20.9%
Tax and duty	3.7 %	1.6%	3.5 %	1.1 %	2.3 %	1.6 %	2.3 %	2.2 %	0.0	2.0%	1.1%
Payment terms changes	-0.5%	1.0 %	2.3 %	0.7 %	0.6 %	0.6 %	0.0	1.5 %	0.0	0.7%	0.8%
Currency fluctuation	-1.8%	-0.5%	-0.6%	-0.2%	0.2 %	-0.1%	0.0	0.0	0.0	-0.3%	0.6%
Forecasting/ordering process	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2%	0.0	0.1%
Bank charges	0.0	0.2 %	0.0	0.2 %	0.2 %	0.3 %	0.2 %	0.1 %	0.4%	0.2%	0.1 %
Transportation	0.0	5.8 %	1.3 %	5.5 %	5.5 %	2.2 %	8.0 %	15.4%	7.2 %	5.7%	4.6 %
Insurance	0.0	0.0	0.0	0.0	0.0	0.0	0.5 %	0.4%	0.1 %	0.1 %	0.2 %
Expediting	0.2 %	6.9 %	0.0	2.7 %	5.0 %	0.0	4.7 %	0.0	0.0	2.2 %	2.7 %
Receiving	0.0	0.0	0.0	0.0	1.8 %	0.0	0.0	0.4%	0.0	0.2 %	0.6 %
Inspection	0.0	22.6%	0.4 %	25.0%	0.2 %	0.1 %	0.0	0.0	0.0	5.4 %	10.5%
Warehouse	15.5 %	18.8%	3.1 %	18.0%	0.1 %	0.1 %	11.1%	0.0	13.1%	8.9 %	8.0 %
Obsolescence	0.0	0.0	0.0	0.0	0.0	23.8%	0.0	0.0	0.0	2.6 %	7.9 %
Capital cost of inventory	0.6 %	0.0	0.2 %	0.0	0.2 %	0.1%	2.1%	0.3%	1.0%	0.5 %	0.7 %
Rejection, returning and re-receiving	0.0	0.0	1.3 %	1.0%	0.0	1.0 %	0.0	0.0	0.0	0.4 %	0.6 %
Rework	0.7 %	0.0	0.0	0.0	0.0	0.0	0.0	0.1%	0.0	0.1 %	0.2 %
Defective material disposition	0.0	0.0	0.0	0.0	0.0	0.8 %	0.0	0.0	0.0	0.1 %	0.3 %
Scrap	0.0	0.2%	0.0	0.3 %	0.0	3.2 %	0.0	0.0	0.0	0.4 %	1.1 %
Cost of staff's time of analyzing quality problem, etc.	0.1 %	1.1 %	0.0	0.6 %	0.0	0.3 %	0.2 %	0.2%	0.0	0.3 %	0.4 %
Travel expenditure	0.1 %	0.0	0.0	4.6 %	0.2 %	1.9 %	2.9 %	1.6%	0.0	1.2 %	1.6 %
Cost of engineering time for technical support	0.1 %	0.0	0.0	10.1%	0.0	1.5 %	0.6 %	4.7%	0.0	1.9 %	3.4 %
Cost of staff's time of performance review, meeting, etc	0.0	0.0	0.0	0.0	0.3 %	2.3 %	1.9 %	0.0	0.0	0.5 %	0.9 %
Costs of calls, faxes, etc.	0.1 %	0.4 %	0.0	0.3 %	0.0	0.0	0.0	0.0	0.0	0.1 %	0.2 %
Costs resulting from culture and language differences	0.0	0.0	0.0	0.0	0.1 %	0.3 %	2.9 %	0.0	0.0	0.4 %	1.0 %
Litigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Effect of "Made in China" on customers	0.0	1.9 %	0.0	2.3 %	0.0	0.0	0.0	0.0	0.0	0.5 %	0.9 %
Dealing with counterfeit products	0.0	0.0	0.0	0.0	0.0	0.0	3.5 %	0.0	0.0	0.4 %	1.2 %
Annual ongoing cost (£)	1,262,144	5,531	303,306	5,783	391,205	45,887	77,826	47,473	15,168	n/a	n/a

In all the case companies, price represented the highest percentage of the total ongoing costs. But the percentages varied greatly, from 27.3% to 88.3% of the total ongoing cost.

Logistics costs

The cost of transportation varied from 0% to 15.4% of the total ongoing cost in case companies, depending on whether the shipment terms were FOB (free on board) or CIF (carriage, insurance and freight).

Costs of expediting with airfreight also varied significantly. In some companies, it did not occur, while in other companies, it occurred and the cost was significant, e.g. in Company B, this cost of the circuit breaker (B1) equalled to 6.9% of the total ongoing cost.

Cost of inventory

Additional cost for warehouse varied from 0.1% to 18.8% of the total ongoing cost in case companies.

The cost of obsolescence only occurred in Company C. For Product C2, the obsolescence cost was £10,921 because the yellow colour of the tape was not acceptable to the market, and none had been sold. According to the MD of Company C, "If it had been made in England, we would not have made tens of thousand before we decided we didn't like them...we may do some promotion for the yellow ones". Company C had not decided a plan about how to deal with the yellow measures, but was considering adopting some special promotions such as buy one get one free. Therefore, this research took the loss as 50% of the price of the yellow measures, $£10,921 * 50\% = £5,461$.

The capital cost of inventory accounted for 0.0%~2.1% of the ongoing cost. In all the case companies, the inventory amount increased significantly after China

sourcing. However, because the purchasing prices from Chinese suppliers were usually much lower than those from the UK or European suppliers, the overall inventory value did not increase significantly. Therefore, the capital cost of inventory (calculated as the product of increased inventory value and borrowing rate of the company) was not very high in most of the case companies.

Cost of quality failures

The cost of rejection, returning and re-receiving due to quality problems occurred in Company B and C:

In Company B, one shipment of enclosures (B2) arriving in the UK turned out to be faulty. Although the supplier was willing to replace the products, the lead time would be another three months because of the long distance. Company B had no other choice but to purchase enclosures from the previous supplier in the UK at the price of £150 per unit, total payment of $150 \times 120 = £18000$, while the payment to the Chinese supplier plus transportation, tax and duty should be only £7969. The faulty products in the first shipment were returned to the supplier and the supplier paid for the transportation and refunded the purchasing value. To handle this problem, there were staff time costs amounting to £105.

Unlike the enclosures, failure of one shipment of the contactor (B3) did not entail extra cost because there were still contactors in stock from the previous supplier at that time and it was not necessary to order contactors from a UK supplier. The supplier in China paid for all the costs of re-sending products. Therefore, the extra cost was an inspection cost when re-receiving the products. The MD spent about one

hour to handle the problem. Additionally, he went to the supplier's factory to solve the problem. The reason for the faulty contactor was that the supplier was using low grade copper which was recycled.

In Company C, Product C2's quality was not satisfactory. In one shipment, all the 3-meter tape measures were rejected. Company C obtained a refund from the supplier but the supplier did not pay for the indirect loss including transportation, receiving and inspection cost. In addition, before the faulty products were thrown away, it took 3 workers one day to chop off the ends of the tape, in order to avoid other people picking them up and selling them. The cost was £144. When the products were received in the second shipment, re-receiving and re-checking took place. The payment to the shipping agent for re-sending the products was £198. Re-inspecting took about 2.5 hours re-receiving including decanting and putting onto shelves, required half an hour of two forklift truck drivers Re-booking took ten minutes and dealing with the administration of the rejection and compensation claim took the operations manager about half a day. at the cost of £75. The total cost amounted to £425.

In all the case companies, the quality problems were found before any products reached the markets and hence did not affect the reputation with customers or lead to extra cost for warranties and customer complaint handling.

Cost of supplier management

In the case companies, ongoing travel expenditure represented 0%~4.6% of the ongoing cost. Staff's time cost of performance review, meeting, etc. represented

0%~2.3% of the ongoing cost.

Cost resulting from culture and language differences occurred in Company C and D. In Company C, according to the Chinese culture, gifts were exchanged between Company C and the suppliers and entailed extra costs. In Company D, during a supplier visiting trip, two translators were employed at the cost of £2288 (including payment for 2-day work, transport and accommodation).

Some costs did not occur in any of the case companies, including: Loss due to late deliveries, Loss of sales due to quality, Warranties and customer complaint handling, Costs due to early delivery, Dealing with inferior infrastructure, Payment/billing process, Dealing with special regulations or even corruption from local government, Downtime due to quality, Litigation and Impact on residual supply from the previous supplier.

Overall, for both set up costs and ongoing costs, the breakdown varied largely between different companies.

5 DISCUSSION AND CONCLUSIONS

The case studies demonstrated that the framework covered all the costs incurred during the processes of sourcing from China. What became very clear during the cases was the significant variation in the sources of costs from case to case, depending on a range of contextual factors.

The set up costs were very dependent on whether this was the first component being sourced in China, or whether components had been previously sourced there. This was clearly demonstrated in Company B. For the first component, the circuit

breaker (B1), the supplier selection and visiting costs amounted to nearly all the set up costs and the actual cost was also much larger than for subsequent components. This is because this was its first experience of sourcing in China and Company B needed to become familiar with the different cultural and business environments. Quite a few suppliers were investigated, many trips to China took place and a large amount of time was devoted before a supplier was selected. The set-up cost for the first component (£19250) was an order of magnitude greater than for subsequent components (around £2000).

Another significant factor affecting the set up cost was the complexity of the part. Products C and E were the most complex and these commanded the highest costs of engineering time.

The ongoing costs also showed huge variation. The add on costs ranged from almost 3 times the purchase price (Component B3), to an addition of only 20% (C1). The add-on costs unlike the set-up costs, did not appear to be linked to complexity. Products C and E, the more complex products, did not display a greater % of add-on costs than other products. This is a very small sample and no firm conclusions can be drawn, but it suggests a hypothesis that once the extra costs of setting up the sourcing of complex products have been incurred, then the ongoing costs are not related to complexity. Further quantitative research should test this.

Based on the average significance of each cost among the TAC, we have modified the framework to present the costs in accordance with their percentages among TAC. Table 5 shows the set up costs and Table 6 shows the ongoing costs. We

do this somewhat tentatively to give an indication of the likely costs of outsourcing to China. However, we must give a warning about the interpretation of this data. Note that figures are mean values (based on a small sample) with very large standard deviations and should be interpreted with great care. Reference to the previous tables shows the significant variations in costs and comments in the text explain some of the reasons behind these. Hence, the framework should not be used to estimate the costs of outsourcing any single component. Nevertheless, we defend its inclusion, as we believe it both provides a useful checklist of costs and some indication of what might be expected for a company outsourcing a range of components

TABLE 5
MODIFIED FRAMEWORK FOR SET UP COSTS

Set up costs	% among set up costs
1) Staff's time cost for searching for, visiting, negotiating with suppliers, adding the supplier into internal IT system, preparing contracts, etc.	35%
2) Travel expenditure	23%
3) Tooling cost	20%
4) Cost of engineering time involved for transfer	12%
5) Quality audit and validation cost	5%
6) Costs for IP registration	2%
7) Collecting information to search for suppliers (e.g. participate trade fairs, pay for agent, etc.)	2%
8) Postage for sending technical data	0.4%
9) Personnel recruit and training	0.3%
10) Cost of phone call, fax or video conferences	0.1%
11) Cost of expanding warehouse	0.03%

Future research is needed to carry out more case studies across varying industry sectors, product types, sizes of firm, degree of success of global sourcing projects, etc. With sufficient data, statistical analysis of all the cost items in the framework may show links to contingent variables and provide the basis for more accurate predictive

models of the cost of outsourcing.

TABLE 6
MODIFIED FRAMEWORK FOR ONGOING COSTS

Ongoing cost	% among ongoing cost
1) Price	65.6%
2) Extra warehouse costs	8.9%
3) Cost of transportation	5.7%
4) Extra inspection costs	5.4%
5) Obsolescence	2.6%
6) Expediting with airfreight	2.2%
7) Tax and duty	2.0%
8) Cost of engineering time for technical support	1.9%
9) Travel expenditure	1.2%
10) Payment terms changes	0.7%
11) Capital cost of inventory	0.6%
12) Cost of staff's time of performance review, meeting, renegotiation, etc	0.5%
13) Effect of "Made in China" on customers	0.5%
14) Cost of scrap	0.4%
15) Cost of rejection, returning and re-receiving	0.4%
16) Dealing with counterfeit products or IP infringement	0.4%
17) Costs resulting from culture and language difference	0.4%
18) Cost of staff's time of analyzing quality problem, etc.	0.3%
19) Extra cost for receiving (e.g. handling the products into warehouse, disposal of the heavy packaging)	0.2%
20) Bank charges	0.2%
21) Insurance	0.1%
22) Costs of international phone calls, faxes, video conference, etc	0.1%
23) Cost of rework	0.1%
24) Defective material disposition	0.1%
25) Extra cost of forecasting/ordering process	0.02%
26) Loss from currency exchange rate fluctuation	-0.3%

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