

# Overseas sourcing decisions – the total cost of sourcing from China

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### Abstract

**Purpose** – Although cost savings are found by many researchers to be a major reason for sourcing from China, the actual cost savings may not be as great as expected. This paper aims at studying and comparing the true cost of sourcing from China and companies' perceptions of the total cost of their China sourcing projects.

**Design/methodology/approach** – This research comprises six case studies and a mailed survey to 201 UK manufacturers with the experience of global sourcing from China. Comparisons of the findings from the cases and the survey are made.

**Findings** – The findings provide a comprehensive analysis of the total costs of outsourcing from China. Additional costs (additional to the quoted price), found from in-depth case studies, averaged 50 per cent of the quoted price. The perception of additional costs, found from a survey, averaged 25 per cent of the quoted price. Taken together, these findings suggest that companies generally do not comprehensively measure the costs of global sourcing, and significantly underestimate the true costs incurred.

**Practical implications** – This has implications for decision making and ultimately profitability, and the paper suggests that more attention is paid to measuring the actual total acquisition costs. It confirms the benefit of a comprehensive cost framework, as a checklist that will prompt companies to think about all the possible sources of cost when sourcing globally. This should both guide their decision making, and also act to identify possible cost reduction activities.

**Originality/value** – This research is the first effort to establish the total cost of sourcing from China and to compare this with companies' perceptions of the cost of such sourcing. It is valuable in providing increased understanding of the sources and magnitudes of the costs of sourcing from China.

**Keywords** Outsourcing, China, Case studies, Surveys

**Paper type** Research paper

## 1. Introduction

Many researchers have stated that cost savings are a major reason for global sourcing, especially when sourcing from developing countries, such as China (e.g. Salmi, 2006; Overby and Servais, 2005; Rexha and Miyamoto, 2000; Quintens *et al.*, 2005). However, global sourcing can be costly. The cost savings may not be as great as expected (Gilley and Rasheed, 2000). In order to calculate the real cost of global sourcing, consideration of all the costs involved is necessary (Bergman, 2006; Ting, 2004). However, the systematic utilization of cost measurement in global outsourcing is quite rare in practice (Lindholm and Suomala, 2004). In addition, no research so far has been carried out to investigate companies' perceptions of the total cost of their China sourcing projects. This research aims at addressing this gap.

The paper is structured as follows: section 2 presents the relevant literature; section 3 discusses the research methods

used; section 4 introduces the China sourcing projects in the case companies; section 5 presents and compares the results from case studies and the survey; section 6 presents the conclusions and discusses the limitations of the work.

## 2 Literature review and framework development

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 (Samli *et al.* 1998; Kotabe and Swan, 1994; Carter and Narasimhan, 1996; Murray *et al.* 1995); the forms and effects of the international buyer-supplier collaboration (Andersen and Christensen, 2000; Sako and Helper, 1998; Zeitlin, 2004; Helper and Kiehl, 2004); location selection (e.g. Burpitt and Rondinelli, 2004; 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); the functions and benefits of setting up an international purchasing office (e.g. Nassimbeni and Sartor, 2006; Cavusgil *et al.*, 1993; Pedersen, 2004); the considerations of 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); and how global sourcing influences customers' evaluations of product quality (Li *et al.*, 2000).

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The potential limitations and negative consequences of global sourcing have also been well documented (e.g. Meixell and Gargeya, 2005; Herbig and O'Hara, 1996; Meredith Smith, 1999; Arnold, 1999; Kotabe and Murray, 2004). Herbig and O'Hara (1996) suggest the disadvantages of global sourcing include: exchange rate fluctuations; 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, p. 533) 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."

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; no direct relation between global sourcing and economic performance is found. Zeng and Rossetti (2004, p. 792 and p. 786) 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."

When sourcing from China, the cross culture supplier relationship management is one of the topics frequently addressed as an obstacle (e.g. Salmi, 2006; Wilkinson *et al.*, 2005; Bergman, 2006; Millington *et al.*, 2005; Mavondo and Rodrigo, 2001; Gold *et al.*, 2002; Li *et al.*, 2001). Salmi (2006) suggests Chinese culture presents many concepts and features that do not directly translate into, or correspond with, Western business behaviour. For instance, the search for harmony and the concept of "face" in interaction is a prevalent Chinese value.

Nassimbeni and Sartor (2006) say commercial success in China is deeply linked to the quantity and quality of personal relationships. "Guanxi" (personal relations) are critical to enhancing inter-organizational relationships, and inter-personal commitment may affect inter-organizational commitment (Mavondo and Rodrigo, 2001). However, as Eberhardt *et al.* (2004) contend, good "guanxi" with suppliers cannot be expected to be achieved through a couple of meetings, but takes time and efforts. "You have got to understand quickly that you have to put the resource in, because things take longer in China, meetings take longer, guanxi can go on for hours. It's part of building a relationship" (Millington *et al.*, 2005).

Although building personal relations is essential in the supplier identification process, it is discouraged in day-to-day

relationships with suppliers, due to fears of the establishment of corrupt relationships (Wilkinson *et al.*, 2005). Wilkinson *et al.* (2005) suggest that the popular expressions for corruption in China are "backdoor practices", "red envelopes", "under table deals". During the interviews carried out by Eberhardt *et al.* (2004), the experience or fear of purchasing staff being involved in illegitimate "under table" dealings with suppliers was mentioned by a significant number of respondents.

Another significant issue when sourcing from China is quality. Eberhardt *et al.* (2004) suggest that the lack of technological expertise, quality fluctuations and poor delivery performance among local Chinese suppliers are major forces against sourcing from China. Ting (2004) argues quality inconsistency can still be a serious issue, which can be due to inconsistent raw material quality, poor process control, undisciplined quality systems, low machinery capacity and inadequate inspection equipment.

A final issue in sourcing from China is logistics. Goh and Ling (2004) find that despite the improvements and advancements undertaken by the Government and other agencies, the current logistics infrastructure, particularly those of transportation networks, telecommunications systems, warehousing facilities and customs procedures are still relatively poor.

## 2.1 Framework development

The above literature shows the complexity associated with understanding the issues of outsourcing to China. In order to investigate the costs in a comprehensive and consistent manner, we developed a cost framework based on the literature and input from practitioners. The development of the framework is described in detail in Song *et al.* (2007). Here we summarise the main points.

Several authors were instrumental in informing the design of our framework. Smytka and Clemens (1993) divided the total costs into two categories: external costs and internal costs. The external costs included: price; discount terms; ordering costs; transportation; supplier visits; tooling and technical support. The internal costs include: inventory cost, delivery expediting cost, line down cost and non-conformance cost. Carr and Ittner (1992) defined costs in terms of the costs of purchasing, the costs of holding inventory, the costs of poor quality and the costs of delivery failure. Ellram (1993) divided the costs into categories of pre-transaction, transaction, and post-transaction.

Using the cost structures identified by the above authors and further input from Degraeve *et al.* (2005), Monckza and Trecha (1988), Grant (1999), Pongpanich (2000) and Min *et al.* (1994) we developed an initial framework, which we then validated with practitioners.

Practitioner input came from interviews with senior industrial managers from seven manufacturing companies and a consultant, all of whom had experience of global sourcing, not only from China, but also from other countries including Lithuania, Singapore, Korea, etc. The interviews resulted in a number of costs additional to those found in the literature.

Based on the inputs from both academic literature and practitioner interviews, a framework of TAC of global sourcing from China was developed (Table I). In this framework, the cost items are classified into set up costs and ongoing costs. The set up costs (Category 1) occur at the

**Table I** A framework of TAC of China sourcing (adapted and revised from Song *et al.*, 2007)

<b>1 Set up costs</b>	1 Cost of collecting information to search for suppliers (e.g. participate trade fairs, pay for agent, etc) 2 Cost of engineering time involved for transfer (e.g. gather information, modify the design due to different environment and IP concern, etc) 3 Postage for sending technical data, samples, etc 4 IP registration fee in the host country 5 Payment to the previous supplier for the design 6 Quality audit and validation cost 7 Staff's time cost for searching for, visiting and negotiating with supplier, preparing contracts, adding the supplier to internal IT system etc 8 Travel expenditure (transport, food and hotel) 9 Cost of phone call, fax or video conference 10 Tooling cost 11 Invest in suppliers' IT systems (e.g. MRP, ERP) 12 Cost of expanding warehouse 13 Personnel recruit and training 14 Cost of removing redundant capacity and labour 15 Cost of sending employees to work overseas for a long term (e.g. costs of settlement, children's international school, insurance, etc)
<b>2 Extended Price (ongoing)</b>	1 Price 2 Tax and import duty 3 Loss from payment terms changes 4 Loss from currency exchange rate fluctuation
<b>3 Administrative costs (ongoing)</b>	5 Extra cost of forecasting/ordering process 6 Extra cost of payment/billing process 7 Bank charges
<b>4 Logistics costs (ongoing)</b>	8 Transportation by sea, by road or by train (including cost for transportation agents) 9 Insurance 10 Expediting by airfreight 11 Loss of sales due to late deliveries or longer lead time 12 Holding and administrative costs related to unexpected early delivery 13 Compared with before China sourcing, extra costs for receiving (e.g. handling the products into warehouse, disposal of the heavy packaging) 14 Compared with before China sourcing, extra costs for inspecting the products (labour and equipment)
<b>5 Inventory costs (ongoing)</b>	15 Extra warehouse costs due to sourcing from China (rent, rate, light, heating, maintenance, insurance, etc) 16 Obsolescence
<b>6 Quality issue (ongoing)</b>	17 Capital cost of increasing inventory 18 Rejection, returning and re-receiving 19 Rework 20 Cost of disposal or discarding of defective products 21 Loss from scrap, including labour cost of handling scraps 22 Loss from production line downtime 23 Cost of staff's time of analysing quality problem, re-arranging schedule, asking for compensation 24 Cost of handling warranty and customer complaints 25 Loss of sales because of quality
<b>7 Supplier management (ongoing)</b>	26 Ongoing travel expenditure (transport, food and hotel) 27 Cost of engineering time for technical support 28 Cost of staff's time of performance review and, meeting and renegotiation 29 Costs of phone calls, faxes, video conferences with the supplier 30 Costs resulting from culture and language differences (translators, gifts, social events, etc) 31 Cost of litigation with the supplier 32 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
<b>8 Other costs related to China sourcing</b>	33 Cost of dealing with inferior infrastructure (e.g. road, power supply, internet) 34 Impact of "made in China" on customers 35 Cost of dealing with special regulations or even corruption from local government 36 Cost for dealing with counterfeit products or IP infringement

beginning stage of global sourcing projects. These are the one-off costs involved in identifying and selecting suppliers, and in setting up the supply relationship in terms of both technical capability and commercial relationships. Ongoing costs (Categories 2–8) are the costs incurred repetitively during the China sourcing process. These were categorised into costs related directly to the price charged, e.g. taxes, duty, currency conversion etc; administrative costs involved in dealing with an overseas supplier; logistics costs to cover all the transport, warehousing, expediting etc; inventory costs to cover extra stock related costs; quality costs, due to lower quality levels, rework etc; supplier management costs covering items such as ongoing technical support, performance review, contract renegotiation etc; and other costs, such as costs of dealing with inferior infrastructure, costs of special regulations, IP costs and costs of dealing with counterfeiting.

The framework was used to structure the costs mentioned in the academic literature. In addition, costs not covered in the literature but found during the preliminary interviews, such as staff's time cost during the supplier selection stage, the loss from payment term changes, costs of dealing with counterfeit products, costs of expatriating staff overseas, extra costs of the forecasting/ordering process, extra costs of the payment/billing process, extra costs of receiving products, staff's time cost of performance review and, meeting and renegotiation with the supplier and so forth were also inserted into the corresponding categories in the framework.

This framework formed the basis for our empirical work.

### 3. Methodology

This study combined two research methods: case; and survey. Cases were used to develop a good understanding of the issues, (Eisenhardt, 1989) and, by using triangulation of data, to ensure the validity and reliability of the research findings (Yin, 1994). However, the generalisability of findings from case studies has been questioned by many researchers (e.g. Blaikie, 2000; Meredith, 1998; Eisenhardt, 1989; Christensen and Sundahl, 2001; Voss *et al.*, 2002), whereas the generalisability of quantitative approaches have been well acknowledged (e.g. Sieber, 1973; Miles and Huberman, 1994; Meredith, 1998). To improve generalisability, a mailed survey was also used.

#### 3.1 Multiple case studies

Case studies were undertaken in six UK manufacturers with the experience of global sourcing from China. The costs of outsourcing, as identified in the TAC framework, were established by interviews and source documentation. 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 transcribed. To ensure internal validity, there was triangulation among interviewees and documentation, (Flick, 1998; Yin, 1994) and, following each case, a report was sent to the interviewees for verification (Eisenhardt, 1989; Voss *et al.*, 2002).

#### 3.2 A mailed survey

The survey was designed and implemented using guidelines from Dillman (2000).

A sample of 201 was generated from companies which participated in "Make it in China" workshops organized by the University of Cambridge, and from manufacturing companies listed in the directory of UK importers – Year 2000, who imported from China.

The questions were based on the TAC framework and required companies to give their perceptions of the cost of each element in the framework relative to the quoted purchasing price. Both set-up and ongoing costs were covered. Piloting of the questionnaire, following the guidelines of Forza (2002) involved colleagues, industry experts and target respondents.

The survey was mailed in June 2007, and following extensive follow-up, received 78 replies, an overall response rate of 39 per cent. To deal with non-response bias, the remaining 123 companies were contacted by phone. Of these: 31 companies were no longer in business; 19 companies did not purchase items from other suppliers (only importing from affiliated companies in China); 68 companies did not have any formal measurement of the cost of China sourcing; and five companies had the policy of not participating in surveys.

Of the 78 responses, 18 companies provided satisfactory answers on the breakdown of each cost contributing to the total set up cost and total ongoing cost of sourcing from China.

### 4. Case studies

Case studies were carried out in six UK manufacturers with the experience of global sourcing from China. The purpose of the case studies was to accurately quantify the cost items in the framework (Song *et al.*, 2007) and study the breakdown of each cost contributing to the total cost of sourcing from China.

Company A is a British high-tech printer manufacturer. The turnover was about 190 million GBP. For one of its products, Company A had 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 per cent of its suppliers were in UK. In order to reduce costs, Company A was planning to re-source 80 per cent of its components from China. As a pilot of this China Sourcing project, the company had been sourcing one of its product components, cabinets, from China since October 2004.

Company B is a UK electrical control panel manufacturer with turnover of about 2.5 million GBP. The company used to purchase most of its components from UK suppliers. In 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 (B1), the enclosure (B2) and the contactor (B3) for investigation. The supplier of the circuit breaker was the first Chinese supplier to Company B, who 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 British 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. The turnover was about 6.5 million GBP. 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 to 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. The turnover was about 3 million GBP.

This research investigated one product sourced from China, fused terminal blocks (FTB). The current supplier for FTB was selected in 2002. In January 2006, Company D changed ownership. Hence, the information on transferring the design and supplier selection/negotiation was not available in the company. Hence, this research only investigated the ongoing costs in 2006.

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 analyse 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.

Company E is a British manufacturer of agricultural equipment, with turnover around 10 million GBP. 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 kind of its products – post drivers. Before sourcing from China, 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. They manufacture products under their own brand, as well as for a number of well-known OEM customers. The main markets of the company are Europe and the US. The turnover of the company was around 6 million GBP. The case study focused on a simple metal part sourced from China since 2005. The part covers the switches and has five 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.

## 5. Discussion

### 5.1 Breakdown of the total cost of sourcing from China

Tables II–III show the breakdowns of set up costs and ongoing costs across all the six case companies and 18 survey respondent companies. The set up costs and ongoing costs are in line with the framework (Table I). We have excluded from

the tables those items where all companies incurred zero cost. For each item we have calculated an average and standard deviation. For some items the interpretation of these statistics must be treated with care. This is particularly so when most companies do not experience the cost. Here the average might be thought of as an indicator of a long term cost, whereas the absolute values experienced by the companies reporting these costs gives a measure of the impact of short term risks. Item 16, obsolescence, provides a good illustration. It was only experienced by one company but accounted for 24 per cent of the sourcing cost. Not many parts suffer from obsolescence so the long-term cost indicated by an average might be less than 3 per cent, however there is a risk of a significant cost on the occasions when obsolescence occurs. However, as always, there is a danger of reading too much into small sample sizes. The tables should be read by looking at the distribution of data, as well as the summary statistics for a more thorough understanding of the costs.

In the following sections we discuss the various cost items.

#### 5.1.1 Set up costs

The cost of collecting information to search for suppliers only occurred in one case company; it was a fixed fee paid to an agent and accounted for 14 per cent of the total set up cost. This cost occurred in 11 survey respondent companies. It represented 4–14 per cent of the set up cost in ten of the 11 companies. Company 16 appears to be an outlier, where this cost represented 60 per cent of the total set up cost.

The cost of engineering time involved for transfer occurred in all the case companies (expect one product in Company B) and varied from 8–33 per cent 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 might explain the higher per cent of this cost in these cases. In the survey respondent companies, this cost did not occur in 4 companies and varied from 6–22 per cent of the total set up cost in the companies where it did occur.

Postage for sending technical data occurred in Company C and E, representing 0.2–3 per cent of the total set up cost. In the ten survey respondent companies where the cost occurred, the per cent varied a lot, ranging from 4–33 per cent of the total set up cost. The high per cent value (33 per cent) reported by Company 13, is because it was sourcing a commodity, and so other set-up costs such as engineering time, tooling etc did not occur.

IP registration fees only occurred in Case Company C (Product C1 13 per cent and Product C2 6 per cent) and one survey respondent company (4 per cent). Other companies did not consider that they had protectable IP, as they were generally sourcing simple components, in order to ease technology transfer and reduce risks.

Payment to the previous supplier for the design did not occur in any of the case companies. It occurred in two of the survey responding companies and represented 4 per cent and 6 per cent of the total set up cost.

Cost of quality audit and validation also varied a lot. In case companies where it occurred, it varied from 1–17 per cent of the total set up cost. In the survey respondent companies, it varied from 4% to 60% of the total set up cost. The disproportionately high value of 60 per cent reported by

Table II Breakdown of set up costs

Set up costs	Case studies														Survey																	
	A (%)	B1 (%)	B2 (%)	B3 (%)	C1 (%)	C2 (%)	E (%)	F (%)	Ave (%)	Stddev (%)	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)	8 (%)	9 (%)	10 (%)	11 (%)	12 (%)	13 (%)	16 (%)	17 (%)	18 (%)	Ave (%)	Stddev (%)				
1. Collecting information to search for suppliers	0	0	0	0	0	0	0	14	2	5	0	14	4	14	4	7	8	13	13	12	0	5	0	60	0	0	10	14				
2. Cost of engineering time involved for transfer	9	0	8	9	20	33	21	11	12	11	17	22	20	16	20	17	21	19	21	6	0	11	0	0	17	0	13	9				
3. Postage for sending technical data	0	0	0	0	00	3	00	0	0	1	9	5	16	24	12	7	4	0	0	0	0	3	33	0	9	0	8	10				
4. Costs for IP registration	0	0	0	0	13	6	0	0	2	5	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
5. Payment to the previous supplier for the design	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	6	0	0	0	0	0	0	1	2				
6. Quality audit and validation cost	6	1	17	6	3	4	0	1	5	5	17	14	12	0	4	14	13	19	18	6	35	19	0	0	17	60	15	15				
7. Staff's time cost for searching for, visiting supplier	45	58	49	55	5	13	36	13	35	20	19	19	28	16	24	21	17	19	26	29	0	16	50	40	19	0	21	12				
8. Travel expenditure	37	41	26	30	6	15	28	0	23	15	15	0	0	16	16	7	4	19	13	18	35	8	0	0	15	0	10	10				
9. Cost of phone call, fax or video conferences	0	0	0	0	0	0	0	0	0	0	9	8	12	14	12	7	4	0	10	6	0	5	17	0	9	0	7	5				
10. Tooling cost	0	0	0	0	53	27	15	61	20	26	11	11	4	0	0	3	29	13	0	18	9	22	0	0	11	40	11	12				
11. Investing in supplier's IT system	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	1	4				
13. Personnel recruit and training	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	22	5	0	0	0	0	2	6				
14 Removing redundant capacity and labour	0	0	0	0	0	0	0	0	0	0	0	8	0	0	4	0	0	0	0	0	0	5	0	0	4	0	1	3				

Table III Breakdown of ongoing cost costs

Ongoing costs (annual) %	Case studies																	Survey																	
	A	B1	B2	B3	C1	C2	D	E	F	Ave	Stdv	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Ave	Stdv				
1 Price	81.1	39.9	88.3	27.3	83.6	60.0	59.1	73.0	78.0	65.6	20.9	72.8	68.9	76.1	83.5	65.1	72.6	71.8	88.7	83.4	91.3	86.2	45.2	97.9	85.7	88.8	95.2	72.5	91.7	80.0	13.0				
2 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	3.6	4.4	0.0	9.1	3.2	1.7	0.0	2.6	0.0	4.2	1.7	2.7	1.8	3.0	2.7	0.0	3.6	4.6	2.7	2.5				
3 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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
4 Currency fluctuation	-1.8	-0.5	-0.6	-0.2	0.2	-0.1	0.0	0.0	0.0	-0.3	0.6	7.2	0.6	2.3	0.0	-2.6	10.2	0.0	0.0	0.0	-2.7	-4.3	2.3	0.0	0.0	0.0	4.8	7.2	0.0	1.4	4.1				
5 Forecasting/ordering process	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2				
6 Payment/billing process	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3				
7 Bank charges	0.0	0.2	0.0	0.2	0.2	0.3	0.2	0.1	0.4	0.2	0.1	0.7	0.0	1.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.4	0.4	0.0	0.7	0.0	0.3	0.5			
8 Transportation	0.0	5.8	1.3	5.5	5.5	2.2	8.0	15.4	7.2	5.7	4.6	3.6	5.0	1.9	7.4	2.5	2.9	5.2	4.4	4.1	1.8	2.6	2.3	0.0	10.3	5.3	0.0	0.0	3.7	3.5	1.7				
9 Insurance	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.1	0.1	0.2	1.4	0.4	0.4	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.9	0.0	1.4	0.0	0.3	0.4			
10 Expediting	0.2	6.9	0.0	2.7	5.0	0.0	4.7	0.0	0.0	2.2	2.7	0.0	0.0	5.3	0.0	9.7	7.3	0.0	0.0	0.0	6.1	8.6	18.1	0.0	0.0	0.0	0.0	0.0	3.6	0.0	3.3	5.7			
11 Loss owing to late deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.2				
12 Costs due to early delivery	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7				
13 Receiving	0.0	0.0	0.0	1.8	0.0	0.4	0.0	0.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7				
14 Inspection	0.0	22.6	0.4	25.0	0.2	0.1	0.0	0.0	5.4	10.5	0.0	0.0	0.8	0.0	3.3	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.4	1.0				
15 Warehouse	15.5	18.8	3.1	18.0	0.1	0.1	11.1	0.0	13.1	8.9	8.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.1				
16 Obsolescence	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
17 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	1.4	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	3.4	4.5	0.0	0.0	0.0	0.0	1.4	0.0	0.8	1.7				
18 Rejection, returning and re-receiving	0.0	0.0	1.3	1.0	0.0	1.0	0.0	0.0	0.4	0.6	3.6	1.9	0.0	0.0	0.7	1.5	0.0	4.4	8.3	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	1.4	2.5				
19 Rework	0.7	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.6	0.0	0.6	0.0	6.5	1.5	2.8	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.9				
20 Defective material disposition	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	3.3	2.2	0.0	0.0	2.5	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.2				
21 Scrap	0.0	0.2	0.0	0.3	0.0	3.2	0.0	0.0	0.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5				
23 Cost of staff's time of analysing 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	1.4	3.1	0.0	0.0	0.7	0.0	3.2	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	1.4	0.0	0.7	1.3				
24 Warranties and customer complaint handling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.6	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	1.4	0.0	0.4	0.7				
25 Loss of sales due to quality	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.1				
26 Travel expenditure	0.1	0.0	0.0	4.6	0.2	1.9	2.9	1.6	0.0	1.2	1.6	0.7	0.6	0.8	0.0	0.7	0.0	1.4	0.0	0.0	2.4	0.0	0.9	0.0	0.0	0.0	0.0	0.7	0.0	0.5	0.7				
27 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	0.7	0.3	3.1	0.0	0.7	0.0	6.5	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.7	0.0	0.8	2.0				
28 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	0.0	0.6	0.8	0.0	0.7	0.0	2.9	0.0	0.0	0.6	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8				
29 Costs of calls, faxes, etc	0.1	0.4	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.2	1.4	0.0	0.8	0.0	0.3	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	1.4	0.0	0.3	0.5				
30 Costs resulting from culture and language difference	0.0	0.0	0.0	0.0	0.1	0.3	2.9	0.0	0.0	0.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
33 Dealing with inferior infrastructure	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
34 Effect of "Made in China" on customers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3				
35 Dealing with special regulations or even corruption from local government	0.0	1.9	0.0	2.3	0.0	0.0	0.0	0.0	0.5	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
36 Dealing with counterfeit products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2				
Ongoing costs (annual)	A	B1	B2	B3	C1	C2	D	E	F	Ave	Stdv	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Ave	Stdv				

Company 18, occurred because the company only measured two costs (quality audit and tooling cost).

In most of the case companies, the cost of staff time cost for searching for, visiting and negotiating with suppliers represented a significant, but widely variable, per cent of the set up cost. In Company C, because of the significant value of tooling cost and cost of engineering time involved for transfer, this cost turned out to be relatively less significant. This cost was also less significant in Company F, because the company hired an agent for selecting and visiting the supplier and hence, much of the staff's time was saved. In the survey respondent companies, the cost did not occur in two companies. In the companies where it occurred, it accounted for 16–50 per cent of the set up cost.

Travel expenditure was significant in Case Companies A, B and E (26–41 per cent of total set up cost). In Company F, the cost did not occur because of the work of the agent. In the survey respondent companies, the per cent was highly variable (0–35 per cent), but on average was significantly lower than for the case companies.

For the case companies, 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. In the survey companies, this cost varied from 0–17 per cent of the total set up cost. If these results are compared with the travel costs, it can be seen that several of the survey companies chose to do much business by phone calls and faxes, rather than visiting China.

Tooling costs did not occur in Company A and B but varied from 15–61 per cent of the total set up cost in other case companies, depending on the complexity of the products. In the 11 survey respondent companies where it occurred, it varied from 3–40 per cent of the total set up cost.

The cost of investing in supplier's IT system did not occur in any of the case companies, but occurred in one survey respondent company (17 per cent of the total set up cost). All the case companies selected only suppliers who already had the required IT infrastructure.

Cost of recruitment only occurred in Case Company A and represented 3 per cent of the total set up cost. It also occurred in two survey respondent companies and accounted for 5 per cent and 22 per cent of the set up costs, respectively.

The cost of removing redundant capacity and labour did not occur in any of the case companies, as personnel and equipment were deployed onto other projects. It occurred in 4 survey respondent companies and accounted for 4–8 per cent of the set up cost.

The cost of expatriating employees did not occur in any of the case or survey respondent companies. This indicates that companies usually do not send their employees to work long term in China on China sourcing projects.

Although there is some variation, there is generally good agreement between the case companies and the survey, in terms of the ranking of costs. If we combine items 1 and 7, as they are both associated with searching for and visiting suppliers then this is the largest cost item and we find very good agreement between the case companies and the survey, 37 per cent for cases, 31 per cent for survey. Tooling costs, travel expenditure, engineering time and quality audit together are the other main cost items and comprise 60 per cent of cost for the cases, and 49 per cent for the survey. The remaining items account for only 3 per cent in the cases and

20 per cent in the survey. The main difference here is the communication costs postage, fax, phone calls. These amounted to 15 per cent in the survey but were negligible in the cases. It is not clear why this difference was so great, however, it can be anticipated that, in the future, these costs will fall significantly with the increased use of email and VOIP communications.

#### 5.1.2 Ongoing costs

In all the case companies and survey respondent companies, price represented the highest percentage of the total ongoing costs. But the percentages varied greatly, in the case companies from 27.3–88.3 per cent and in the survey respondent companies from 45.2–97.9 per cent. This result will be further analysed in the next section.

In the case companies, loss from payment term changes ranged from –0.5–2.3 per cent of the ongoing cost. Apart from Company A, most of the case companies' suppliers in China provided much shorter payment term than European suppliers, which resulted in an extra cost of capital interest. On the other hand, the cost was measured by none of the survey responding companies.

The effect of currency fluctuations was small in the case companies, ranging from a cost reduction of 1.8 per cent to a cost increase of 0.2 per cent. In the survey companies it ranged from a cost reduction of 4.3 per cent to a cost increase of 10.2 per cent. The larger values and high variability indicate the potential risk of sourcing from China. The recent significant decline in the value of the pound (second half 2008) will have exacerbated the situation.

The increase in the cost of the forecasting and ordering process only occurred in one case company (F) and one survey company (Company 3). Although the forecasting and ordering process became more complicated when sourcing from China and required more time, the frequency of ordering was much lower, as a larger amount was ordered each time. Hence, the overall work content remained similar to that before sourcing from China.

The costs of the billing process and bank charges for currency transfer were very small for both case companies and survey.

The cost of transportation and insurance varied from 0–15.8 per cent of the total ongoing cost in case companies, depending on whether the shipment term is FOB (free on board) or CIF (carriage, insurance and freight). In the survey respondent companies, this cost varied from 0–10.9 per cent of the total ongoing cost.

The average of per cent of the expediting cost of case companies was lower than that of the survey respondent companies. It was partly because in one survey respondent company No. 12, the per cent of expediting cost was high (18.1 per cent). The average is less interesting than the high variability from company to company. This illustrates the risk involved in overseas sourcing that can significantly impact costs. If expediting is required, then it is likely to be costly.

Although costs due to losses owing to late deliveries and costs due to early delivery did not occur in any of the case companies, and were generally low in the survey companies, there were two cases, Companies 2 and 12, where logistics problems caused substantial extra costs. This is yet another indication of the risks of China sourcing.

There is a large difference in the percentage of “inspection cost” between the case studies and the survey. This difference



is caused mostly by the result of two items, B1 and B3, where the company's MD went to China in person to inspect the quality of the products before they were sent to the UK. Only four of the survey companies measured the cost of inspection. This may lead to the underestimation of total ongoing cost.

The extra cost of warehousing averaged 8.9 per cent of the ongoing cost in case companies, but there was large variation. For four products (A, B1, B3 and F) the percentage turned out to be high, representing from 13–18.8 per cent of the ongoing cost, for others it was much lower. This cost was only mentioned by one of the survey companies, who estimated it at 3.8 per cent. This was the largest of the non-price cost differences between the case and survey companies and may suggest underestimation of total ongoing cost by the surveyed companies.

Loss from obsolescence in all the survey companies was regarded as zero. In case companies, loss from obsolescence occurred in one case company and entailed a big loss (23.8 per cent of ongoing cost). Due to the large increasing inventory in most cases of China sourcing, the loss from obsolescence may become significant once it occurs. Neglecting this cost may cause the underestimation of the total cost.

The quality failure costs (including rejection, rework, staff's time cost of handling quality problems, warranty, loss of sale, etc) represented a higher percentage of ongoing cost for the survey companies (3.4 per cent) than the case companies (1.3 per cent). Again there was large variability, showing that some companies encountered bigger quality issues than others. When the quality of products sourced globally is inferior, overlooking the quality costs will give rise to the underestimation of the total cost.

The average of per cent of engineering time for technical support of case companies was higher than that of survey responding companies (1.9 per cent vs 0.8 per cent). Many of the survey companies neglected this cost when it occurred. This may also cause the underestimation of the total cost.

The cost of culture and language difference and the effect of "made in China" on customers were generally low. All the 18 survey responding companies estimated these costs as zero. While in some case companies, costs were incurred, they averaged less than 1 per cent, with a maximum of 2.9 per cent in company D.

The cost of dealing with inferior infrastructure was relatively insignificant. It did not occur in any of the case companies because they were sourcing from relatively well-developed regions in China where the infrastructure is satisfactory. Where this cost did occur, in two of the survey companies, it represented 0.7 per cent and 0.8 per cent of the ongoing cost, respectively.

The cost of dealing with special regulations or even corruption from local government did not occur in any of the case companies while they were mentioned by one survey company (0.7 per cent). Three case companies experienced some small costs from cultural and language differences, but these were not mentioned by any of the survey companies. This shows most of the companies did not incur significant costs of dealing with the local government. All the other costs were very small.

In summary, from the case studies, the largest cost items were:

- price (65.6 per cent);
- warehousing (8.9 per cent);

- transportation (5.7 per cent);
- inspection (5.4 per cent);
- obsolescence (2.6 per cent);
- expediting (2.2 per cent);
- duty (2.0 per cent);
- engineering time (1.9 per cent).

Together these accounted for almost 95 per cent of the total cost. From the survey, the largest cost items were:

- price (80.0 per cent);
- transportation (3.5 per cent);
- expediting (3.3 per cent);
- duty (2.7 per cent).

Together these accounted for almost 90 per cent of the total cost.

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

## 5.2 Comparison of the total cost between cases and survey

The purpose of this section is to compare what managers perceived the total cost to be (survey) and what the researcher found from a thorough investigation and quantification of the total cost (case studies).

The average of the percentage of the price, as a part of total ongoing cost, in case companies was 65.6 per cent (standard deviation 20.9), while that of the price in the survey respondent companies was 80.0 per cent (standard deviation 13.0). In order to test whether the mean of the per cent of price in case companies is smaller than that in survey companies, a *t*-test (independent two-sample *t*-test, unequal sample sizes) was carried out.

- $H_0: u_1 = u_2$ .
- $H_1: u_1 < u_2$ .
- Significance level  $\alpha = 5$  per cent.
- One-tailed test.
- $u_1$  is the mean of the per cent of price in case companies.
- $u_2$  is the mean of the per cent of price in survey companies.

SAS 9.1 version was used to do the test. The result shows that the *P*-value is 0.0187; hence the null hypothesis is rejected at 5 per cent significance.

One issue is: an assumption for *t*-test is the normal distribution of data. As this cannot be guaranteed, a non-parametric alternative to the *t*-test, the Mann-Whitney U test, was also used.

SAS 9.1 was also used to do this Mann-Whitney U test. The *T<sub>w</sub>* value (91) was less than the critical value for the one-sided test with 5 per cent significance (94), hence we can reject the null-hypothesis at a 5 per cent significance level.

Therefore, both the *T*-test and the Mann-Whitney U test support the hypothesis that the mean of the per cent of price among the case companies population is smaller than the mean of the per cent of the price among the survey companies population.

The result indicates that respondents to the survey generally under-estimated the total cost of sourcing from China. Note, however, that because different samples are used, it is still possible that the price percentages among the survey were accurate and differences between the results of the cases and the survey came from the different situations of sourcing from China and hence the different breakdown of TAC.

## 6. Conclusions

Based on the total acquisition framework for global sourcing (Table I), this research carried out multiple case studies and a mailed survey in order to investigate and compare the true cost and companies' perceptions of the cost of sourcing from China.

By comparing the results from case studies and survey, it was found that the total cost of sourcing from China is usually under-estimated in practice. This is consistent with the finding of a paper by Holweg *et al.* (2008). We found from in-depth study that price accounts on average for about 2/3 of the total ongoing cost, albeit with a large range (From one quarter of the total ongoing cost to four-fifths of the total ongoing cost). However, the perceptions of companies were very different. On average they estimated that price accounted for four-fifths of the total ongoing cost, and with much less variability.

The managerial implications of this research are twofold. Firstly the in-depth case studies have indicated that, on average, companies need to add about 50 per cent to the quoted price to get an indication of the total cost of outsourcing from China. However, this is subject to significant variation from product to product and hence can only be used as a rough guideline. For a more detailed estimate of total cost the framework presented can be used as a comprehensive checklist.

Secondly, the research indicates that companies tend to underestimate the add-on costs of sourcing from China. Detailed case studies showed that these averaged about 50 per cent of the quoted price; the perception of companies from the survey was that these add-on costs were less, averaging about 25 per cent of the quoted price. This difference was statistically significant. The implication here is that companies need to be more thorough in their identification of the true costs of overseas outsourcing and to be wary of significantly underestimating these costs.

There were limitations related with the approach of sampling in this research. First, the directory of UK importers used to identify companies sourcing from China was published in 2000 (this directory ceased publication after 2000). Therefore, the companies who sourced from China since 2001 were not covered. Second, it was not known how the information was gathered by the directory and hence impossible to make sure that the sampling process was entirely random. (The importance of unbiased sampling was underlined by Forza (2002) and Vidich and Shapiro (1955)). Third, the "Make it in China" workshops, used as another source of survey participants, have only been run since 2000. This enabled us to identify companies, which were a good complement to the manufacturing companies listed on the directory of UK importers – Year 2000, but may suffer from self selection bias and hence not be representative of the population as a whole. Despite the mentioned shortcomings, the sampling approach was adopted because it provided access to a relatively large number of disparate companies who were sourcing from China.

Another major limitation of the research is the small sample sizes and the lack of control for different industries and products both within each sample, and between the cases studies and the survey. This was not possible with the number of responses received.

Future work should attempt to address the above deficiencies, however researchers should not underestimate the difficulties involved in getting access to carry out detailed costing within companies, and should be wary of self reported costs as the basis for such costs may not be easily validated. Future research might also investigate how the total cost of outsourcing varies with:

- different transaction volumes;
- experience of adopting outsourcing practices;
- relationship with the outsourcing vendor;
- industrial practice; and
- different product types.

Despite the limitations, we believe that this research, as the first effort to study both the true total costs and companies' perceptions of the total cost of sourcing from China, revealed that companies generally do not comprehensively measure the costs of global sourcing, and significantly underestimate the true costs incurred. It confirms our earlier findings of the benefit of a comprehensive cost framework, such as that presented in Table I, as a checklist that will prompt companies to think about all the possible sources of cost when sourcing globally. This should both guide their decision-making, and also act to identify possible cost reduction activities. Although this study was based on companies that outsourced to China, we believe that the findings might be equally applicable to other overseas outsourcing, for example, India, Thailand or Vietnam.

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