Assessing the future challenges in strategic sourcing commodity and seasonal fashion garments from China; a case study investigation

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Abstract

There has been an increasing trend of global sourcing garment supply from South-East Asia but the challenges confronting retailers sourcing commodity and seasonal garments from countries such as China are less well understood. A supplier evaluation model developed from the Kaufmann and Hedderich (2005) framework assesses the Delivery, Flexibility, Cost, Quality, Reliability and Culture sourcing challenges from China using a case study approach of a UK-based garment sourcing company using a fuzzy logic method. The results have identified that the highest challenges include unforeseen risk in delivery process, rigid negotiability, language barriers and Chinese-style business customs. The most important challenges are improvement, sourcing location, languages barriers, unforeseen delivery risks, and customer services.

Keywords: Chinese garment supply; Fuzzy logic methodology; Strategic global sourcing; Trading relationships

Introduction

Many firms are combining international and global sourcing to achieve sustainable competitive advantages such as lower prices, better quality, access to new market and shorter product life cycles (Shook et al., 2009). Globalisation has become one of the most inevitable trends in recent years as garment retailers have to deal with customer inspired change more quickly and more frequently than ever before whilst focussing on cost reduction. Leading retailers in developed countries depend heavily on overseas manufacturers as their source of garments. Many brands co-operate through alliances with overseas partners to produce branded clothing and footwear (Lee et al., 2004).

Global sourcing has been defined as "the integration and coordination of procurement requirements across worldwide business units, looking at common items, processes, technologies, and suppliers." (Monczka and Trent, 1991, p3). It can generate cost savings from 10% to 40% which makes it an attractive strategy to pursue for garment retailers (Frear et al., 1992; Zeng, 2003). Some popular European fashion brands have progressively moved their supply regions from Europe to South East Asia as these countries are very competitive for their low product prices and increasing quality levels (Towers and Peng, 2006; Masson *et al*, 2007).

With the large volume garment producers of China and India gradually increasing access to foreign companies there is an increasing trend of multinational companies who regard a global procurement strategy as an important part of the new business strategy. To follow the trend of globalisation garment retailers choose global sourcing as their approach of procurement accomplishing the process of production and distribution in different regions throughout the world. During this process, developed countries such as China dominate exports in the textiles sector. "China was the world's largest exporter both of textiles and clothing in 1995 as well as 2002 and its world market share (excluding intra-EU trade) increased from 22.5 per cent to 30 per cent over this period in the clothing sector and from 16 to 22 per cent in the textile sector" (Nordas, 2004, p16).

But the supply chain management process in the textiles industry is complex, generally with a large number of partners involved and a supply chain that is relatively long (Jones, 2002). For instance, the process of producing a mid range cotton sportswear sold at a typical fashion high street retailer starts with harvesting the cotton buds in regions where there is warm temperate climate such as western China. Fabric production occurs in the east coast of China with final production including labelling and packing in the south east of the country. The processes involved are shown below in Figure 1 and the whole process can take approximately 12 months from harvesting to arrival in the European store.

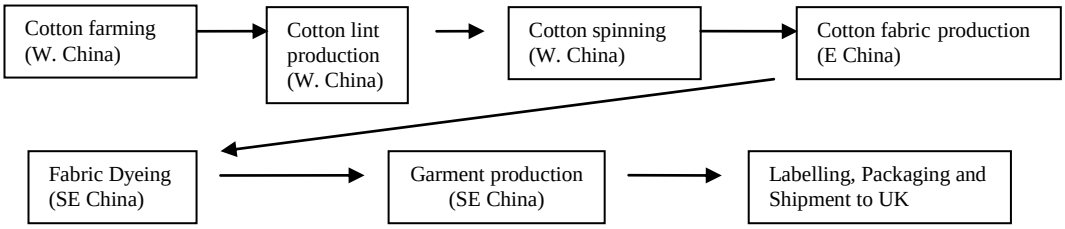

Figure 1: A Typical Garment Supply Chain

Management of the demand chain is required in order to reduce lead times and improve efficiency, highlighting the need to use a responsive approach (Forsberg and Towers, 2007). In sourcing product from Asia, the supply base holds very high challenge levels, such as unforeseen risk in delivery process, rigid negotiability, language barriers and Chinese-style business customs that need to be overcome in order to deliver customer service for their end consumers. Effective management of the supply chain is required in order to reduce lead times and improve efficiency, highlighting the need to use a responsive approach (Towers and Burnes, 2008).

This research analyses the constraints of global sourcing, and the circumstances and the challenges associated with global sourcing of garments from China. The aim is to evaluate the current situation of global sourcing in the textile and clothing industry and to identify future challenges in strategic sourcing clothing from China. The following section undertakes a literature review of global sourcing challenges leading to a proposed framework for challenges of sourcing from China

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Literature Review

Global Sourcing Challenges

The global purchasing process by garment retailers from their suppliers involves the efficient use of worldwide human, material, energy, and capital resources (Khan and Pillania, 2008). Manufacturers sought to collaborate with their customers and suppliers to upgrade their purchasing functions as an integral part of the supply chain. Retailers also exploited suppliers' common strengths and technology for the support of new product development. They also tried to integrate their physical distribution and logistics functions into supply chain management as a strategic approach to operations, materials and logistics management (Croom et al., 2000).

A merchandise range is divided into three major segments of basic, seasonal and short season (Lowson, 2003) which provide a number of challenges for global sourcing of garments. A basic or commodity garment, such as a single colour tee shirt is typically available all year with a demand forecast profile based on historical sales performance. Supply into the market is driven by an allocative process that responds to volume requirements and apportions deliveries accordingly. Demand is relatively predictable with forecast error typically between 10% and 20% (Mason-Jones et al, 2000). With a focus of minimising cost in the supply process more frequent deliveries with smaller batch sizes is an

important contribution from the supplier to reduce inventory in the supply pipeline.

A seasonal product such a men's summer jacket is available for a specific time period, typically ten to thirteen weeks and is characterised by fashion trends. A short season garment such as a fashion ladies top is available for a limited period of time often within a season or across two seasons. The important market driver for both of these season-related products is availability of the garment range in store for the limited period of time in the selling season. The sales forecast is unpredictable, often with an error of more than 100% and requires a very responsive supply chain to service the fluctuating retailers' demand requirements, particularly at the item (or product) level. Hence connecting the demand requirements with the supplier's capability is the key to servicing the final customers' requirements of availability in store.

There are a number benefits that can be gained from global sourcing which include cost reduction, quality, availability, shortening time of product development, improving company image, satisfying obligations, better delivery terms and international competitiveness (Cho and Kang, 2001). However, due to the geographical distance and differences in language and culture there are many challenges for a garment manufacturing company engaged in global sourcing.

Cho and Kang (2001) identified thirteen challenges for sourcing garments abroad that included cultural and behavioural factors such as language barriers, different customs and business practices as well as operations management and economic influences. There has been a growing recognition that offshore retail trading with suppliers has become much dependant on the strength of the relationships that incorporates sociological issues. Aswell as the mutual exchange of information relating to material, capacity and order requirements understanding the needs and capability of the supplier is also important in the longer term (Towers and Burnes, 2007). Buying firms have been developing closer sourcing relationships in their decision making for global sourcing with suppliers involving such issues as new product introduction, image and aesthetics. A focus on achieving the operational objectives of cost, quality, delivery, and flexibility through a number of performance measures, shown in Table 1 below is required (Pyke and Johnson, 2003).

Objective	Sample definitions	Sample measures
Cost	Lowest cost in the industry Cost competitive with our closest competitors Cost is relatively unimportant because we hold the patent and can charge a premium	$ per unit Labour hours per unit Inventory turnover
Quality	Performance Conformance Durability Reliability Serviceability Features Aesthetics Image	Parts per million defective Warranty dollars spent Percent returns Results from satisfaction surveys
Delivery	Speed Reliability	Percent of demand met from the shelf Percent on time Number of days late Cycle time from order to receipt
Flexibility	New product introduction Ability to customize Breadth of product mix	Time to market Number of new product introductions per year Number of stock-keeping units in the catalogue

Table 1: Operating objectives in global sourcing (Pyke and Johnson, 2003, p80)

Hence, sourcing from China offers challenges from a number of influences, including economic, communication, sociocultural, and political/regulatory considerations. For instance UK garment retailers, sourcing from China need to include the extended lead time of delivery to the point of sale from the manufacturer. The sea freight transportation time is typically six weeks from Shanghai to London and is compounded by an internal lead time often extended by the underdeveloped rural Chinese infrastructure. Further, outside of regional cities it is difficult to integrate Chinese suppliers due to the lack of IT-Infrastructure which also increases search costs for potential suppliers and market data. Although English is the business language in China, there still exist language barriers and cultural problems between UK companies and Chinese suppliers (Towers and Peng, 2006). Also the regulatory system in China is not transparent which generates unusual problems in selecting and sourcing where companies are sometimes forced to collaborate with specific suppliers by the authorities. However, sourcing from China of commodity and seasonal products has increased, originally as a result of the low labour rates but also from improvements in performance throughout the extended supply chain from raw materials to delivered final garment.

Kaufmann and Hedderich (2005) developed a textile/apparel supplier performance model, shown below in Figure 2 that included the five challenges of delivery, flexibility, cost, quality and reliability and the performance metrics for each challenge. Cultural considerations were not included in their model which had a primary focus of operations management trading issues. However their model has helped to inform the contribution of supplier performance within the context of a textile apparel supply chain.

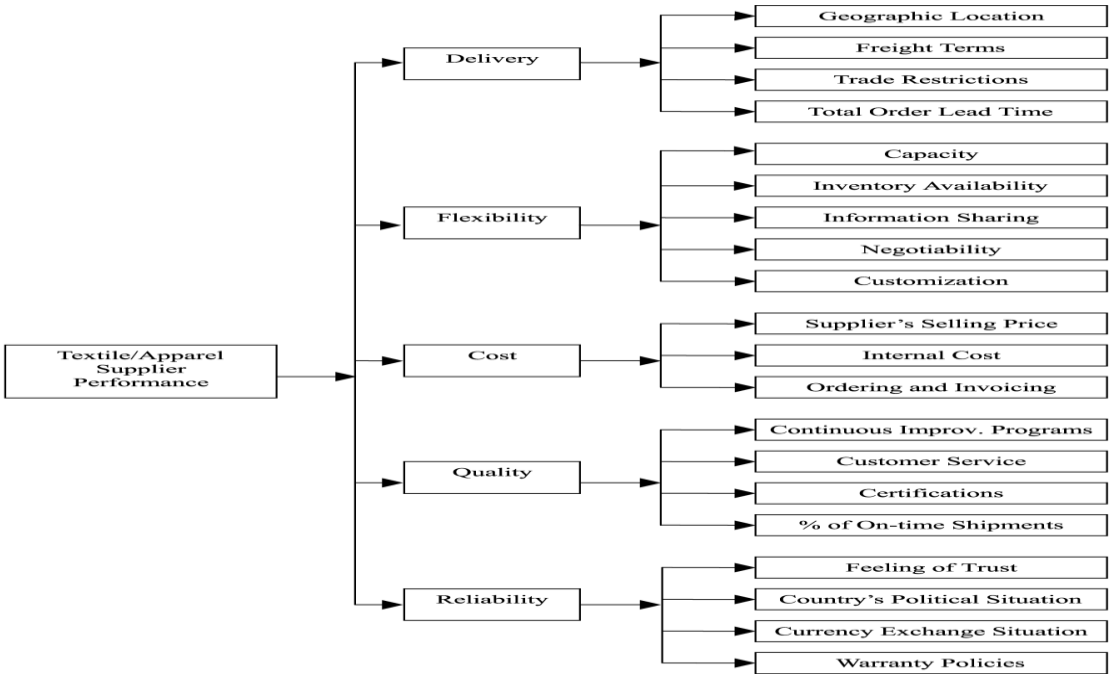


Figure 2: Supplier evaluation model (Kaufmann and Hedderich, 2005, p124)

The challenge of managing trading arrangements with suppliers is underpinned by mutual trust between supply chain partners geographically separated by large distances. The challenges presented from delivery, flexibility, cost, quality and reliability will each be discussed in the following section.

Delivery challenges relate to geographic location, shipping and freight terms and lead time delays. It also includes the garment supplier's level of responsibility for delivery, trade restrictions through government regulations and challenges brought by underdeveloped internal Chinese infrastructure. The total order lead time within an interconnected apparel supply chain of raw materials, fabric, and garment production together with the logistics considerations between each activity is multi dimensional and often extended over different continents.

Flexibility refers to the supplier's capacity to respond to unexpected customer demands. But within the context of a supply chain it refers to activities not only within the producer firm's control but also among external partners, such as suppliers, carriers, and third-party companies. It includes capacity challenges with economic order quantities that a supplier can accommodate, shipping conditions which are associated with the supplier's level of responsibility and access to information of inventory levels, production plans, and status of outstanding orders. Flexibility in garment sourcing is significantly influenced by product customization requirements where garment design incorporates special characteristics and features that requires dedicated production machinery with special setup conditions.

Cost consists of challenges associated with sourcing cost, including the internal manufacturing cost and the cost of ordering and invoicing (Lowson, 2003). It also includes unfair selling prices in the under-developed Chinese market and other internal costs such as transportation, communication, knowledge protection and

the ease of order placing. Internal cost also includes those relating to the quality assurance activity of plant visits, rectification and inspection of garments.

The quality challenge relates to products or services quality, such as customer service, on-time shipments and a supplier's certification. Quality is directed towards the continual drive for process improvements sought in lead times, conformities and reliability of deliveries as well as a supplier's effectiveness to respond to customer requests or complaints. Sourcing from China relies heavily on certification of conformity to an accredited international quality standard such as ISO 9000. Quality performance measures include on-time shipment, and process and audit conformance to agreed standards of supply (Towers and McLoughlin, 2005).

Finally, reliability relates to the supplier's operations to consistently fulfil its supply chain activities over a period of time. Reliability often includes measures of perception, such as a Buyer's assessment of a supplier's performance including trust, accuracy of information over a period of time and the confidence in the developed relationship (Fernie and Azuma, 2004). More tangible measures relate to on time delivery, disruptions in the flow of goods, the security of production and government regulations for different categories of manufactured garments.

Proposed framework for challenges of sourcing from China

However future challenges in strategic sourcing garments from China also include important influences based on Chinese business cultural beliefs and behaviour. As well as language differences there are unique challenges derived from social relationships known as Guanxi. Different business practices and customs are present with all parties involved with trading from China, including regional and national Chinese government agencies. Although English is the business language spoken in China, a guanxi based access to Chinese decision-makers requires special personnel relationships and customs. Consequently culture has a particular relevance in trading with China and poses an additional challenge.

The individual elements from each of the six challenges of sourcing from China (delivery, flexibility, cost, quality, reliability and culture) have been developed into a working framework, shown below in Figure 3. This framework is adapted from the textile/apparel supplier performance model proposed by Kaufmann and Hedderich (2005) through adding the challenge of language, customs and business practice under the heading of culture. Our framework shown in Figure 3 below identifies the performance metrics within each of the challenges for sourcing product from China.

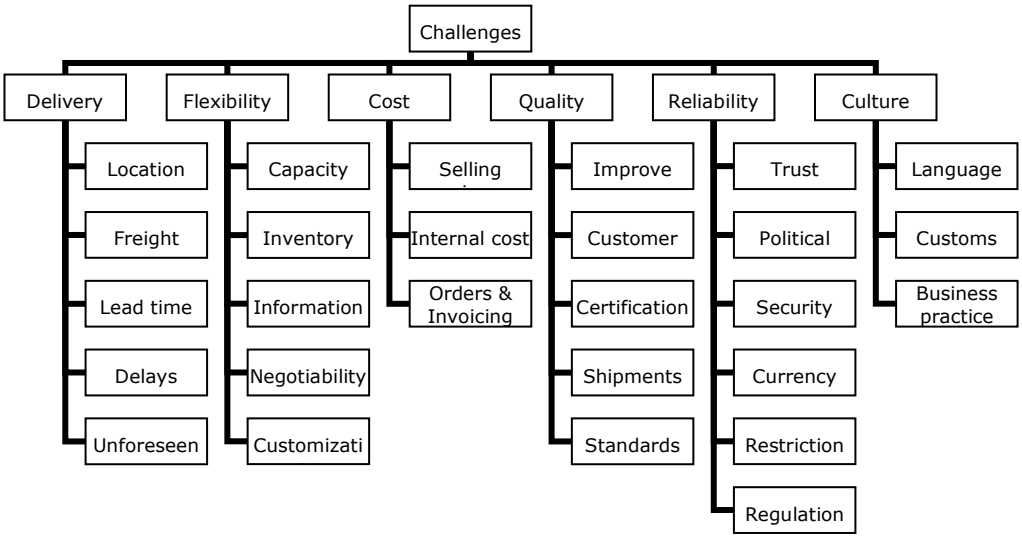


Figure 3: Challenges of Sourcing from China (adapted from Kaufmann and Hedderich, 2005, p125)

Research Proposition

To test the validity of the framework an empirical investigation was undertaken on a single UK case study company that sources garments from China. The intention was to assess the challenges confronting the trading relationship between the retailer and their supplier when sourcing garments globally. The hypothesis used in this research is:

H_1: Understanding the relative merits of the future challenges are crucial in strategic sourcing garments from China for UK retailers.

The proposition is that long tem purchasing arrangements are necessary to ensure close cooperation between retailer and garment producer in the volatile fashion business environment. Developing a strong understanding of the requirements will ensure a mutually beneficial trading relationship within the sourcing process. An empirical investigation was undertaken adopting a research methodology using the fuzzy logic approach, which will be discussed in the next section.

Adopted Research Methodology

Philosophical issues help researchers to understand which topic is important and the relationship between the enquirer and the subject under investigation. Much logistics and supply management research is dominated by quantitative methodologies that aim to be predictive and extrapolative (Näslund, 2002). However it has been noted that it is a trend of the researcher to use multiple methods in many research disciplines (Dunn *et al.* 1993). The deductive research approach is used as a theory testing process, which commences with an established theory or generalization, and seeks to see if the theory applies to specific instances. Major research paradigms are related to philosophical anchors: ontology, epistemology and axiology (Ponterotto, 2005). The philosophical position in this study is based on the constructivism paradigm, because of the complex relationships and the interactions between the case study company and its suppliers with a global sourcing strategy. The constructivism paradigm would help in apprehending a company's unique situation. The essence of

constructionism is the idea that reality is determined by people rather than by objective and external factors. It focuses on the ways that people make sense of the world, especially through sharing their experiences with others and appreciate the different constructions and meanings that people place upon their experience (Easterby-Smith *et al*., 2002).

The ontological position adopted in this study saw reality as influenced by its context, such as personal experience, individual's perceptions, social environment and interaction between the research participant and the researcher. The Epistemology adopts a contructivist position that proposes a subjectivist stance where the reality is socially constructed (Towers and Chen, 2007). The research participants were described by the dynamic interaction between the participant and the researcher. This research involves the community and daily life of the participants in the case study company. From a naturalistic inquiry qualitative research methods were employed, such as face to face interview and participant observation and assumes the values and living experience of the researcher cannot be separated from the scientific research process.

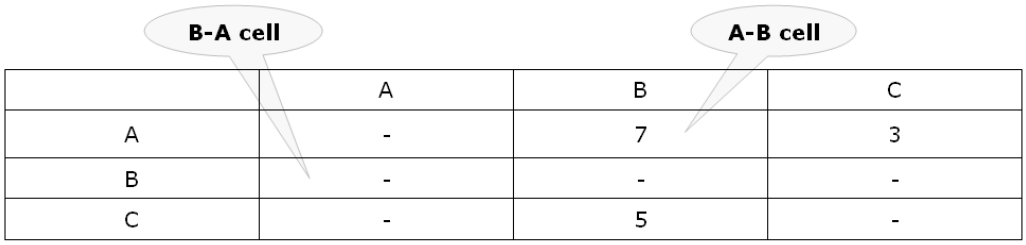
In this study, the researcher was independent in data collection but will interact with staff from the company to qualitatively derive information for a better understanding of the challenges of sourcing from China. A longitudinal design was chosen in this study and the challenges of sourcing from China were evaluated based on one company's situation. Thus the influence is identified from various points of view of the six challenges.

Research methods

Primary data was collected in the autumn of 2007 using two questionnaires from the UK based garment sourcing company. Unlimited access was granted to all members of the Buying and Merchandising Team. The member of staff responsible for sourcing garments from China completed the questionnaires. The Buying Director was also interviewed to ensure triangulation validity of the collected data. The purpose of Questionnaire I was to investigate the relative weights of the challenges and Questionnaire II was to score the individual elements from each challenge in sourcing from a specific location in China.

In Questionnaire I the relative importance between each pair of challenges was used as the basis to calculate the weights (absolute importance) of the challenges using Saaty's reciprocal matrices approach (Ribeiro, 1996). Relative importance was obtained by using a questionnaire technique. There are seven forms referring to weights among groups and within each of the six constructs. Challenges were compared pair by pair, the one in the left column to the one in the top row. Although relative importance is a fuzzy concept, it can be scored with a scale of 9 and input in the crossing cell for each pair of candidates (Ribeiro, 1996): 1 – the same important; 3 – a little more important; 5 - more important; 7 – obviously more important; and 9 - absolutely more important. The values in between (2, 4, 6, 8) represent compromise judgements. If A is important than B, the an appropriate score is entered into the A-B cell, and input "-" in the B-A cell. For example, the relative importance among a group consisting of three elements (A, B, C) is described as: A is obviously more important than B; A is a little more important

than C; and C is more important than B. Then the matrix is fulfilled as shown in Figure 4 below.



	A	B	C
A	-	7	3
B	-	-	-
C	-	5	-

Figure 4: an example of reciprocal matrix

The matrix format questionnaire was found to be difficult to understand according to the feedback from the company staff. The question format in Questionnaire I was therefore redesigned in order to make it more easily understood. Each question in Questionnaire I generated a pair of elements for each matrix. There were 66 questions divided into seven groups corresponding to importance among groups and inside six groups. The challenges have different challenging level for the company. The challenging level is also a fuzzy concept but evaluated into a score scale of 5: 1 – very low challenge; 2 – low challenge; 3 – acceptable challenge; 4 – high challenge; 5 – very high challenge. The construction of the square reciprocal matrices is performed by asking the decision maker to compare element i with element j, the value a_{ij}, with respect to a particular criterion or objective. The other values are assigned as follows: (a) $a_{ji} = 1/a_{ij}$; (b) $a_{ii} = 1$. For the case study, Saaty's reciprocal matrices are:

Groups

$$\begin{bmatrix} 1 & 8 & 4 & 1/4 & 8 & 10 \\ 1/8 & 1 & 1/2 & 1/6 & 1/4 & 8 \\ 1/4 & 2 & 1 & 1/8 & 1 & 6 \\ 4 & 6 & 8 & 1 & 10 & 10 \\ 1/8 & 4 & 1 & 1/10 & 1 & 1/2 \\ 1/10 & 1/8 & 1/6 & 1/10 & 2 & 1 \end{bmatrix}$$

Delivery

$$\begin{bmatrix} 1 & 8 & 1 & 1/2 & 1 \\ 1/8 & 1 & 8 & 1 & 10 \\ 1 & 1/8 & 1 & 10 & 1 \\ 2 & 1 & 1/10 & 1 & 1 \\ 1 & 1/10 & 1 & 1 & 1 \end{bmatrix}$$

Flexibility

$$\begin{bmatrix} 1 & 10 & 1 & 2 & 2 \\ 1/10 & 1 & 4 & 1/2 & 1 \\ 1 & 1/4 & 1 & 2 & 1/2 \\ 1/2 & 2 & 1/2 & 1 & 2 \\ 1/2 & 1 & 2 & 1/2 & 1 \end{bmatrix}$$

Reliability

$$\begin{bmatrix} 1 & 8 & 2 & 1 & 1/4 & 1/2 \\ 1/8 & 1 & 1/2 & 2 & 1/2 & 2 \\ 1/2 & 2 & 1 & 1/2 & 2 & 4 \\ 1 & 1/2 & 2 & 1 & 8 & 6 \\ 4 & 2 & 1/2 & 1/8 & 1 & 1/2 \\ 2 & 1/2 & 1/4 & 1/6 & 2 & 1 \end{bmatrix}$$

Quality

$$\begin{bmatrix} 1 & 10 & 10 & 6 & 8 \\ 1/10 & 1 & 8 & 2 & 8 \\ 1/10 & 1/8 & 1 & 1 & 1 \\ 1/6 & 1/2 & 1 & 1 & 1/6 \\ 1/8 & 1/8 & 1 & 6 & 1 \end{bmatrix}$$

Cost

$$\begin{bmatrix} 1 & 1 & 1/4 \\ 1 & 1 & 1/4 \\ 4 & 4 & 1 \end{bmatrix}$$

Culture

$$\begin{bmatrix} 1 & 2 & 6 \\ 1/2 & 1 & 1/2 \\ 1/6 & 2 & 1 \end{bmatrix}$$

This study was undertaken in the autumn of 2007 and evaluated current challenges of sourcing from China and started from the position of the constructivism paradigm due to the complex interactions among the researcher, the participant, the investigator and the target. With regard to research design selection, the researcher was involved at different levels according to different data type and then applied it to the developed theoretical framework. Following collection of the quantitative and qualitative data a number of analysis methods were employed to gain a greater understanding of the subject. These will be discussed in the following section.

Findings and Analysis

The challenges of sourcing from China for Gazelle Sports Ltd. a UK based clothing company were analysed. The objective of this research was to evaluate the current situation of global sourcing for a supplier of garments to UK retailers and to identify the relative merits of future challenges in strategic sourcing clothing from China. From the results the most important challenges were identified and analysed.

Company profile

Gazelle Sports Ltd. is a UK based provider of sportswear located in Manchester, United Kingdom with an annual sales turnover of 1.5 million pounds in 2007 and

employs 13 full-time and 1 part-time staff. The company began to source abroad in 1990, mainly from Cambodia, Bangladesh and China. In China the company predominantly sources commodity and seasonal sportswear from the cities of Shanghai, Shenzhen and Hong Kong.

The values in the matrices are given by data from Questionnaire I. For example, the Delivery challenge is demonstrably more important (grade 8 in the Groups matrix) than Flexibility and Reliability challenges; in the Flexibility challenge, Capacity is of little importance (grade 2 in the Flexibility matrix) than Negotiability and Customization. Other comparisons are shown in the reciprocal matrices. For a certain matrix, the eigenvector related to the maximum Eigen value is used to evaluate the weights of the challenges compared. Then, the eigenvectors are normalised to ensure the consistency of comparison. For the example, these intermediate results are shown below in Table 2.

Groups (V_{total}) $\begin{bmatrix} -0.4922 \\ -0.1191 \\ -0.1428 \\ -0.8398 \\ -0.1190 \\ -0.0613 \end{bmatrix}$ Normalised $\begin{bmatrix} 0.2774 \\ 0.0671 \\ 0.0805 \\ 0.4733 \\ 0.0671 \\ 0.0346 \end{bmatrix}$

Delivery (V_1) $\begin{bmatrix} 0.6399 \\ 0.5940 \\ 0.3914 \\ 0.2443 \\ 0.1575 \end{bmatrix}$ Normalised $\begin{bmatrix} 0.3157 \\ 0.2930 \\ 0.1931 \\ 0.1205 \\ 0.0777 \end{bmatrix}$

Flexibility (V_2) $\begin{bmatrix} -0.8108 \\ -0.3042 \\ -0.2954 \\ -0.3058 \\ -0.2633 \end{bmatrix}$ Normalised $\begin{bmatrix} 0.4096 \\ 0.1537 \\ 0.1492 \\ 0.1545 \\ 0.1330 \end{bmatrix}$

Cost (V_3) $\begin{bmatrix} 0.2357 \\ 0.2357 \\ 0.9428 \end{bmatrix}$ Normalised $\begin{bmatrix} 0.1667 \\ 0.1667 \\ 0.6667 \end{bmatrix}$

Quality (V_4) $\begin{bmatrix} 0.9382 \\ 0.3102 \\ 0.0602 \\ 0.0726 \\ 0.1209 \end{bmatrix}$ Normalised $\begin{bmatrix} 0.6246 \\ 0.2065 \\ 0.0401 \\ 0.0484 \\ 0.0805 \end{bmatrix}$

Reliability (V_5) $\begin{bmatrix} 0.4554 \\ 0.2701 \\ 0.3349 \\ 0.6621 \\ 0.3369 \\ 0.2361 \end{bmatrix}$ Normalised $\begin{bmatrix} 0.1984 \\ 0.1177 \\ 0.1459 \\ 0.2884 \\ 0.1468 \\ 0.1029 \end{bmatrix}$

Culture (V_6)	$\begin{bmatrix} -0.9254 \\ -0.2544 \\ -0.2809 \end{bmatrix}$	Normalised	$\begin{bmatrix} 0.6335 \\ 0.1741 \\ 0.1923 \end{bmatrix}$

Table 2: The Eigenvectors values for each Challenge

Evaluation of the challenges

From data of Questionnaire II, the score of every challenge is shown as following (1 – very low challenge; 2 – low challenge; 3 – acceptable challenge; 4 – high challenge; 5 – very high challenge.):

Delivery	Location	Freight	Lead time	Delays	Unforeseen
	3	1	1	1	5

Flexibility	Capacity	Inventory	Information	Negotiability	Customization
	1	3	2	5	1

Cost	Selling prices	Internal cost	Orders & Invoicing
	3	1	1

Quality	Improve	Customer	Certification	Shipments	Standards
	1	1	3	1	1

Reliability	Trust	Political	Security	Currency	Restriction	Regulation
	1	2	1	1	3	4

Culture	Language	Customs	Business practice
	5	5	1

The data is written into vectors:

Delivery (S_1)	$[3 \quad 1 \quad 1 \quad 1 \quad 5]$
Flexibility (S_2)	$[1 \quad 3 \quad 2 \quad 5 \quad 1]$
Cost (S_3)	$[3 \quad 1 \quad 1]$
Quality (S_4)	$[1 \quad 1 \quad 3 \quad 1 \quad 1]$
Reliability (S_5)	$[1 \quad 2 \quad 1 \quad 1 \quad 3 \quad 4]$
Culture (S_6)	$[5 \quad 5 \quad 1]$

For each group, the group score is the product of weight vector and score vector:
$Sg_i = V_i \cdot S_i$

The group scores are shown in Table 3 below:

Delivery	Flexibility	Cost	Quality	Reliability	Culture
1.9421	2.0745	1.3333	1.0802	1.7198	4.2307

Table 3: Scores of challenge groups

Thus, the score vector of groups (Sg) is written as:
$Sg = [1.9421 \quad 2.0745 \quad 1.3333 \quad 1.0802 \quad 1.7198 \quad 4.2307]$
The total score (S_{Total}) is obtained when group weight vector is multiplied by group score vector.
$S_{total} = V_{Total} \cdot Sg = 1.5582$

The following section will discuss the outcomes of the findings and analysis with reference to the research proposition .

Discussion

P_1: Understanding the relative merits of the future challenges are crucial in strategic sourcing garments from China for UK retailers.

Relative merit of each challenge (V_{total})

The total score is 1.5582 in this case, which means the challenge of sourcing from China is between very low and low level for this company. The result describes the company accurately as it specialises in sourcing garments and has been successful in servicing its customers for over 17 years. It has developed an expertise that overcomes the demanding challenges involved in offshore garment sourcing. Further analysis explores the relative importance of challenges in details.

In understanding the relative merits of each challenge the most important category is the Quality challenge with a normalized weight 0.4733, followed immediately by the Delivery challenge with a normalized weight 0.2774. The Reliability challenge holds the third place with normalized weight 0.0805. The Flexibility challenge, with normalized weight 0.0671, is as important as the Cost challenge. The Culture challenge is the least important category, with normalized weight 0.0346. The result shows that quality and delivery challenges are much more important than other kinds of challenges, although culture does have a limited influence on the sourcing process. These challenges are the major problems brought by sourcing overseas in supply chain management. An interesting finding is that the quality challenge attracts significant attention from the company, although sourcing garments usually need to overcome the long geographical distance from suppliers to the company. The language and cultural differences between sourcing countries and the company does not have much influence on the decision making of the sourcing strategy.

Analysis within each challenge (V_{group})

In the Delivery challenge (V_1), geographical location and freight terms are important, but not much more than others with a weight 0.3157 and 0.2930 respectively. In other words, long geographical distance and shipping conditions are the main challenges in the delivery process. The lead time and infrastructure delays, with weights of 0.1931 and 0.1205 must also be considered.

In the Flexibility challenge (V_2), capacity has the highest weight of 0.4096 and the others weights are all more than 0.1. The order quantity that a supplier can deal with capacity is important when considering the supplier's ability to provide flexible production. Other issues are nearly at the same importance level.

In the Cost challenge (V_3), Orders & Invoicing holds a dominant weight value of 0.6667. It shows that the cost related to placing orders and sending invoices is the largest portion of total cost. It is normally the largest administrative burden within a business providing a significant challenge to focus on minimising the internal financial costs associated with dealing with international orders and invoices efficiently.

In the Quality challenge (V_4), Improve holds the dominated position, with a weight of 0.6246 significantly greater than the other constructs. It demonstrates that for this company it needs to constantly seek to improve their lead times, conformities and reliability of deliveries from their suppliers. This can only be achieved through keeping abreast of developments within their market and improving their own expertise.

In the Reliability challenge (V_5), the weights of each element are quite close to each other. Currency holds a little more of an important position with a weight of 0.2884 than Trust with a value of 0.1984. The changes in currency exchange rate catch some attention from the company. Not surprisingly for an apparel sourcing company with geographically long supply networks and extended design cycles for sportswear products trust is an important challenge.

In the Culture challenge (V_6), language barriers are much more important than special personnel relationship and business practice. The location of the two countries of England and China with different languages provides a challenge for both normal dialogue with the Chinese suppliers and also with technical discussions and interpretation of garment specification requirements.

Rating analysis for each Challenge

The results from the collected Questionnaire II data which scored the individual elements from each challenge are discussed below.

In the Delivery challenge, Unforeseen issues regarding supply is a very high challenge value (grade 5), Location is an acceptable challenge (grade 3), and other issues in this group are very low rated challenges. Product availability in store is a market winning criteria for fashion products such as sportswear (Mason-Jones *et al,* 2000). Hence negative influences on reliability and accuracy in timing of delivery such as unforeseen issues

In the Flexibility challenge, Negotiability is a very high challenge (grade 5), Inventory level is an acceptable challenge (grade 3), and others are rated low or very low challenges.

In the Cost challenge, Selling price is an acceptable challenge (grade 3), and other constructs are rated low or very low challenges.

In the Quality challenge, Certification is an acceptable challenge (grade 3) according to the feedback for Questionnaire II, and other issues in this group are rated as very low.

In the Reliability challenge, Regulation is a high challenge (grade 4), Restriction is an acceptable challenge (grade 3), and the remainder constructs are rated low or very low.

In the Culture challenge, Language and Customs are very high challenges (grade 5) whilst Business practice is a very low rated challenge.

Overall highest ranked challenge analysis

Consideration of the relative merit analysis and the rating analysis has been used to determine the contribution of the overall weighted value for each element, by challenge. In this analysis Improvement in the Quality challenge (V_4) is the most important one (contribution 0.2956), followed by Location in the Delivery challenge (V_1) (contribution 0.2627), Language in the Culture challenge (V_6) (contribution 0.1096), Unforeseen in the Delivery challenge (V_1) (contribution 0.1078) and Customer in the Quality challenge (V_4) (contribution 0.0977). A summary is shown in Table 4 below.

Challenge	Highest ranked construct	Challenge weight (a)	Group weight (b)	Score (c)	Contribution to final result [(a)x(b)x(c)]
Quality	Improve	0.6246	0.4733	1	0.2956
Delivery	Location	0.3157	0.2774	3	0.2627
Culture	Language	0.6335	0.0346	5	0.1096
Delivery	Unforeseen	0.0777	0.2774	5	0.1078
Quality	Customer	0.2065	0.4733	1	0.0977

Table 4: Contribution of challenges to the final result

Implications for theory development and business practitioners

China provides an important contribution to the global production of garments for the European market. The availability of good quality raw materials, both synthetic and natural together with yarn, fabric and extensive garment production capability within the country provide the potential for significant strategic sourcing opportunity beyond single colour basic commodity garments where price is the determining feature of supply but delivery reliability is important. Seasonal product, with a greater design component require a more detailed understanding of the challenges that need to be managed in servicing the retailer's requirements prior to and during the limited selling period. Retailers require responsive suppliers who can consistently produce the more detailed product to match the unpredictability of demand.

Some challenges hold very high values according to the result above, such as unforeseen risk in delivery process, rigid negotiability, language barriers and Chinese-style business customs. It is also shown in the results that the most important challenges are improvement, sourcing location, languages barriers, unforeseen delivery risks, and customer services. These challenges aggregate to a focussed approach based on effectiveness of supply, underpinned by a mutual and collective understanding that can respond to changes in the marketplace.

Our developed model shown in Figure 3 above, adapted from the supplier evaluation model of Kaufmann and Hedderich (2005) has been shown to add value to the theoretical discussion of textile/apparel supplier performance. It has demonstrated that Guanxi has an important influence within the context of sourcing garments from China. Acceptance to participate in the social network based on Chinese business cultural beliefs and behaviour has been recognised as a key challenge in sustaining a successful long term strategic trading relationship. This is of great importance to business practitioners in understanding, planning, managing and controlling the complex and geographically extended garment apparel supply chain from China. As language and Chinese customs were seen to be very high challenges the approach adopted in the technical discussions, particularly involving interpreting and resolving garment specification requirements and standards is a very important area for managing the relationship. However, as much as it is a very challenging and time consuming activity it can also be a source of conflict and friction if not closely managed. It is important to participate in open discussions so that there is a clear understanding of the basis of the supplier performance evaluation. This will eliminate unwanted surprises in the evaluation process and allow a consistent approach to improvement.

Conclusions

Recognition of the six competing challenges of delivery, flexibility, cost, quality, reliability and culture has highlighted the multi dimensional composition of the strategic trading relationship with Chinese garment suppliers. Focussing on customer service through on-shelf availability at the retailer (Fernie and Azuma, 2004) sourcing has been shown to be underpinned by an approach that addresses these challenges of supply from China. Close detailed attention to each performance metric within each challenge is required to achieve the required operating objectives in global sourcing. Careful management of the strategic sourcing challenges of garments, particularly those with commodity and seasonal supply attributes will enhance the future viability of China as a global supplier.

The proposition in this paper is that long tem purchasing arrangements are necessary to ensure close cooperation between retailer and garment producer in the volatile fashion business environment. Developing a strong understanding of the requirements has been shown to be based on a mutually beneficial trading relationship within the sourcing process. A garment supplier has to be responsive to constantly changing and unpredictable demand requirements from the retailer (Mason-Jones et al, 2000; Forsberg and Towers, 2007; Masson *et al*, 2007). Translating this into the specific constructs has reinforced the need to focus on the challenges of delivery, flexibility, cost, quality, reliability and culture.

These findings will have an influence on the implication of managing strategic arrangements for sourcing garments from South East Asia. It will be important for these challenges to be incorporated into the business practices and performance metrics of the international trading relationship. They will reinforce the basis of the partnership between the members in the supply chain and help to successfully manage the procurement activity in the difficult and volatile trading environment of the extended garment supply chain.

Limitations

Although the proposed method is robust there are some limitations when applying it. There are always many challenges in practice and it is not always possible to identify and evaluate every challenge. Since only importance is compared in this study nuances among challenges may be lost. The comparison is made pair by pair, thus it is difficult and time consuming to keep consistency in the weight evaluation procedure. Also for this study a simply uniform scale is used to evaluate fuzzy elements in current research. For more accuracy, fuzzy set theory can be applied to deal with uncertainties in evaluation or decision making.

Future challenge

There has been an increasing trend of retailers sourcing their garments from China. This growing trend has been further influenced by the removal of national and regional tariff and trade quota restrictions such as the multi fibre agreement in 2005 that have opened up the global textile and apparel market. The challenge in the near future can be explored based on some reasonable assumptions: (1) Challenges with high grades (highly challenging) are disadvantages for sourcing from China, some of which may still exist in the near future, although others may develop and improve. (2) Challenges with low grades (low challenging) are advantages for sourcing from China. Such advantages may be sustained or overcome by sourcing from other countries, thus making them more challenging.

Although this study focused on the evaluation procedure for a company's sourcing location, it can also be applied in the decision-making procedure for a company's sourcing policy helping to select a sourcing location. The proposed method can be implemented into a standalone or online software/expert system, which can give results immediately and provide guidance and recommendations according to the users' unique strategic sourcing requirements.

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