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An Assessment of Supply Chain Flexibility in the Print Industry of Some Selected Printing Presses in Kumasi

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Abstract
The capacity to adjust to changes in product mix, production volume, or design and often reaction to environmental uncertainty to meet the demands of the end consumer has been overlooked by many organisations in Ghana. The study sought to empirically; examine supply chain flexibility practices within the print industries in Kumasi, Ghana. Furthermore, it was envisaged that the causes of the industries' inability to be flexible with supply chain variables were identified and appropriate solutions found to effectively integrate supply chain flexibility. It is hoped that the findings would help the print industries in Kumasi to make informed decisions to improve their businesses and gain competitive advantage. The study employed quantitative approach with multiple cases to examine the supply chain flexibility within the print industries in Kumasi. Primary and secondary data were used for the study. The primary data was sourced through Self-administered questionnaire during the months of May and June, 2013. The questionnaire was sent to sixty (60) small and medium-sized print industries in Kumasi within three clusters in Kumasi. Descriptive and inferential statistics were used to analyze the quantitative data with the aid of Statistical Package for Social Sciences (SPSS) and Microsoft Excel 2007 Software. The study revealed that the Sourcing and product flexibility were relatively low whilst delivery flexibility was comparatively high. Finally, the management of the print industries, particularly those in Kumasi should give serious attention to supply chain flexibility by putting measures in place to address the problems of low sourcing and product flexibility and also improve the standard of delivery flexibility.
Keywords: Flexibility, Supply Chain Flexibility, Print Industry, Kumasi, Ghana,

1. Introduction

In today's dynamic competitive markets, companies no longer compete on business to business but supply chain to supply chain (Otchere, et al 2013; Lambert, 2008; Fantazy, Baharanchi, 2009; Narasimhan, 1997). Supply chain management is the design and management of seamless, value-added processes across organizational boundaries to meet the real needs of the end customer (Fawcett, et al., 2002). Further, supply chain (SC) is a network of organisations involved in different processes and activities producing value in the form of products and services to the ultimate customer (Christopher, 2003). Notwithstanding, Supply-chain is saddled with uncertainty which is an issue that every practising manager wrestles with as a result of increasing complexity of global supply networks (Otchere, et al 2013; Lambert, 2008; Fantazy, Baharanchi, 2009; Narasimhan, 1997). In fact, SCs have to deal with many sources of uncertainty as one of the complexities of global supply networks, such as customer demand, supply quality and lead-time, and information delay (Giannoccaro, et al., 2002). Consequently, modernization and flexibility is required under these competitive pressures in order to succeed.

Flexibility is the capacity to adjust to changes in product mix, production volume, or design and often reaction to environmental uncertainty. Flexibility indeed has become a competitive weapon. It involves the ability to produce a wide variety of products, to introduce new products and modify existing ones quickly, and to respond to customer needs. Despite the fact that, flexibility in the supply chain of companies across the world is as important as any other issue that affects those companies, many companies around the world (including Ghana) give little attention to supply chain flexibility. This eventually affects performance. Companies should be able to predict future demands, resource requirements and consumer needs. These collaborative forecasting will help in increasing the performance of supply chain. Flexibility is a core factor that influences the performance of a supply chain (Zhao, Xie & Leung, 2002). In view of the above, this research was guided by the following objectives: one, to examine the sourcing flexibility of printing presses in Kumasi; two, to assess the product flexibility of printing presses in Kumasi; and three, to examine the delivery flexibility of printing presses in Kumasi. The objectives were followed by these research questions: One, what is the sourcing flexibility of printing presses in Kumasi? Two, what is product flexibility of printing presses in Kumasi? Finally, how do printing presses in Kumasi apply delivery flexibility in their operations? It is hoped that this paper would help the print industry particularly those in Kumasi to effectively manage flexibility to enhance the socio economic

development of Ghana. Finally, the study will contribute to existing knowledge on supply chain flexibility and serve as basis for further studies.

2 Literature Review

2.1 Supply Chain

Supply chain consists of the whole activities associated with products and services movement from raw material stage to final products which are consumed by customers. This movement includes financial and information flow as well as material flow. In other words, supply chain is a network consisting of downstream and upstream organizations which are involved in different processes and activities that create value for end customers in the form of products or services (Hussain and Nassar, 2010; Otchere et al, 2013). Further, Supply chain is a set of three or more entities directly involved in the upstream and downstream flows of products services, finances and information from a source to a customer (Lambert 2008).

In today's highly unsteady and competitive markets, rivalry among companies is transformed from competing on the basis of own capabilities to competing with the whole supply chain (Ketchen and Hult, 2007; Otchere et al, 2013; Lambert, 2008; Fantazy, Kumar and Kumar, 2010; Baharanchi, 2009; Narasimhan, 1997). Presently, customers are smart and clever as to what they want; hence speed (responsiveness) and low cost (effectiveness) supply chains have been important drivers for companies. Depending on the market, the firm operates in, these supply chains work perfectly in steady conditions since the entire supply chain is focused on economies of scale, delivering quick supply for the least amount of money. However, these supply chains are not able to react to sudden changes in demand. Several articles explain how current market conditions require supply chains that are capable of dealing with sudden changes of demand and strategies, instead of a cost and/or speed oriented view solely. Changing market demand, differing supplier lead time, product quality and information delay are sources of uncertainty that create a need for building 'flexible'- supply chains that can deal with these changes and preferably in a better way than their rivals. In doing so, a competitive advantage can be achieved (Giannoccaro et al, 2003).

2.2 Flexibility

The concept of flexibility in supply chain management is the ability of a business process to effectively manage or react to changes with little penalty in time, cost, quality or performance (Viswanadham & Raghavan 1997). On the other hand, Lee (2004) explains the flexibility of supply chains as the ability of a company in terms of three distinctive components. These components are: One, Adaptable: Adjust the supply chain's design to meet structural shifts in markets, modify supply network strategies, products and technologies. Two, Alignment: Create incentives along the partners within the supply chain for better overall performance. Although, is considered to be one of the aspects of flexibility. Three, Agility: The ability of a supply chain to respond to short-term changes in demand or supply quickly and handle external disruptions smoothly.

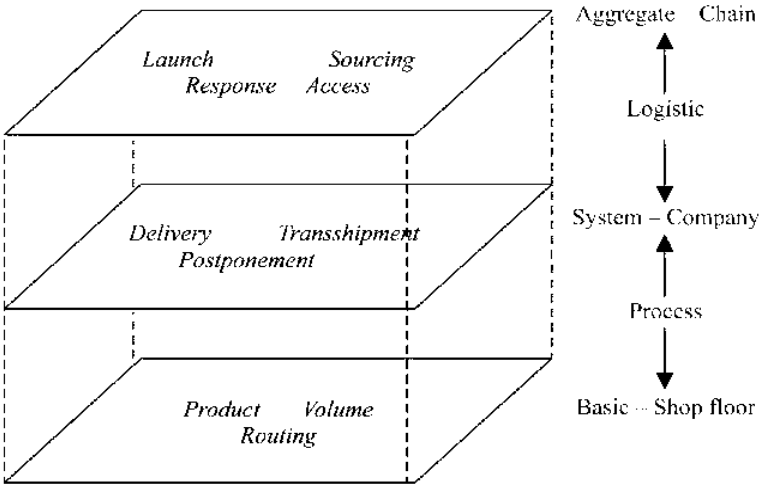
According to Vickery, *et al*. (1999), a manufacturing system is said to have flexibility, when it achieves the ability of reacting to changes faster and in a less costly manner in a way that system effectiveness will be less influenced. Given that flexibility is important but pursuing high flexibility is costly, there should be an assessment on how much flexible a supply chain should be. Fisher (1997) provides a nice classification of products into two types: functional and innovative. Functional products are characterised by a relatively long life cycle, few product variations and easy to predict demand; thus error in forecasts at the time the production is committed is less than 10%. On the other extreme, the innovative products are characterised by a short product life cycle (PLC), wide variety of products and, consequently, the forecast errors are normally high. The focus of the supply chain in responding to these two types of products should certainly be different. A supply chain supplying innovative products should pursue responsiveness while for functional products costs should be the primary focus. Based on this classification, innovative products certainly require higher supply chain flexibility than the functional products do. It is important therefore that the assessment of flexibility for a manufacturing company as well as for a supply chain should relate the ability and the requirements to be flexible. Classified manufacturing flexibility Suarez et al (1995) argued that a company's competitiveness is determined by its ability to answer the need from the market in terms of quality, efficiency and flexibility. Implicitly, a company does not need to be very flexible if the market does not require it. This notion is important because investment for flexibility is often costly and thus, high flexibility should be pursued only if the market indicates the need for it.

2.3 Dimensions of flexibility

In the last two decades, manufacturing flexibility has been an issue that attracts much attention of the academics. A large body of literature has addressed flexibility as an important competitive advantage. For example, D'souza

and Williams, (2000) conducted research into externally driven and internally driven manufacturing flexibility. The externally driven manufacturing flexibility includes two dimensions, volume and variety flexibility, while the internally driven flexibility includes process and material handling flexibility. Each of the dimensions has two elements: range and mobility. Koste and Malhotra, (1999) presented a comprehensive review on manufacturing flexibility based on previous literature addressing flexibility. The dimensions include flexibility in machine, labour, material handling, routing, operations, expansion, volume, product mix, new product and modification. The ten dimensions were then mapped into four elements: range-number, range-heterogeneity, mobility and uniformity. While the dimensions seem to cover a wide definition of flexibility, they only address the elements of flexibility internal to a manufacturing system. Nemeth P., (2008) also defined flexibility as consisting of two dimensions, temporal and intentional. In expanding the framework he identified four dominant dimensions of flexibility in his literature as temporal, range, intention, and focus. In fact whether flexibility is gained internally or externally Angel & Manuela (2005), propose the following flexibility dimensions: Product flexibility, Volume flexibility, Routing flexibility, Delivery flexibility, Trans-shipment flexibility, Postponement flexibility, Sourcing flexibility, demand (market response) flexibility, Launch flexibility, and Access flexibility. A model of it is presented in figure 2.1.

Figure 2.1 Supply chain flexibility dimensions



Source: (Angel and Manuela 2005)

From the above definition given, each author used different dimensions of supply chain flexibility. However, a trend in definition was that a supply chain flexibility dimension was related to supply chain functions. This usually included procuring the materials (sourcing), developing new products, manufacturing/production and delivering the finished products. Hence, Swafford et al. (2000), proposed four dimensions of supply chain flexibility as: sourcing, product design, manufacturing/production and delivery. Three of them (sourcing, product and delivery) are considered in this study. From the perspective of Angel & Manuela (2005), sourcing flexibility is related to the company's ability to find another supplier for each specific component or raw material. Product flexibility on the other hand, is defined in a supply chain framework as the ability to handle difficult, non-standard orders, to meet special customer specifications, and to produce products characterized by numerous features, options, sizes, and colours. Finally, Delivery flexibility is the company's capability to adapt lead times to the customer requirements; an example of high delivery flexibility is Just-in-Time (JIT), when suppliers deliver the products to the customer at the right quantity, place and time.

2.4 Drivers of flexibility

The need for flexibility is largely determined by the operating and environment characteristics of a supply chain. Suarez et al. (1995) pointed out that more volatile markets, shorter product life cycle (PLC) and more sophisticated buyers have all contributed to flexibility's emergence as a new strategic imperative. Other aspects such as uncertainty and global competition are also considered as factors behind the need for flexibility. Vokurka & O'Leary-Kelly (2000) classified external factors on manufacturing flexibility into environmental factors, organisational attributes, strategy and technology. D'Souza and Williams (2000) noted that there are external and internal drivers of flexibility. While the market situation and supply uncertainty (SU) are examples of external drivers, operating characteristics such as process similarity (PS) are internal drivers. Several literatures have

pointed out numerous drivers of flexibility. The following seven have been identified as dominant drivers. These seven drivers include both operating (internal) and environment (external) factors as follows: the length of product life cycle, product variety, customer requirements disparity, order stability, component commonality, process similarity, and supply uncertainty

3 Methodology

Deduction approach was used for this study as it seeks to identify and analyse supply chain flexibility in the printing industry within Kumasi. The study also used survey with multiple case strategy; the rationale for selecting the multiple case studies is to find a general trend in the industry as far as supply chain flexibility in the Printing industry was concerned and for generalisation (Saunders, 2009). The choice of the industry was made because of its growing nature and prospects in the future and Kumasi being a strategic location as the commercial hub of the country. Both primary and secondary data were used for the study. The primary data was sourced from presses in Kumasi. The target population was the entire printing industry in Kumasi. However, due to the informal nature of the industry in Kumasi, the population could not be quantified. Since all the printing companies could not be reached, the cluster sampling was used to select a representative sample for the study. The study area was divided into three clusters within the Kumasi Metropolis. These include Asafo Cluster, Adum Cluster and Ash town Cluster. The clusters were chosen because the printing companies are densely populated within those areas. The sample of the study was top management members of the sixty-nine printing presses selected from three clusters in the Kumasi Metropolis (Asafo Cluster, Adum Cluster and Ash town Cluster. Twenty (23) printing presses were then randomly selected using snowballing from each cluster giving the sample size of sixty-nine (69). Most of these presses were micro having a workforce of between one and nine of which one or two are top management.

The primary data was collected from respondents through the use of questionnaires. The questionnaire was designed using a 7-point Likert scale consisting of open-ended and close-ended questions. The questionnaires (self-administered) included five open-ended questions to allow for the expression of views from respondents. The researchers administered the questionnaires personally; each one took a cluster in the study area. After explaining the purpose of the study to the respondents, the questionnaires were left with them for two weeks after which the completed questionnaires were collected. Out of the sixty nine (69) questionnaires administered, 60 were returned representing 86.96% response rate. All data were coded and analysis were carried out using the Statistical Package for Social Sciences (SPSS) version 16.0 and Microsoft Excel 2007 Software to measure the means of all the factors of the responses, generate frequency, and percentage tables for discussion. To ensure validity and reliability, the Self-administered questionnaire was pilot tested to 9 management members (3 from each cluster) of the print industry in Kumasi. This helped the researchers to rectify any ambiguity with the questionnaires before finally administered. Notwithstanding, the challenges faced during the research, the reliability, validity, credibility, and accuracy of the result is assured.

4 Data Presentation, Analysis, and Discussions

4.1 Supply Chain Flexibility

The main reason for the conduct of this research was to find out the level of flexibility of the print industry in Kumasi. In order to understand the level of flexibility within the industry, four (4) types of flexibility were used: (sourcing flexibility, product flexibility, delivery flexibility, and information systems flexibility). Each of these factors had a number of variables testing them. The respondents were asked to indicate the extent to which they agree or disagree with the various variables testing the factors of Supply Chain flexibility within the print industry of Kumasi**.** The rating was a seven point likert scale, ranging from 1 = “Extremely Low” to 7 = “Extremely High”

4.2 Sourcing Flexibility

Table 4.1 Sourcing Flexibility

VARIABLES	No.	Minimum	Maximum	Mean	Std. Dev.
Operating efficiently and profitably at different levels of input arising from smooth flow of supplies	60	2.00	7.00	6.3167	1.35277
Your relationship with suppliers in managing the changing environment	60	2.00	7.00	4.7167	1.30308
Your suppliers coping with changing production volume and variety	60	2.00	7.00	5.5833	1.16868
Range of delivery frequency and possible order sizes	60	1.00	6.00	3.5333	1.14191
Costs and time implication of changing the schedule	60	1.00	7.00	3.8667	1.34626
Managing reasonably the cost of switching from one supplier to another	60	2.00	7.00	4.4333	1.28045
Managing the time and cost needed for out sourcing changing requirements	60	2.00	7.00	4.4833	1.22808
Cost of changing delivery times of order placed with suppliers	60	2.00	7.00	4.8667	1.15666

Source: (Author's construct based on the data gathered from the field survey, 2013)

Table 4.2 Sourcing Flexibility

VARIABLES	1		2		3		4		5		6		7	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Operating efficiently and profitably at different levels of output	0	0	2	3.2	4	6.1	8	12.1	21	31.8	19	28.8	5	7.6
Your relationship with suppliers in managing the changing environment	0	0	3	4.5	9	13.6	12	18.2	18	27.3	14	21.2	4	6.1
Your suppliers coping with changing production volume and variety	0	0	2	3.0	2	3.0	4	6.1	14	21.2	27	40.9	11	16.7
Range of delivery frequency and possible order sizes	1	1.5	9	13.6	22	33.3	17	25.8	7	10.6	4	6.1	0	0
Costs and time implication of changing the schedule	1	1.5	9	13.6	15	22.7	16	24.2	11	16.7	7	10.6	1	1.5
Managing reasonably the cost of switching from one supplier to another	0	0	5	7.6	10	15.2	14	21.2	17	25.8	13	19.7	1	1.5
Managing the time and cost needed for out sourcing changing requirements	0	0	3	4.5	10	15.2	19	28.8	12	18.2	15	22.7	1	1.5
Cost of changing delivery times of order placed with suppliers	0	0	2	3.0	2	3.0	21	31.8	17	25.8	13	19.7	5	7.6

Source: (Author's construct based on the field survey, 2013)

It is discernable enough from Table 4.1 that most of the mean ratings fell below 5 indicating that sourcing flexibility in the case companies were poor, with exception of two: 'Operating efficiently and profitably at different levels of output' with mean value of about 6.32 (SD=1.35), 'Your suppliers coping with changing production volume and variety' (mean=5.58, SD=1.17). The least factor was 'Range of delivery frequency and possible order sizes' (mean=3.53, SD=1.14). On the contrary, the individual responses from Table 4.2, shows that, the highest average percentages fell between "Average (4)" and "Very High (6)" threshold which means SC sourcing flexibility is relatively high. The average individual score for the scale indicates that the highest was "High (5)" with percentage value of 22.2 (n=14.6), followed by "Very High (6)" and "Average (4)" (21.2%, n=14) and (21%, n=13.9) respectively. The least among them was "Extremely Low (1)" (0.38%, n=0.25), followed by "Extremely High (7)" (5.31%, n=3.5). It is clear when comparing the two tables that, SC sourcing flexibility is relatively low.

4.3 Product Flexibility

Table 4.3 Product Flexibility

VARIABLES	No.	Minimum	Maximum	Mean	Std. Dev.
Developing a number of new products per year	60	2.00	6.00	3.7000	1.03006
Performing design activities concurrently	60	2.00	7.00	4.9167	1.26614
Involving and supporting design of suppliers in new product development	60	3.00	7.00	4.8500	1.17639
Using computer-aided design and aided-manufacturing, to create new products	60	3.00	7.00	5.1667	1.23737
Handling a number of new product development projects in design at a given time and at reasonable cost	60	2.00	7.00	5.0167	1.17158
Managing the cost and time to perform new design activities concurrently	60	2.00	7.00	4.4167	1.21141
Managing the time and cost to development new products	60	1.00	7.00	3.6667	1.48057
Modifying features and specifications of existing products	60	2.0	75.0	5.950	1.03006
Managing varying mix of products in the market place	60	1.00	6.00	4.1833	1.22808
Managing large number of different designs from many standard modules	60	1.00	7.00	4.6500	1.38790
Postponing product configurations until the customer orders are specified	60	1.00	34.00	4.6000	4.09713
Managing setup time and cost for most of the machines	60	2.00	7.00	4.6333	1.22082
Managing the time and cost of performing difficult and non standard products	60	1.00	7.00	3.5000	1.32127
Managing the cost and time of changing the production product mix in the plant	60	1.00	7.00	3.3167	1.47857

Source: (Author's construct based on the field survey, 2013)

Table 4.4 Product Flexibility

VARIABLES	1		2		3		4		5		6		7	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Developing a number of new products per year	0	0	6	9.1	21	31.8	22	33.3	7	10.6	4	6.1	0	0
Performing design activities concurrently	0	0	4	6.1	5	7.6	8	12.1	21	31.8	19	28.8	3	4.5
Involving and supporting design of suppliers in new product development	0	0	9	13.6	15	22.7	16	24.2	16	24.2	4	6.1	0	0
Using computer-aided design and aided-manufacturing, to create new products	0	0	0	0	8	12.1	8	12.1	19	28.8	16	24.2	0	0
Handling a number of new product development projects in design at a given time and at reasonable cost	0	0	2	3.0	4	6.1	10	15.2	25	37.9	13	19.7	6	9.1
Managing the cost and time to perform new design activities concurrently	0	0	3	4.5	13	19.7	13	19.7	19	28.8	11	16.7	1	1.5
Managing the time and cost to development new products	3	4.5	13	19.7	11	16.7	16	24.2	9	13.6	7	10.6	1	1.5
Modifying features and specifications of existing products	0	0	5	7.6	2	3.0	17	25.8	17	25.8	13	19.7	5	7.6
Managing varying mix of products in the market place	2	3.0	4	6.1	8	12.1	21	31.8	17	25.8	8	12.1	0	0
Managing large number of different designs from many standard modules	1	1.5	2	3.0	11	16.7	11	16.7	18	27.3	12	18.2	5	7.6
Postponing product configurations until the customer orders are specified	2	3.0	6	9.1	13	19.7	11	16.7	17	25.8	10	15.2	1	1.5
Managing setup time and cost for most of the machines	0	0	2	3.0	9	13.6	17	25.8	16	24.2	13	19.7	3	4.5
Managing the time and cost of performing difficult and non standard products	4	6.1	9	13.6	17	25.8	18	27.3	8	12.1	3	4.5	1	1.5
Managing the cost and time of changing the production product mix in the plant	3	4.5	20	30.3	13	19.7	9	13.6	11	16.7	2	3.0	2	3.0

Source: (Author's construct based on the field survey, 2013)

It is clear from Table 4.3 that most of the mean ratings fell below 5, indicating that product flexibility in the case

companies was not effective. Even though, three of the factors: 'Using computer-aided design and aided-manufacturing, to create new products' had mean value of about 5.17 (SD=1.24), 'Handling a number of new product development projects in design at a given time and at reasonable cost' (mean=5.02, SD=1.17) and 'Modifying features and specifications of existing products' (mean=5.95, SD=1.03). The least factor was 'Managing the cost and time of changing the production product mix in the plant' (mean=3.32, SD=1.48). The least factor was 'Managing the cost and time of changing the production product mix in the plant' (mean=3.32, SD=1.48), followed by 'Managing the time and cost of performing difficult and non standard products' (mean=3.5, SD=1.32). Also, the individual responses from Table 4.4 shows that, the highest average percentages fell between "low (3)" and "Very High (6)" threshold which means SC product flexibility is high. The average individual score for the scale indicates that, the highest was "High (5)" with percentage value of 23.8 (n=15.7), followed by "average (4)" and "low (3)" (21.3%, n=14.07) and (16.24%, n=11) respectively. The least among them was "Extremely Low (1)" (1.61%, n=1.1), followed by "Extremely High (7)" (3.02%, n=2).

4.4 Delivery flexibility

Table 4.5 Delivery flexibility

VARIABLES	No.	Minimum	Maximum	Mean	Std. Dev.
Managing the varying number of delivery modes available per product	60	1.00	7.00	5.1667	1.45167
Delivering urgent requests with different and faster modes of transportation	60	1.00	7.00	4.7167	1.54142
Handling one or more delivery order of a customer from more than one warehouses, distribution channels or factories	60	1.00	7.00	4.3667	1.44933
Managing small delivery order quantity from the customer can be satisfied	60	2.00	7.00	5.2667	1.14783
The time and the cost implications of changing the Delivery due dates	60	2.00	7.00	5.7333	1.26044
The cost of mixing different products into a delivery load	60	3.00	7.00	5.2000	1.07040
Managing the cost of delay in meeting customers' orders	60	1.00	7.00	4.6667	1.49197
Managing the time and the cost implications of changing the quantity and types of products to be delivered	60	1.00	6.00	2.9000	1.27159

Source: (Author's construct based on the field survey, 2013)

Table 4.6 Delivery flexibility

VARIABLES	1		2		3		4		5		6		7	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Managing the varying number of delivery modes available per product	1	1.5	3	4.5	4	6.1	7	10.6	18	27.3	16	24.2	11	16.7
Delivering urgent requests with different and faster modes of transportation	2	3.0	4	6.1	7	10.6	8	12.1	22	33.3	9	13.6	8	12.1
Handling one or more delivery order of a customer from more than one warehouses, distribution channels or factories	2	3.0	3	4.5	11	16.7	18	27.3	11	16.7	11	16.7	4	6.1
Managing small delivery order quantity from the customer can be satisfied	0	0	1	1.5	3	4.5	11	16.7	16	24.2	22	33.3	7	10.6
The time and the cost implications of changing the Delivery due dates	0	0	1	1.5	4	6.1	4	6.1	11	16.7	21	31.8	19	28.8
The cost of mixing different products into a delivery load	0	0	0	0	3	4.5	13	19.7	20	30.3	17	25.8	7	10.6
Managing the cost of delay in meeting customers' orders	2	3.0	4	6.1	4	6.1	16	24.2	17	25.8	10	15.2	7	10.6
Managing the time and the cost implications of changing the quantity and types of products to be delivered	7	10.6	19	28.8	15	22.7	14	21.2	2	3.0	3	4.5	0	0

Source: (Author's construct based on the field survey, 2013)

It is evident enough from Table 4.5 that almost all of the mean ratings were above 5 indicating that delivery flexibility in the case companies were relatively high, with exception of one: 'Managing the time and the cost implications of changing the quantity and types of products to be delivered' with mean value of about 2.9 (SD=1.27), The highest factor was 'The time and the cost implications of changing the Delivery due dates' (mean=5.73, SD=1.26) followed by 'Managing small delivery order quantity from the customer can be satisfied'(mean=5.27, SD=1.15) and 'The cost of mixing different products into a delivery load' (mean=5.2, SD=1.07). On the other hand, the frequency and percentage table for the individual responses (Table 4.6), shows that, the highest average percentages fell between "average (4)" and "very high (6)" threshold which means SC product flexibility is high. The average individual score for the scale indicates that the highest was "High (5)" with percentage value of about 22 (n=14), followed by "very high (6)" and "average (4)" (20.6%, n=13.6) and (17%, n=11) respectively. The least among them was "Extremely Low (1)" (2.6%, n=1.8), followed by "very low (2)" (6.6%, n=4.38). It can be said, comparing the two tables that, SC delivery flexibility is relatively high.

5 Summary of Key Findings, Conclusions, and Recommendations

5.1 Summary of Key Findings

The following are the summary of key findings with respect to the analysis of empirical data conclusions and finally, recommendations made based on the findings:

5.2 To examine the sourcing flexibility of printing presses in Kumasi.

The results from Table 4.1 indicates that most of the mean ratings of sourcing flexibility in the case companies were poor, with exception of the factor 'Operating efficiently and profitably at different levels of output' had a significant mean value of about 6.32 (SD=9.35). The least factor was 'Range of delivery frequency and possible order sizes' (mean=3.53, SD=1.14). The individual responses from Table 4.2 shows that, the highest average percentages fell between "Average (4)" and "Very High (6)" threshold which means SC sourcing flexibility is relatively high. The average individual score for the scale indicates that the highest was "High (5)" with percentage value of 22.2 (n=14.6), followed by "Very High (6)" (21.2%, n=14). The least among them was "Extremely Low (1)" (0.38%, n=0.25). It is clear when comparing the two tables that, SC sourcing flexibility is

relatively low to average. Although, the industry is operating efficiently to a large extent, it appeared the market does not require high flexibility. This is consistent with Suarez, et al (1995) findings that a company does not necessarily need flexibility if the market does not require that.

5.3 To assess the product flexibility of printing presses in Kumasi.
It is clear from Table 4.3 that most of the mean ratings fell below 'High' (5) indicating that product flexibility in the case companies was not effective. Eventhough, they were not too low, none of the mean ratings fell between 'Very High (6)' and 'Extremely High (7)'. The highest mean was 5.95, (SD=1.03) and the least mean=3.32, (SD=1.48). On the other hand, Table 4.4 shows that, the highest average percentages fell between "low (3)" and "Very High (6)" threshold which means SC product flexibility is relatively high but not encouraging. The average individual score for the scale indicates that, the highest was "High (5)" with percentage value of 23.8 (n=15.7), followed by "average (4)" and "low (3)" (21.3%, n=14.07) and (16.24%, n=11) respectively. The least among them was "Extremely Low (1)" (1.61%, n=1.1). Once again this confirms Suarez, et al (1995) findings that a company does not necessarily need flexibility if the market does not require that.

5.4 To examine the delivery flexibility of printing presses in Kumasi.
Table 4.5 shows that almost all of the mean ratings were above 5 indicating that delivery flexibility in the case companies were relatively high, with exception of one: 'Managing the time and the cost implications of changing the quantity and types of products to be delivered' with mean value of about 2.9 (SD=1.27), The highest mean was 5.73 (SD=1.26) followed by 5.27(SD=1.15) and 5.2, (SD=1.07). The frequency and percentage table of the individual responses (Table 4.6) confirms this, the highest average percentages fell between "average (4)" and "very high (6)" threshold which means SC product flexibility is high. The average individual score for the scale indicates that the highest was "High (5)" with percentage value of about 22 (n=14), followed by "very high (6)" and "average (4)" (20.6%, n=13.6) and (17%, n=11) respectively. It can be said that, SC delivery flexibility is relatively high, but needs improvement. This is in line with Fisher's (1997) argument that, innovative products need high flexibility.

5.5 Conclusion
The findings of the study indicate that, the mean ratings of sourcing flexibility in the case companies were poor, with exception of one that had a significant mean value of about 6.32 (SD=9.35) The individual responses also show that, the highest average percentages fell between "Average (4)" and "Very High (6)" threshold which means SC sourcing flexibility was seemingly high. On product flexibility the findings indicate that, most of the mean ratings fell below 'High' (5) showing that product flexibility within the case companies was not effective. Even though, they were not too low, none of the mean ratings fell between 'Very High (6)' and 'Extremely High (7)'. With delivery flexibility almost all of the mean ratings were above 5 indicating that delivery flexibility in the case companies were relatively high, with exception of one: 'Managing the time and the cost implications of changing the quantity and types of products to be delivered' with mean value of about 2.9 (SD=1.27), The highest mean was 5.73 (SD=1.26) Table 4.6. Table 4.7 confirms this, the highest average percentages fell between "average (4)" and "very high (6)" threshold which means SC product flexibility is high, but needs improvement. Based on the findings of the study, it is recommended that: One, Management should put measures in place to address the problems of low sourcing flexibility within the printing industry especially in Kumasi. Two, Management should work hard to improve product flexibility of printing presses in Kumasi. Three, management should maintain the standard and try to improve the delivery flexibility within the printing industry in Kumasi to improve performance. Finally, further study needs to be conducted to link flexibility with performance and also, to extend the study to all the printing presses in the ten regions in Ghana to have a clear picture of the state of SC flexibility in the Ghanaian print industry.

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