Supply Chain Information System Flexibility and Performance in the Print Industry in Some Selected Printing Press in Kumasi

Gladys Tuo
Stephen Okyere
Otchere Fianko Alexander

Department of Purchasing and Supply
Faculty of Business and Management Studies
Kumasi Polytechnic, Ghana
P. O. BOX SE2533/ 854 KUMASI

Abstract

Flexibility indeed has become a competitive weapon in the business world. The increase in competition has made supply chain flexibility even more important emerging issue for businesses. However, many companies around the world give little attention to flexibility within supply chains. This eventually affects performance and competitiveness of those businesses. This study sought to empirically; examine information systems flexibility and performance that leads to competitive advantage within the print industries in Kumasi. The study envisaged that the causes of the industries" inability to be flexible with information flow be identified and appropriate solutions found to curb the problems of poor performance. The study employed quantitative approaches with multiple cases to examine the information systems flexibility and performance on supply chain within the print industries in Kumasi. Primary and secondary data were used for the study. The primary data was sourced through Self-administered questionnaire through sixty (60) respondents in print industry in Kumasi within three clusters. Descriptive and inferential statistics were used to analyze the data with the aid of Statistical Package for Social Sciences (SPSS) and Microsoft Excel 2007 Software. The study revealed that, the sixty print industries stood strong in terms of supply chain performance and the information systems flexibility was comparatively high. The study also revealed that there was a positive correlation between information systems flexibility and performance. It is recommended therefore that, the management of the print industries, particularly in Kumasi should give consideration to information systems flexibility by putting measures in place to build strong information infrastructure that is robust and can respond quickly to market demand and forces to improve the standard of information systems and try to maintain high performance.

Key Words: Supply Chain Flexibility, Information System Flexibility, Performance, Print Industry, Kumasi

1. Introduction

The changing environment in which companies find themselves requires rapid new product introduction, quick response to customer requirements in all parts of the world and fast turn-round on customers' orders. Recent trends such as outsourcing and mass customization are forcing companies to find flexible ways to meet customer demands (Chase et al, 2006). 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, 1992).

Further, 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., 2007). In spite of its importance, Supply-chain is bedeviled with uncertainty which is an issue that every practising manager wrestles with, as increasing complexity of global supply networks (Simangunsong and Stevenson, 2012). As matter of fact, Supply chains' 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.

Increasing competition has made supply chain flexibility an important emerging issue for businesses (Kumar et al., 2006). Flexibility is the capacity to adjust to changes in product mix, production volume, or design as well as reaction to environmental uncertainty (Riley and Lockwood, 1997; Russell and Taylor 2009). It is highly advisable that to achieve the appreciable level of flexibility that adds value to customers, supply chain organizations must look beyond manufacturing flexibility (Kumar et al., 2006). Flexibility indeed has become a competitive weapon. It involves the ability to produce a wide variety of products, to introduce new product and modify existing ones quickly, and to respond to customer needs. In spite of 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 give little attention to supply chain flexibility and this eventually affects performance, lack of competitiveness, high cost of doing business, lost of market share, decline in growth and finally less profit margin. The question is that, how does printing presses in Kumasi adapting supply chain flexibility to improve performance? Companies should be able to predict future demands, resource requirements and consumer needs. These collaborative forecasting will help increase the performance of supply chain. Flexibility is a core factor that influences the performance of a supply chain (Zhao, Xie & Zhang, 2002). This paper was guided by the following objectives: one, to evaluate the information systems flexibility of printing presses in Kumasi; Two, to assess the supply chain performance of printing presses in Kumasi. It is hoped that this paper would help the print industry particularly the printing presses in Kumasi and beyond to appreciate the impact of supply chain flexibility on business performance and uncover a strategy that will assist them to effectively manage supply chain flexibility. It will also assist other organisations, which do not manage their supply chain flexibility effectively increase their performance to enhance the socio economic development of Ghana. Finally, the study will contribute to existing knowledge on supply chain flexibility and performance 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 consumable 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 (Laengle, et al., 1994; Hussain and Nassar, 2010; Otchere et al, 2013). Further, Supply chain is a set of three or more entities directly involve in the upstream and downstream flows of products services, finances and information from a source to a customer (Hadfield, 2002; Mentzer, 2001). Dangayach and Deshmukh, (2001) on the other hand, defined supply chain to encompass those flexibility dimensions that directly impact a firm's customers and are the shared responsibility of two or more functions along the supply chain, whether internal (marketing, manufacturing) or external (suppliers, channel members) to the firm.

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 and low cost supply chains have been important drivers for companies. Depending on the market the firm is in, these supply chains work perfectly in steady conditions since the entire supply chain is focused on economies of scale, delivering quick supply with least amount of money. However, these supply chains are not able to react on 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 (Giannoccaro et al, 2003). Also, a study conducted by Berry and Cooper, (1999) has shown that productivity of a production system decreases when the product variety (PV) is increased. This suggests that in order to be competitive in the marketplace, a supply chain is required to be able to produce various different products and deliver to the market in an acceptable speed and cost. This implies that flexibility is an important competitive advantage for which supply chain should pursue to win the intense competition.

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 to the ability and the requirements to be flexible. 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.

In a nutshell, flexibility in the context of a manufacturing system is no longer adequate in the current competition. Flexibility should therefore be pursued by supply chain, or at least by every function related to supply chain activities. In their review of empirical research on manufacturing flexibility, Vokurka & O'Leary-Kelly (2000) presented 15 dimensions of manufacturing flexibility. Many of the dimensions are the same as those identified in Koste & Malhotra (1999), which focused on elements of manufacturing flexibility. Although the latter identified other types of flexibility such as market and delivery flexibility, it seems that the focus is not specifically on the interface between channels in the supply chain. As stated by Golden and Powell cited in Ketchen & Hult, (2007), flexibility requires inter organisational data sharing in a supply chain. Despite its importance, the availability of the literature addressing supply chain flexibility is still limited to date.

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. D'souza and Williams, (2000) classified manufacturing flexibility 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. The authors offered a quite general definition on the two elements. Range was defined as the range of output volumes at which the firm can run profitably.

Mobility, on the other hand, was measured in terms of the cost implication and the time required increasing or decreasing the volume of output. Koste and Malhotra, (1999) also presented a comprehensive review on manufacturing flexibility based on previous literature. The dimensions include flexibility in machine, labour, material handling, routing, operations, expansion, volume, 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 internal flexibility in a manufacturing system. Furthermore, Nemeth P., (2008) defined flexibility as consisting of two dimensions, temporal and intentional.

In expanding the framework he identified four dominant dimensions of flexibility in his literature. The first is temporal; how long it takes an organization to adapt. The second is range; the number of options that an organization has open to it for change that was foreseen and the number of options it has available to react to unforeseen change. The third is intention; whether the organization is being proactive or reactive. The final dimension of flexibility is focus; specifically whether the flexibility is gained internally to the organization or by managing external relationships with trading partners. 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

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. (2002), proposed four dimensions of supply chain flexibility as: sourcing, product design, manufacturing/production and delivery. All the four dimensions will lead to improved performance if information system flexibility is effectively in place. From the perspective of Angel & Manuela (2005), Information systems flexibility is the ability to align information system architectures and systems with the changing information needs of the organization as it responds to changing customer demand.

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 and O'Leary-Kelly (2000) classified external factors on manufacturing flexibility into environmental factors, organisational attributes, strategy and technology. D'Souza and Williams (2000) also 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 literature have pointed out numerous drivers of flexibility, the following seven have been identified as dominate 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.

2.5 Supply Chain Performance

The most effective relationships exist where supply chain partners have been made aware of what performance standards they are being held accountable for (Stuart and McCutcheon, 2000). Selecting performance measures is intended to make sure companies accomplish the specific (collaborative) goals that they set. The supply chain performance measures that an organization sets for itself and others should be specific, measurable and evaluated at regular intervals, and whatever measures are selected should be enforced (Tummala *et al.*, 2006). Supply chain companies have realized the importance of financial and non-financial performance measures (Fantazy *et al.*, 2010). An effective performance measurement system ought to cover all aspects of performance that are relevant for the existence of an organization and the means by which it achieves success and growth (Kaplan and Norton, 1996; Hillman and Keim, 2001). This means that any performance measurement system ought to include more than just financial measures. This point is well established as many authors contend that any credible model of performance measurement must have more than one criterion (O'Regan and Ghobadian, 2004).

This view is consistent with earlier literature concerning organizational performance. A broader conceptualization of business performance includes emphasis on indicators of operational performance (i.e. non-financial) in addition to financial indicators. According to Venkatraman and Ramanujam (1986), the inclusion of performance indicators takes us beyond the black-box approach that seems to characterize the exclusive use of financial indicators and focuses on those key operational success factors that might lead to financial performance. Other important factors to consider in the design of a cost-effective, and viable, performance measurement system in supply chain flexibility concerns the use of new technologies, such as mobile telephones and computer networks, the latter of which can provide real-time performance information to managers interested in tracking employee performance and service delivery results.

3. Methodology

Deduction approach was used for this study as it seeks to identify and analysed supply chain flexibility in the printing industry within Kumasi. The study also used survey with multi case strategy; the rationale for selecting the multiple case studies was to find a general trend in the industry as far as supply chain flexibility in the Printing industry was concerned (Saunders, 2007). The choice of the industry was made because of its growing nature and prospects in the future as well as the strategic location of Kumasi as a commercial hub of the country and easy access to information. Both primary and secondary data were used for the study. The primary data was sourced from printing 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 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 Ashtown Cluster). These clusters were chosen because the printing companies are densely populated within those areas. Twenty (23) printing presses were then randomly selected 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 rating scale consists 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 secondary sources of data were however, obtained from the annual reports, manuals and guidelines of Printing Press, journals, articles, books on supply chain flexibility as well as organizations' websites. 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 frequencies, percentages tables and graphs for discussion. To ensure validity and reliability, the self-administered questionnaire was pilot tested to 5 management members 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 Information Systems Flexibility

Table 4.1 information systems flexibility

VARIABLES	No.	Minimum	Maximum	Mean	Std. Dev.
The degree of commonality of information systems for supporting changing requirements	60	1.00	6.00	3.2333	1.39450
Speeding the flow of information throughout the supply chain network	60	2.00	7.00	5.5667	1.24010
The ease with which changes can be made to the IT hardware and software	60	1.00	7.00	3.4500	1.26792
Meeting varying information needs from existing information systems	60	2.00	7.00	4.6833	1.01667
The efficiency of the existing information systems applications to integrate with other systems applications	60	2.00	7.00	5.2500	1.25718
Managing time and cost for exchanging the required information	60	1.00	6.00	4.4500	1.38301
Managing time and cost for installing and maintaining IT applications	60	2.00	7.00	5.3167	1.11221
The cost of updating the IT systems to support changing requirements	60	1.00	7.00	4.7667	1.47713

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

Table 4.2 Information systems flexibility

VARIABLES	1		2		3		4		5		6		7	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
The degree of commonality of information systems for supporting changing requirements	4	6.1	19	28.8	12	18.2	14	21.2	6	9.1	5	7.6	0	0
Speeding the flow of information throughout the supply chain network	0	0	3	4.5	1	1.5	3	4.5	19	28.8	20	30.3	14	21.2
The ease with which changes can be made to the IT hardware and software	2	3.0	12	18.2	21	31.8	10	15.2	13	19.7	1	1.5	1	1.5
Meeting varying information needs from existing information systems	0	0	2	3.0	5	7.6	15	22.7	27	40.9	10	15.2	1	1.5
The efficiency of the existing information systems applications to integrate with other systems applications	0	0	1	1.5	5	7.6	9	13.6	19	28.8	15	22.7	11	16.7
Managing time and cost for exchanging the required information	2	3.0	4	6.1	9	13.6	11	16.7	18	27.3	16	24.2	0	0
Managing time and cost for installing and maintaining IT applications	0	0	1	1.5	2	3.0	10	15.2	19	28.8	20	30.3	8	12.1
The cost of updating the IT systems to support changing requirements	1	1.5	6	9.1	4	6.1	11	16.7	15	22.7	19	28.8	4	6.1

Source: (Authors' construct based on the field survey, 2013

It could be discern from Table 4.1 that out of the eight mean ratings 5 were above average (4) indicating that information systems flexibility in the case companies were relatively high but not very high. The information systems flexibility with mean ratings above 5 include: 'Speeding the flow of information throughout the supply chain network' with mean value of about 5.57 (SD=1.24), 'The efficiency of the existing information systems applications to integrate with other systems applications' (mean=5.25, SD=1.26) and 'Managing time and cost for installing and maintaining IT applications' (mean=5.32, SD=1.11). The least factor was 'The degree of commonality of information systems for supporting changing requirements' (mean=3.23, SD=1.39). With the frequency and percentage table of the individual responses (Table 4.2), shows that, the highest average percentages fell between "Average (4)" and "Very High (6)" thresholds which means SC information systems flexibility is relatively high. The average individual score for the scale indicates that the highest was "High (5)" with percentage value of 26% (n=17), followed by "Very High (6)" and "Average (4)" (20%, n=13) and (16%, n=10) respectively. The least among them was "Extremely Low (1)" (1.7%, n=1.1), followed by "Extremely High (7)" (7.39%, n=4.9).

4.1 Supply Chain Performance

The reason for conducting this research was to assess information systems flexibility and performance level within the print industry in Kumasi as a follow up to an earlier work done on types of flexibility. Respondents were asked to rate the factors of information systems flexibility on performance within the print industry in Kumasi**.** The rating was a seven point likert scale, ranging from 1 = "Extremely Low" to 7 = "Extremely High" (Table 4.3 and Figure 4.1 to 4.6).

Table 4.3 supply chain performance

VARIABLES	No.	Minimum	Maximum	Mean	Std. Dev.
Average net profit	60	1.00	7.00	4.7667	1.35755
Average sales growth rate	60	1.00	7.00	5.1500	1.16190
Order lead-time	60	3.00	7.00	5.0500	1.24090
Response time to customer query time	60	2.00	7.00	4.7833	1.62701
Level of customer perceived value of product	60	3.00	7.00	5.6333	1.02456
Level of service systems to meet particular customer needs	60	2.00	77.00	6.9333	9.27886

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

Figure 4.1 Average net profit

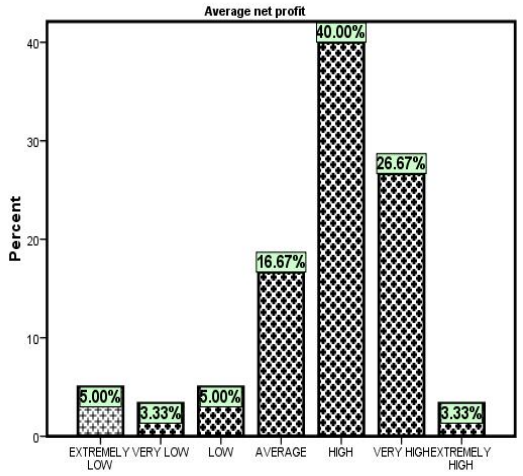
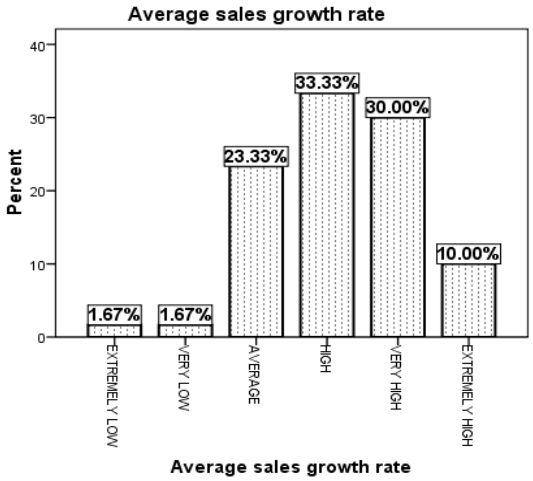


Figure 4.2 Average sales growth rate



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

It is obvious from Table 4.3 that most of the mean ratings fell above 5 indicating that performance in the case companies were very good, with exception of two: 'Average net profit' with mean value of about 4.77 (SD=1.36) and 'Response time to customer query time' (mean=4.78, SD=1.63). The highest factor was 'Level of service systems to meet particular customer needs' (mean=6.93, SD=9.28) which is very significant. With Figure 4.1 'Average net profit' the highest percentage was 40% in favour of 'High' (5) followed by 'Very High' (26.67%). The least was 'Very Low' and 'Extremely Low' (3.33%). On 'Average sales growth rate' (Figure 4.2) the highest percentage was 33.33% in favour of 'High' (5) followed by 'Very High' (30%). The least was a tie 'Extremely Low' and 'Very Low' (1.67%); this means that 'High' is dominant for the two variables.

Figure 4.3 Order lead-time

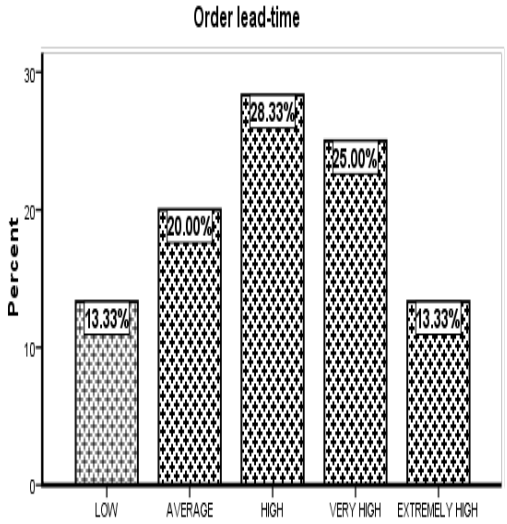
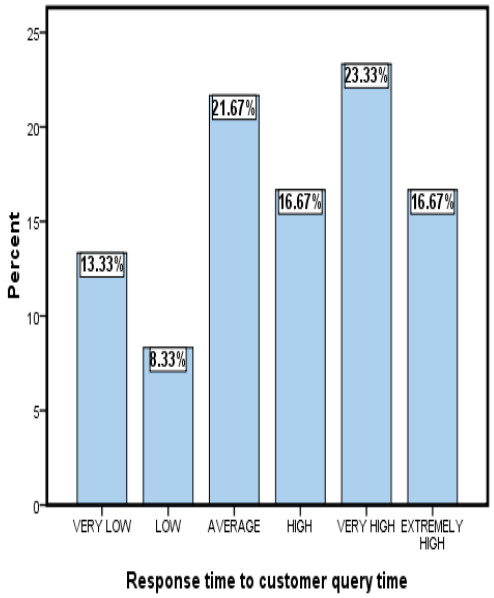


Figure 4.4 Response time to customer query time



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

With Figure 4.3 'Order lead-time' the highest percentage was 28.33% in favour of 'High' (5) followed by 'Very High' (25%). The least was once again a tie 'Low' and 'Extremely High' (13.33%). With Figure 4.4 'Response time to customer query time' the highest percentage was 'Very High' (5) (23.33), followed by 'Average' (21.67%). The least was 'Low' (8.33%).

Figure 4.5 Level of customer perceived value of product

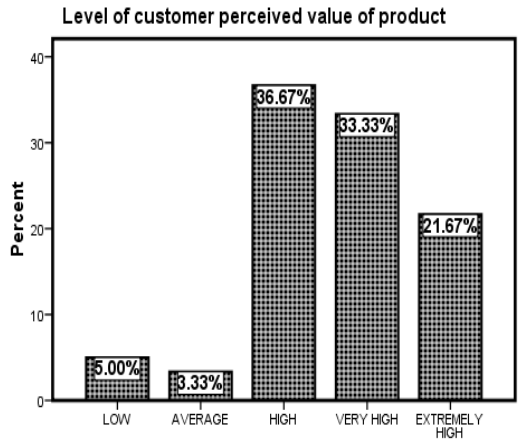
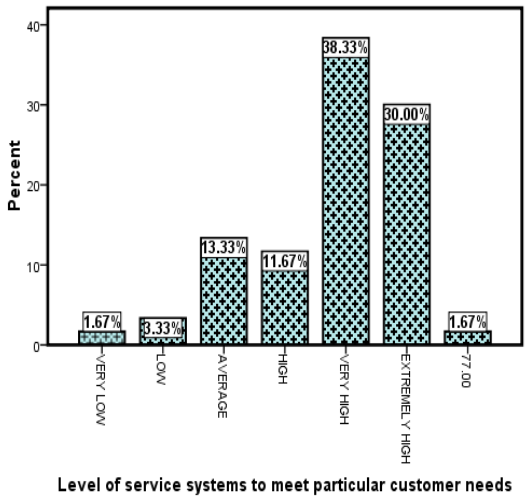


Figure 4.6 Level of service systems to meet particular customer needs



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

With respect to Figure 4.5 'Level of customer perceived value of product', the highest percentage was 36.67% in favour of 'High' (5) followed by 'Very High' (33.33%) and the least was 'Average' (3.33%). Finally, 'Level of service systems to meet particular customer needs' Figure 4.6 shows that, the highest percentage was 'Very High' (5), (38.33%) followed by 'Extremely High' (30%). The least was 'Very Low' (1.67%).

5. Summary of Key Findings

The following are the summary of key findings with respect to the analysis of empirical data:

5.5 To evaluate the information systems flexibility of printing presses in Kumasi.

Results from Table 4.1 portrays that, out of the eight mean ratings 5 were above average (4) indicating that information systems flexibility in the case companies was relatively high but not very high. The mean ratings above 'High' (5) were: 5.57 (SD=1.24), 5.32, (SD=1.11) and 5.25, (SD=1.26). The least factor was 'The degree of commonality of information systems for supporting changing requirements' (mean=3.23, SD=1.39). On the frequency and percentage table of the individual responses (Table 4.2), the highest average percentages fell between "Average (4)" and "Very High (6)" threshold which means SC information systems flexibility is relatively high. The average individual score for the scale indicates that the highest was "High (5)" with percentage value of 26% (n=17), followed by "Very High (6)" and "Average (4)" (20%, n=13) and (16%, n=10) respectively. This confirms Fisher's assertion that innovative products require high flexibility (Fisher, 1997).

5.1To assess the supply chain performance of printing presses in Kumasi.

It is discerning from Table 4.3 that most of the mean ratings fell above 5 indicating that performance in the case companies were very good, The highest factor was 'Level of service systems to meet particular customer needs' (mean=6.93, SD=9.28) which is very significant. Both Figures 4.1, 4.2 and 4.3 indicated the high percentages. With Figure 4.4 the highest percentage was 'Very High' (6) (23.33), followed by 'Average' (21.67%). The least was 'Low' (8.33%). With respect to Figure 4.5 'Level of customer perceived value of product' the highest percentage was 36.67% in favour of 'High' (5) followed by 'Very High' (33.33%). Finally, 'Level of service systems to meet particular customer needs' Figure 4.6 shows that, the highest percentage was 'Very High' (6), (38.33%) followed by 'Extremely High' (30%). This indicates that performance was good. This is consistent with the assertion that an effective performance measurement system ought to cover all aspects of performance that are relevant for the existence of an organization and the means by which it achieves success and growth (Kaplan and Norton, 1996; Hillman and Keim, 2001). This means that any performance measurement system ought to include more than just SC flexibility. This point is well established as many authors contend that any credible model of performance measurement must have more than one criterion (O'Regan and Ghobadian, 2004).

Conclusion

In a nutshell, it was evident with information systems flexibility that, five out of the eight mean ratings were above average (4) indicating that information systems flexibility in the case companies were relatively high but not very high. Three of the mean ratings were above 'High' (5) with 5.57 (SD=1.24), being the highest. The highest average percentages from the frequency and percentage table fell between "Average (4)" and "Very High (6)" threshold which means SC information systems flexibility is relatively high. Again, it is discerning from the findings of the study that, most of the mean ratings for performance metrics fell above 5 indicating that Supply chain performance in the case companies were high, The highest factor was Level of service systems to meet particular customer needs (mean=6.93, SD=9.28), this is highly significant (Table 4.3). Figures 4.1, 4.2, 4.3 and 4.6 indicated that the highest percentages were 'high'. Furthermore, with Figure 4.4 and 4.5 the highest percentages were 'Very High' (6). These indicate that performance was good. However, all performance measurement system ought to include more than just SC flexibility. This explains why performance was high in spite of some of the categories of flexibility being on the low side. It is recommended that, management of the printing presses in Kumasi should maintain the standard of information systems flexibility within the printing industry in Kumasi to improve performance and to maintain the standard of performance as well as finding ways to improve them the more. Finally, the study needs to be extended to all the printing industries of the ten (10) regions in Ghana to have a clear picture of the state of SC flexibility and performance in the Ghanaian print industry.

Reference

Angel M. S. & Manuela P. (2005) Supply chain flexibility and firm performance. *International Journal of Operations & Production Management*, 25(7)

Baharanchi, S. R. H. (2009) Investigation of the Impact of Supply Chain Integration on Product Innovation and Quality Transaction. *E: Industrial Engineering,* 16(1), 81-89.

Berry, W.L. and Cooper, M.C. (1999) 'Manufacturing flexibility: methods for measuring the impact of product variety on performance in process industries', Journal of Operations Management, Vol. 17, pp.163–178.

Chase, R.B., et, al. (2006). *Operations Management for Competitive Advantage.* New Delhi: Tata-McGraw-Hill, 11th ed.

Christopher M. (2003) The Agile Supply Chain: Competing in volatile markets, URL: www.martin-christopher.ino, 1.10.2003

Dangayach, G. and Deshmukh, S. (2001), "Manufacturing strategy: literature review and some issues", International Journal of Operations & Production Management, Vol. 21 No. 7, pp. 884-932.

D'Souza, D. E. and Williams, F. P. (2000) Toward a taxonomy of manufacturing flexibility Dimensions. *Journal of Operations Management*, (18), 577–593.

Fantazy K. A., Kumar V., & Kumar U. (2010) Supply management practices and performance in the Canadian hospitality industry. *International Journal of Hospitality Management*, 29(4): 685-693.

Fawcett, S.E. and Magnan, G.M. . (2002). *The rhetoric and reality of supply chain integration.*

International Journal of Physical Distribution & Logistics Management, Vol. 32 No. 5, P. 339-61.

Fisher, M. L. (1997) What is the right supply chain for your products? *Harvard Business Review*, March–April, p.105–116

Giannoccaro, I., Pontrantrandolfo, P., Scozzi, B. (2003) Uncertainty in supply chain inventory management: a fuzzy approach, in European Journal of Operational Research 149: 185–196.

Giannoccaro, I. and Pontrandolfo, P., (2002) Inventory management in supply chains: a Reinforcement learning approach. *International Journal of Production Economics* 78(2), 153–161

Handfield, et al (2002), "Supply Chain Redesign: Transforming Supply Chains into Integrated Value Systems", Prentice Hall, Upper Saddle River, NJ07458, Pp.38

Hussain A. H. A., Nassar M. O., (2010) Supply Chain Integration: Definition and Challenges. *Proceedings of Multinational Conference of Engineers and Computer Scientist,*1,Hong Kong.

Ketchen Jr., D. J. & Hult, G. T. M. (2007) Bridging organization theory and supply chain management: The case of best value supply chains. *Journal of Operations Management*, 25:573-580

Koste, L. L. and Malhotra, M. K. (1999) A theoretical framework for analyzing the dimensions of manufacturing flexibility, *Journal of Operations Management*, 18:75–93

Laengle, K., Griffin, P. M. and Griffin, S.O. (1994) A quantification of economic value of flexible capacity, *International Journal of Production Research*, 32(6): 1421–1430

Lambert D. M. (2008) An Executive Summay of Supply Chain Management: Processes, Partnerships, Per45formance. *Supply Chain Management Institute*

Lee, H. L., (2004) A triple-A supply chain, in *Harvard Business Review* 82(10): 102-112.

Mentzer J. (2001), Defining Supply Chain Management, Journal of Business Logistics, vol.22

Narasimhan, R., (1997). Strategic supply management: a total quality management imperative. *Advances in the Management of Organizational Qality,* 2, 39-86.

Nemeth P., (2008) Flexibility in Supply Chain Management, Acta technical Jaurinesis Series Logistica, Vol.1

Otchere, A. F., Annan, J. & Anin, E. K., (2013) Achieving Competitive Advantage through Supply Chain Integration in the Cocoa Industry: A Case Study of Olam Ghana Limited and Produce Buying Company Limited. *International Journal of Business and Social Research (IJBSR).* 3(2), 131-145

Saunders M, Lewis P, & Thornhill A, (2009) Research Methods for Business Students, 5th ed. London, FT/Prentice Hall.

Suarez, F. F., Cusumano, M. A. and Fine, C. H. (1995) An empirical study of flexibility in Manufacturing. Sloan Management Review, Fall, :25–32.

Swafford, P., Ghosh, S. and Murthy, N. (2000) A model of global supply chain agility and its impact on competitive performance, Proceedings of the 31st National DSI Meeting, Orlando, Florida, November 2000, pp.1037–1039.

Takahashi, K., Hiraki, S. and Soshiroda, M. (1994) Flexibility of production ordering Systems. *International Journal of Production Research*, 32(7):1739–1752.

Vickery S., R. Calantone, C. Droge, (1999) Supply Chain flexibility: An Empirical Study. *The Journal of Supply Chain Management*, pp. 16-24.

Viswanadham, N., Srinivasa Raghavan, N. R., (1997) Flexibility in manufacturing enterprises, In Sädhanä vol. 22 (2): 135-163.

Vokurka, R.J. and O'Leary-Kelly, S.W. (2000) A review of empirical research on manufacturing flexibility, *Journal of Operations Management*, 18: 485–501.

Zhao X, Xie J, Zhang W. J., (2002) The impact of information sharing and ordering co-ordination on supply chain performance. *Supply Chain Management: An International Journal*, 7(1): 24-40.