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Effects of Lean Production on Supply Chain Performance in the Automotive Industry in Kenya

(A CASE OF SIMBA COLT MOTORS)

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ABSTRACT

Businesses of all sizes can use the principles of lean enterprise to help eliminate waste, reduce costs and boost productivity. The benefits of achieving process and quality improvements in the workplace are open to private and public companies across all sectors, including areas such as commerce and healthcare alongside traditional industry employers. The core idea is to maximize customer value while minimizing waste. Simply, lean means creating more value for customers with fewer resources. The objective of this study was to determine the effects of lean production on supply chain management. The study will be limited to Simba colt motors in Nairobi, Kenya. This study will adopted a descriptive survey design.The target population

of this study was 100 employees in the supply chain department, parts department, production department and Logistics department. The study used both secondary and primary data. Secondary data was obtained from the handbooks and data base while primary data will be collected through questionnaires which contained questions designed to elicit data in accordance with the research questions. Questionnaires was used to collect primary data from respondents and they will be designed to address the various research objectives. With the aid of Statistical Package for Social Sciences (SPSS) Version 21, the research performed multiple regressions and the most significant lean production factors influencing supply chain performance were: continuous improvement and Just in Time production.

Background of the Study

Universally, the automotive industry has been accepted as a major driver of growth of a nation's economy and is a significant contributor to the global economy. The automobile has been described as a both a form and a function based product involving high level of engineering as well as being positioned as a fashion product (Ross, 20004). The industry has rightly been called as the industry of industries since it uses outputs of nearly all manufacturing industries and supports upstream (mining, steel etc) and downstream industries (finance, insurance, after-market etc)

Although the industry is considered vibrant companies are facing a problem of broad production in their organization which results in a lot wastages. This has caused many companies problems of wastes along the supply chain. Logistics and procurement managers are therefore bound to embrace the essence of adopting lean production which is a business initiative to reduce waste in production (Lewis, 2000).

According to Ward (2003), the top five global supply chain challenges are visibility, cost containment, risk management, increasing customer demands and globalization. It is interesting to note that automotive supply chains, globally, lag behind other supply chains such as retail and pharmaceutical in the five parameters clearly indicating the need for and scope of

considerable improvements to make them more effective and responsive. The surge in demand in the last decade has put sudden pressure on the existing global auto industry and auto component manufacturers with hardly any integration, to quickly adopt global standards and practices and introduce lean production to vitalize the supply chain processes.

Supply chain performance in the automotive sector has to contend with peculiarities in the Kenyan market which are distinctly different from those in developed countries. Preference for second hand cars, lack of visibility at the customer end especially in the rural markets, packaging complexities due to language and cultural diversity, quality challenge due to resource shortcomings, lack of infrastructure and a multilevel distribution system impacting price of products are some of the major challenges affecting supply chain, the biggest challenge being integration of lean processes in the supply chain, followed by managing in bound logistic, product and part proliferation.(Kinoro, 2013)

According to Barla (2003), the heart of lean production is a focus on the reduction of inventory and lead times. Production is driven by real customer orders, rather than forecasts that anticipate market demand. This means that demand “pulls” a product through production, rather than management forecasts “pushing” it onto the shop floor.

Global Perspective of Supply Chain Performance in Automotive Industry

In the old days national companies of multinationals where run as independent subsidiaries with full control over their value chains. Now the value chains of more and more industries are

globalizing. Value creation happens in the countries that possess comparative advantage for each functional activity. Manufacturing is in China. Customer service is in India and Sales and Marketing is (still) placed in the Western countries where the demand is. Customer preferences are based on national cultures but the underlying business processes span countries and regions. On top of this, globalization changes market demands faster than before. Local customer preferences are influenced through contact with people from other countries and through the reading of international media and online reviews (Martin, 2007).

The consequences of such trends are that business processes on the one hand become much more complex and on the other need to develop and adapt to changes more frequently than before. This poses great challenges for the individuals who try to improve them through Lean principles. Lean production is a systemic method for the elimination of waste within a manufacturing process. Lean also takes into account waste created through overburden and waste created through unevenness in workloads. Working from the perspective of the client who consumes a product or service, "value" is any action or process that a customer would be willing to pay for. Businesses of all sizes can use the principles of lean enterprise to help eliminate waste, reduce costs and boost productivity. The benefits of achieving process and quality improvements in the workplace are open to private and public companies across all sectors, including areas such as commerce and healthcare alongside traditional industry employers. The core idea is to maximize **customer value** while minimizing waste. Simply, lean means creating more value for customers with fewer resources (Hines*et al*, 2004).

To accomplish this, lean thinking changes the focus of management from optimizing separate technologies, assets, and vertical departments to optimizing the flow of products and services through entire value streams that flow horizontally across technologies, assets, and departments to customers (Lewis, 2000). Eliminating waste along entire value streams, instead of at isolated

points, creates processes that need less human effort, less space, less capital, and less time to make products and services at far less costs and with much fewer defects, compared with traditional business systems. Companies are able to respond to changing customer desires with high variety, high quality, low cost, and with very fast throughput times. Also, information management becomes much simpler and more accurate. A popular misconception is that lean is suited only for manufacturing. Not true. Lean applies in every business and every process. It is not a tactic or a cost reduction program, but a way of thinking and acting for an entire organization (Rothenberg & Cost 2004).

Businesses in all industries and services, including healthcare and governments, are using lean principles as the way they think and do. Many organizations choose not to use the word lean, but to label what they do as their own system, such as the Toyota Production System or the Danaher Business System. Lean is not a program or short term cost reduction program, but the way the company operates. The word **transformation or lean transformation** is often used to characterize a company moving from an old way of thinking to lean thinking. It requires a complete transformation on how a company conducts business. This takes a long-term perspective and perseverance (Al-Hakim, 2005).

Local perspective of Supply Chain Performance on Automotive Industry

For a firm to remain competitive, it must be able to continuously deliver quality goods, at competitive cost, and with timely delivery. This is perhaps even more crucial in a global economy that thrives on E-Commerce and E-Business. The traditional market for a business that comprised the local area has now been redefined as regional trading blocs become popular. In the case of Kenya, East Africa Community market integration and the Common Market of East and Southern Africa, COMESA , block have made Kenya accessible and be able to access

19 other African states with a market size of over 400 million people (Rothenberg & Cost, 2004).

Such an opportunity has its pros and cons. On one side, it represents potential for competitive Kenyan companies to tap into a market size 10 times that of Kenya. On the other side, however, it exposes the underbelly of weak Kenyan companies to external competition. Perhaps, the Small and Medium Enterprises are the firms that are most exposed by such external competition. According to the Kenya National Bureau of Statistics (KNBS), in 2007, three out of five businesses did not operate past a few months of their registration. This suggests a survival rate of lower than 40% in the first year, these points to the weak competitive position that most SMEs occupy. It is therefore imperative to have the business performance of SMEs improve (Lewis, 2000).

Various methods are available to effect these improvements. They include techniques like business process re-engineering, use of information technology, robotics, and automation to mention but a few. Generally, these improvement methods can be classified as being Dramatic or Non-Dramatic. Dramatic improvement methods aim at bringing rapid significant improvement in business processes. These changes are usually associated with high investment costs. Business process re-engineering, innovation and full automation are examples of these. Non-dramatic improvements aim at achieving small and often incremental improvements in key result areas. This approach is often practiced where improvement is required but the capital investment is not available. Semi automation and Lean are examples of these (Barla, 2003).

According to Naagarazan and Arivalagar (2006), lean is a philosophy that defines management's role in continuously encouraging and implementing small improvements involving every person with the ultimate aim of ensuring that all activities, money and processes are geared to creating value for the customer. The steps for implementing lean

include: identification of problems; prioritizing problems; analyzing problems using P-D-C-A cycle; selection of idea/solution; reporting for approval, and; implementation.

Lean is derived heavily from the Toyota Production System – TPS which relied heavily on 2 concepts –Just-In- Time and Jidoka. In practice, methods employed by Lean are applicable to any size of business from small to large, and usually involve little or no capital investment (Taylor & Pettit, 2009).

Lean Production

Lean production is a business model and collection of tactical methods that emphasize eliminating non-value added activities (waste) while delivering quality products on time at least cost with greater efficiency. Lean production aims to cut costs by making the business more efficient and responsive to market needs. (Ward, 2003)

According to Towill (2005), this approach sets out to cut out all activities that do not add value to the production process, such as holding of stock, repairing faulty product and unnecessary movement of people and product around the plant.

The most important aspects of lean production for current UK A-level specifications are as follows:, Just in time production (JIT) , Cell production , Kaizen (Continuous improvement) , Quality Circles , Total Quality Management (TQM) and zero defect production , Time based management , Simultaneous engineering (Ilyas*et al*, 2008).

Lean implementation is therefore focused on getting the right things to the right place at the right time in the right quantity to achieve perfect work flow, while minimizing waste and being flexible and able to change. These concepts of flexibility and change are principally required to allow production leveling, using tools like SMED, but have their analogues in other processes such as research and development (R&D). The flexibility and ability to change are

within bounds and not open-ended and therefore often not expensive capability requirements. More importantly, all of these concepts have to be understood, appreciated, and embraced by the actual employees who build the products and therefore own the processes that deliver the value. The cultural and managerial aspects of lean are possibly more important than the actual tools or methodologies of production itself. There are many examples of lean tool implementation without sustained benefit, and these are often blamed on weak understanding of lean throughout the whole organization (Martin, 2007).

Lean production is quite simply about getting more from less. The aim of lean production is to reduce the quantity of resources used in providing goods and services for consumers. At the same time, it is about making the organization more efficient. Lean production involves eliminating waste and therefore using less labor, materials, space and time. This in turn reduces costs (Lewis, 2000).

Statement of the Problem

Lean production is perceived as a proactive tool for lowering cost of production, increasing the productivity of human resources and focusing on customer satisfaction. This implies by extension that implementation of lean production practices is associated with the business orientation that aim at gaining market advantage hence supply chain performance. According to Reeds *et al.* (1996) customer focus orientation of lean production aims at gaining market advantage by outperforming competitors in terms of attracting more customers with distinguished products and charge premium prices.

The automotive industry in Kenya has had declining revenue for several years due to severe competition from the second hand cars. As a result there is the danger of falling behind the market which would be detrimental to the overall profitability of the company (Awuor, 2013). In Kenya supply chain has experienced lack of direction, poor coordination and lack of total

quality management. Consequently lack of qualified supply chain specialists to conduct and manage supply chains in a timely and cost effective manner (Baily, 2004).

Most of the past studies conducted on lean production focused more on implementation status and not practices and also were conducted in developed countries only. In Asia, Teng and Quazi carried out a study to investigate the aims of implementing lean production alongside the relationship between its implementation and the level of economic growth. They found out that there was a positive correlation between the level of economic growth and adoption of quality management.

The only studies which focused on lean production were by Chong and Rundus (2003) in Australia and Mutunga (2003) in Kenya. They analyzed firms in Australian on the role of lean production in enhancing competitive positioning of an organization and observed that, where there is a high degree of market competition, the more lean production are successfully aligned towards customer focus, organization performance and product differentiation.

To bridge this gap, this study aims at holistically investigating how auto mobile industries are implementing lean production in line with differentiation as a competitive strategy.Because of this the automotive industry in Kenya is still in its infancy despite the industry being one of the largest in Africa. thus necessary to carry a study on the effects of lean production on supply chain performance, taking a case of Simba Colt Motors.

Objectives of the Study

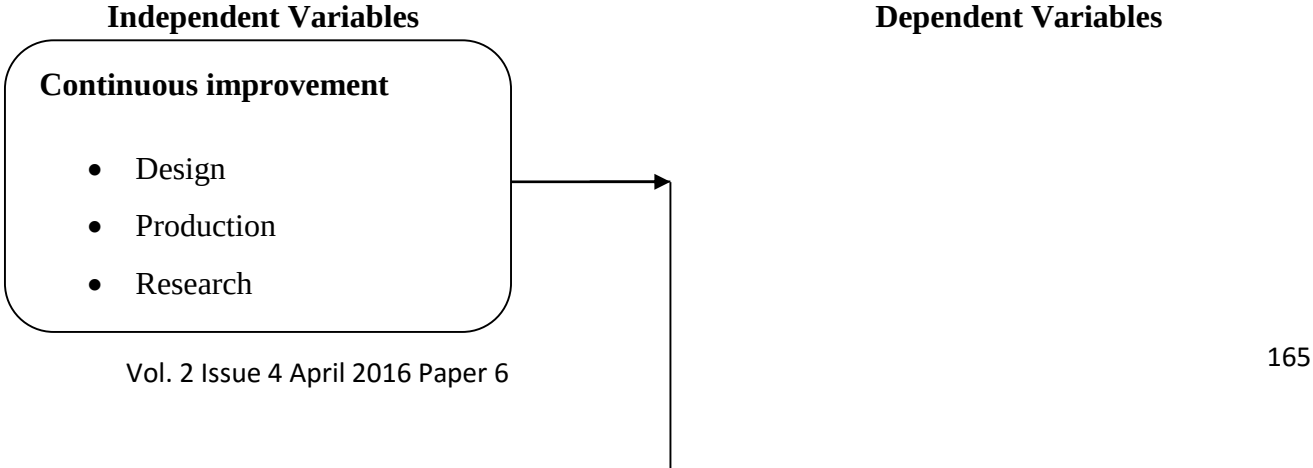
The study was guided by the following specific objectives:

1. To identify the effects of continuous improvement on supply chain performance of Simba Colt Motors.
2. To determine effect of just in time production on supply chain performance of Simba Colt Motors.

3. To analyze effect of total quality management on supply chain performance of Simba Colt Motors.
4. To evaluate effect of time bound project on supply chain performance of Simba Colt Motors.

Conceptual Framework

A concept is a basic building block that captures the essence of a thing. It refers to what extent a researcher conceptualizes to be the relationship between contextual variables in the study and show the relationship graphically or diagrammatically (Mugenda & Mugenda, 2003). The relationship describes the association between the independent variables and the dependent variables.



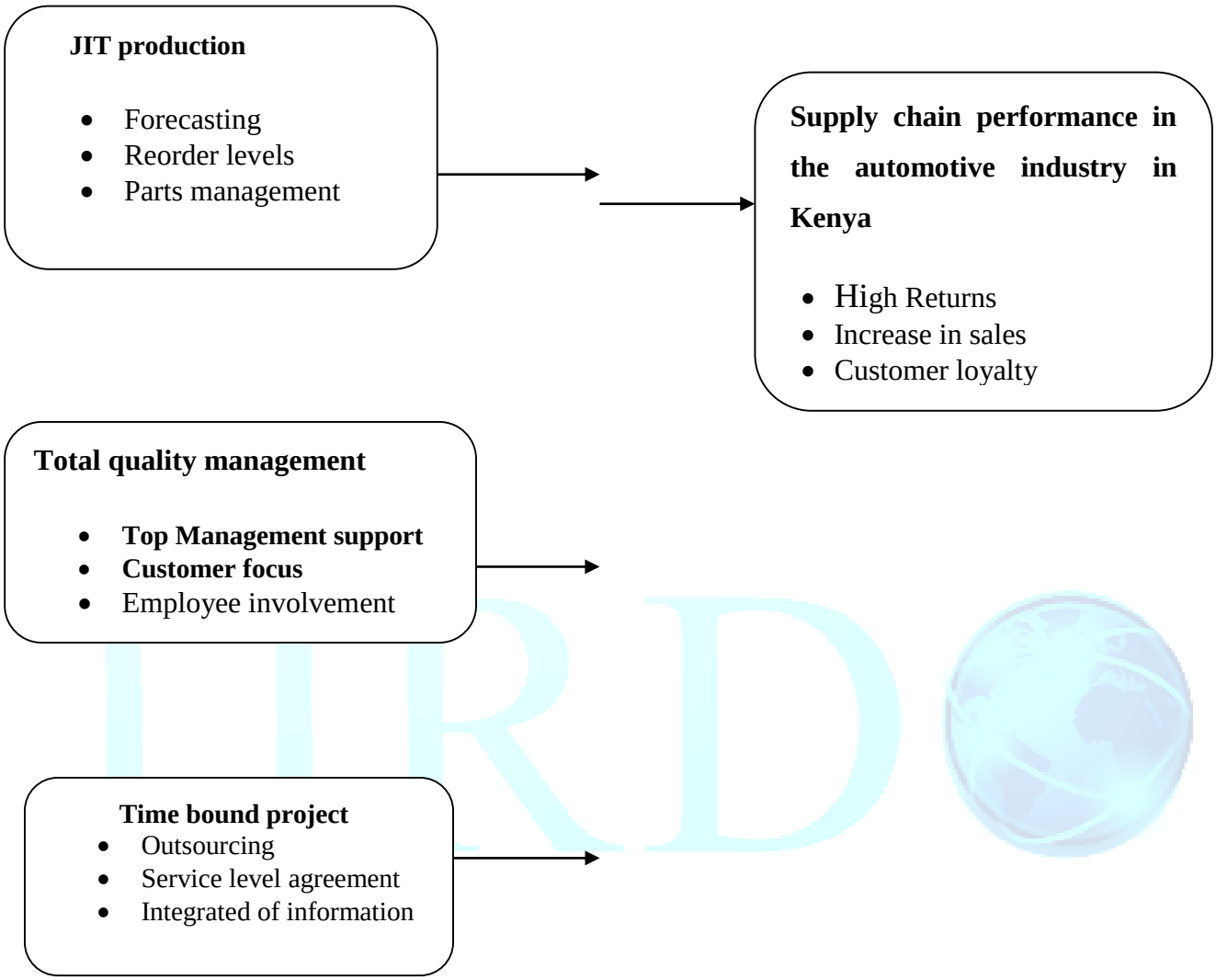


Figure 1: Conceptual framework

Continuous Improvement

Continuous improvement of service and products involves Processes Planning, Product Design, Process Design, Assessment and Action, and Resource Procurement. It involves evaluation of current processes and total quality management practices. In addition, it entails

offering training on the methods and tools of continual improvement. The argument behind continuous improvement is that human preferences and taste are dynamic and that the definition of what is seen as quality today could not be so tomorrow.

Firms through process planning usually select the resources and establish the general sequence of steps that begin with acquisition of materials and end up with creation of a finished product. The firm also determines the workflow, equipment needs as well as implementation requirements so as to create a new product to sell to its customers. The framework for continuous improvement was initially credited to Shewhart analytical work in 1931. The philosophy is now closely associated to Deming and entails a process improvement approach known as Plan-Do-Check-Act (PDCA) cycle, which managers are expected to use to achieve quality improvement.

In the cycle, management identifies the important organization goals in the 'Plan' phase. Activities in the 'Do' and 'Check' phases involve the identification and analysis of process variables that affect achievement of the goals. During 'Act' phase of the cycle, processes corrections and improvements are made and evaluated. Effective changes are made formally installed and the process is monitored to maintain the improved performance. The cycle is then repeated to pursue continuous improvement.

Continuous Improvement is arguably the most critical principle of lean manufacturing. It should truly form the basis of your lean implementation. Without continuous improvement your progress will cease. As the name implies, Continuous Improvement promotes constant, necessary change toward achievement of a desired state. The changes can be big or small but must lend itself toward improvement (often many small changes are required to achieve the target). The process is continual as there is always room for improvement. (Taylor, 2009)

All processes can be improved continuously. Some improvements may be gradual and others dramatic, but opportunities for improvement should be sought by all stakeholders all the time.

In order to do this, a common method is required with a comprehensive set of tools and techniques. It is important that this is shared with all stakeholders. It is useful to have a simple, memorable improvement cycle in which to fit the tools. Many hundreds of such cycles exist. Some are better than others. The key is to select a reliable, proven cycle and then standardize it (Liker, 2004).

In summary, because quality improvement resources are limited, organizations have to be certain that they focus on the 20 percent of the issues and opportunities that will give 80 percent of the potential return or benefit.

Just In Time Production

The basis behind this is to build what is required, when it is required and in the quantity required. Working in conjunction with levelized production, this principle works well with kanbans (a pull system). It allows for movement and production of parts only when required. This means components are not used in product that is not required and no time is wasted building unsalable product (Liker, 2004).

The widespread adoption of JIT inventory principles undoubtedly makes production operations more efficient, cost effective and customer responsive. Companies effectively implementing JIT principles have substantial competitive advantages over competitors that have not. The trick is figuring out how to apply JIT principles to gain competitive advantages in your specific industry and business situation (Pettit, 2009).

The basic premise of JIT is to have just the right amount of inventory, whether raw materials or finished goods, available to meet the demands of your production process and the demands of your end customers. No more, nor less. The closer you get to operating in a true JIT situation, the more responsive you are to your customers – and the less capital you have tied up in raw

materials and finished goods inventory. The less you spend to store and carry inventory, the less obsolescence you have to write off, and the better you can optimize your transportation and logistics operations. Ultimately, this all translates into saving your company real money (Al-Hakim, 2005).

The downside of JIT is that it is a continuum; the closer you get to it, the more beneficial it is to your business. But go too far and reduce inventories too far, the less beneficial it is for your business. Too much or too little inventory leaves you at a competitive (or cost) disadvantage to your competitors. But if you can do it right, JIT can be a strategic source of competitive advantage (Lewis, 2000).

Total quality management

The history of TQM had its genesis in the quality management processes designed and implemented in the manufacturing sector as early as 1920s. Even though TQM is considered a recent concept, elements of its principles had appeared in earlier publications and as Stuelpnagel (2003) notes, origin of TQM can be related to Ford and Crowter's book, 'My life and Work' published in 1926. The popularity and importance of TQM has been rubberstamped by quality innovations systems such as quality cycles, quality function deployment, six sigma programs, benchmarking and internationally sanctioned quality awards and standardization series (ISO standards) (Mutunga, 2013).

Government and state corporations were not left behind in the implementation of TQM. The efforts raised a notch high in 2010, after the implementation of performance contracting in all government institutions which is aimed at utilizing human capital efficiently in order to ensure high quality delivery of services. TQM is manifested in a number of practices that include: competitive benchmarking, continuous improvement, commitment of top management,

adoption of system approach, mutually beneficial supplier relationship, employee involvement, and customer focus.

According to Openda (2013) the goals for lean manufacturing practices are to improve quality; to stay competitive in today's marketplace, a company must understand its customers' wants needs and designs processes that meet their expectations and requirements. In the recent years, many manufacturing and service companies have been challenged to increase their focus on quality of products and customer satisfaction.

TQC means organized Kaizen activities involving everyone in a company managers and workers in a totally systemic and integrated effort toward improving performance at every level. It is to lead to increased customer satisfaction through satisfying such corporate cross-functional goals. With TQM quality is not the product but the process. To institute the process, corporate trainers must bring about a cultural transformation wherein all employees shed their individualism for a unified set of corporate values (Perona, 2004).

Top management commitment is essential for TQM. Top management must commit to quality by clearly stating quality objectives in mission statements and commit sufficient amount of resources for successfully accomplishing quality objectives. Top management commitment should be collaborative throughout the entire supply chain for achieving competitiveness in world market place using a common vision of quality excellence which starts with focus on total customer's satisfaction (Ross, 2009).

In this approach the most important goal is customers' satisfaction. Only satisfied customers come back and bring more business. Therefore, companies must design their products to satisfy their customers; Products should not only meet the needs but exceed the expectations of the customers, to make customers happy (Ross, 2009).

New product development translates the customer expectation data into technical specifications of the product design not only to meet the needs but also to exceed the expectations of the customers. Dan (2000) mentioned that Taguchi recommended a number of methods such as design of experiments, a statistical technique for analyzing customer expectation data, and prioritizing expectations for building them into the quality of product design, failure mode analysis, for building reliability in the products operating life and robust design techniques for designing the product to withstand any changes in its operating environment. It is the product designer who set the quality of the product at the first place. Therefore, product designers must be qualified and well trained in Taguchi's methods of product design for quality.

Time bound project

As cycle times are reduced in a lean business, the company improves its on-time delivery. A business using lean manufacturing techniques builds products only when a customer places an order. This allows the company to be responsive to the needs of its customers and decrease the time it takes to deliver an order. A business changing from a traditional manufacturing system to a lean one can count on-time deliveries to determine the success of its efforts (Ward, 2007).

A time-bound project is constrained by hard deadlines in which the timing of the delivery is as important as the delivery itself. Another way to put it is that if you deliver after the deadline, the delivery loses much of its value. Examples of hard deadlines include exhibition dates, competitors' announcements, and government-imposed regulations (Ross, 2009).

As with many other projects, most time-bound projects start with more requirements than developers can realistically handle within the imposed time constraints. As a result, they often have to start slashing these requirements halfway through the project, resulting in missed deadlines, customer frustration, and wasted effort. A better approach is to define requirement priorities prior to starting a project and then allocate their development to successive releases

of the project. With this approach, ever under severe adversity, the development team can guarantee delivery of the most important requirements by the deadline while still having a fair chance of completing less important requirements (Banweet, 2008).

Empirical perspective on Lean Production on Supply Chain

Yu, (2010) concludes that Client needs nowadays are getting more stylish due to the continuous new challenges in the environment, economy, technology and society for the necessity of creating or upgrading new projects. Meeting these requirements involves changing old methods in managing project into new ones which are more essential to meet the needs of the market. Moreover, newconcepts have been considered in addition for the time, cost and quality to guaranty the success of a business. Many new concepts could be presented for production management, but the Lean technique is one of the most successful practices concerning the development of project management(Martin, 2007).

Holweg (2006) in his artcle says that, the core idea is to maximize **customer value** while minimizing waste. Simply, lean means creating more value for customers with fewer resources. A lean organization understands customer value and focuses its key processes to continuously increase it. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste. To accomplish this, lean thinking changes the focus of management from optimizing separate technologies, assets, and vertical departments to optimizing the flow of products and services through entire value streams that flow horizontally across technologies, assets, and departments to customers(Hines *et al*, 2004).

Eliminating waste along entire value streams, instead of at isolated points, creates processes that need less human effort, less space, less capital, and less time to make products and services at far less costs and with much fewer defects, compared with traditional business systems. Companies are able to respond to changing customer desires with high variety, high quality,

low cost, and with very fast throughput times. Also, information management becomes much simpler and more accurate. A popular misconception is that lean is suited only for manufacturing. Not true. Lean applies in every business and every process. It is not a tactic or a cost reduction program, but a way of thinking and acting for an entire organization (Al-Hakim, 2005).

One of the principles of a lean business is an ability to quickly and easily adapt to change. Most start-ups already practice lean business concepts by virtue of having scarce resources that need to be deployed in a smart and timely manner to have a positive effect. However, many businesses grow out of being lean without realizing that it can be the best way to grow while still retaining the agile properties of a start-up (Rothenberg & Cost 2004).

Abudho (2015), emphasized on her research that one of the most important approach to successful lean is that the company has to demonstrate a commitment to the long term with the implementation of its lean strategies. The main focus being to continuously improve its processes with its end results being increased sales, low stock levels and low production costs. The results also showed that increased customer numbers, profitability, investment, continuous improvement, customer responsiveness, low supervision costs and reduced cycle times were other notable effects of lean production on organizational performance.

Ondiek (2013) on his research sought to examine the extent to which lean manufacturing tools and techniques are adopted by sugar processing industries in Kenya and their impact on factory time efficiency. His research revealed that companies in the sugar sector in Kenya have not given attention to all the key areas of lean manufacturing from a holistic perspective. The industry has only adopted practices related to lean manufacturing and there was little impact of these practices to factory time efficiency.

Ondiek (2013) mentioned that Capacity utilization in Kenyan sugar industries stands at less than 70% and coupled with factory time inefficiencies translates into high production costs

according to Centre for Governance and Development (CGD) Bills Digest (2005). By global standards, factory time efficiencies (FTE) stands at 91.7% while the average in Kenya is 57% and best performing factory manages just over 86%. Indeed, lost time has been cited as the single largest operating problem of the sugar industries in Kenya as concluded in CGD Bills Digest (2005). In summary he concluded that to improve on factory performance Just InTime prodution coupled with timely maintenance of the milling and processing plants is required to achieve optimum effeciency.

Openda (2013) undertook a research on lean manufacturing practices and performances of organizations listed at the Nairobi Stock Exchange. Her study was set to achieve three objectives namely; the fist being to determine the effects of Lean manufacturing practices on the performance of organizations listed at the Nairobi Securities Exchange, to document the extent to which Lean manufacturing practices have been adopted by organizations listed at the Nairobi Securities Exchange and to find out the challenges faced by organizations listed at the Nairobi Securities Exchange in their pursuit to implement lean manufacturing practices.

Ayub (2005) did a reasearch on how supply chain integration improves customer service and lower costs. This is mostly because it focuses on better connecting demand with supply. He mentions that customer service is characterized as a situation where products are available according to the six rights (the right product, at the right place, at the right cost, in the right condition, at the right time, and in the right quantity) to provide the expected level of service. The objective of any supply chain, whether in the private commercial sector or in the public health sector, is to deliver products reliably to end users.

According to the management research, the success of any effort targeted at changing the operational philosophy of any organization is strongly linked with the top management commitment. It is very difficult to change the behavior of the members of the organization without the support of the top management (Ahire *et al.*, 1996).Top management leadership is

the degree of which top management sets up TQM objectives and strategies, provides and allocates necessary resources, contributes in quality improvement efforts, and assesses TQM implementation and performance (Saraph *et al.*,1989).

Studies conducted on the role of top management in guiding TQM practices in an organization shows higher positive relationship between top management and effective implementation of TQM practices. For instance, top management conveys its commitment to quality through: provision of adequate resources to the implementation of quality management efforts, assigning a higher priority to quality over cost or schedule, investing in human and financial resources as well as making quality a dimension in performance evaluation for every one in the organization.

Employee involvement is a management and leadership philosophy about how people are most enabled to contribute to continuous improvement and the ongoing success of the organization. It is creating an environment in which people have an impact on decisions and actions that affect their jobs. C and continuous process activities through; work teams, continuous improvement meetings (Kaizen), corrective action processes and periodic discussions with the supervisors.

According to Sadler (1970) successful employee involvement is where the organization increases the role of employees and decreasing roles of supervisors in decision process. This includes: the supervisor makes the decision and announces to it staff, he/she invites input into the decision while retaining authority to make the final decision him/herself. He/she then turns the decision into another party.

Ayub (2005) mentions that a plan of action is useful in itself because it makes it easier to present the way the project intends to reach its objectives to stakeholders and prospective donors. Moreover, later on, while you are implementing your activities, it will be easier to monitor them, because you will have a clear picture against which to judge what is happening

in the reality of your project. A good plan will go a long way towards making your monitoring smoother.

Methodology

The study used descriptive research design. The sample size for the study was 100 employees in the supply chain and related departments of Simba colt motors. Questionnaires were used to collect primary data from respondents and will be designed to address the various research objectives. The completed questionnaires were edited for completeness and consistency. Pearson coefficient correlation analysis was used to determine the relationship between each of the effects of supplier management practices and supply chain performance. The study employed a multiple Regression analysis to estimate the causal relationships between independent and dependent variables under study. With the aid of Statistical Package for Social Sciences (SPSS), the research thus performed a multiple regressions analysis on primary data to estimate the beta values of factors and t-test to determine the significance of the coefficients at 95% confidence level. F – Test statistics were used to determine the overall significance of the model at confidence level of 95%. The results of analyzed data were presented using tables and charts with a brief description thereafter.

The multiple regression equation of the study is shown below;

$$Y = \beta_{\circ} + \beta_1 x_{1+} \beta_2 x_{2+} \beta_3 x_{3+} \beta_4 x_{4+} \varphi$$

Where;

Y = Supply chain performance, $\beta_{\circ}$ = Constant

β1… β4 = the slope representing degree of change in dependent variable due to unit change in independent variable. $X_{1=}$ Continuous improvement, $X_{2=}$ Just In Time Production,

$X_{3=}$ Total Quality Management, $X_{4=}$ Time bound project

$_{\varphi}$= error

Findings and Discussions

The research targeted 100 respondents to survey. All of them were supplied with questionnaires. Out of 100 questionnaires issued, 78 questionnaires were well filled as required.

According to the findings, majority 45% of the respondent indicate that reducing stock holding leads to improvement of profit margin, 35% indicated that improving on information integration leads improve return on investment, while 25% of the respondent indicated that risk diversification leads to increase on return on investment.

Correlation analysis

Inferential statistics namely Pearson's product moment correlation analysis was employed for the study variables. Pearson's product moment correlation tests were chosen in order to assess whether there is a relationship between the study variables. The method was also chosen because a rating scale was used in the questionnaire.

From the correlation analysis, the study found that there is a strong positive relationship between continuous improvement and supply chain performance, where the correlation coefficients was 0.913 and a p-value of 0.003. The study also found that there is a strong positive relationship between Just in Time and supply chain performance with correlation coefficients of 0.892 and p-value of 0.000. The study further established that there is a positive relationship between Total quality management and supply chain performance with a correlation coefficient of 0.903 and p-value of 0.000. Lastly, the study found that there is a positive relationship between time bound project and supply chain performance with a correlation coefficient of 0.911 and a p- value of 0.038

Table 1: Correlation of the study variables

		Supply chain performance	Continuous improvement	JIT	TQM	Time bound project
Supply chain performance	Pearson Correlation	1				
	Sig. (2-tailed)					
Continuous improvement	Pearson Correlation	.913(*)	1			
	Sig. (2-tailed)	.003				
JIT	Pearson Correlation	.892(*)	.927(*)	1		
	Sig. (2-tailed)	.000	.000			
TQM	Pearson Correlation	.903(*)	.931(*)	.951(*)	1	
	Sig. (2-tailed)	.000	.001	.005		
	Pearson Correlation	.911(*)	.916(*)	.929(*)	.922(*)	1
Time bound project	Sig. (2-tailed)	.038	.000	.000	.000	

* Correlation is significant at the 0.05 level (2-tailed).

The study conducted a multiple linear regression analysis so as to determine the relationship between the supply chain performance and the four independent variables. The regression model was;

$$\mathbf{Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \sum}$$

Whereby: β_0 is the regression intercept; β_1-β_4 is the regression coefficients; Y is the dependent variable (supply chain performance); X_1 is the continuous improvement; X_2 is JIT; X_3 is Total quality management and X_4 is Time bound project. The researcher applied the statistical package for social sciences (SPSS) to code, enter and compute the measurements of the multiple regressions for the study.

Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in

the dependent variable. The four independent variables that were studied, explain 97.14% of the supply chain performance in the Simba Colt Motors as represented by adjusted R square. This therefore means that other variables not studied in this research contribute 2.85% of the leadn production on supply chain performance in Simba Colt Motors in Kenya. Therefore, further research should be conducted to investigate the other variables and factors (2.85%) influence of supply chain performance in the automotive industry in Kenya.

Table 2; Model Summary

Model	R	R Square	Adjusted R Square	Std Error of the Estimate
1	.957[a]	.912	.9614	.55499

a. Predictors: (constant), Continuous improvement, JIT, Total quality Management and time bound Project

As per the SPSS generated coefficient, ($Y = \beta0 + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \varepsilon$) becomes:

Y= 0.162X1+ 0.423X2+ 0.208 X3+ 0.173 X4 +5.053

Y is the dependent variable (supply chain performance); X_1 is the continuous improvement; X_2 is Just in Time; X_3 is Total quality management and X_4 is Time bound project.

Table 3: Regression Coefficient

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	5.064	3.061	1.652		.106
Continuous improvement	0.262	0.073	0.204	2.221	0.003
JIT	0.323	0.079	0.623	5.344	0.000

TQM	0.171	0.058	0.375	3.063	0.004
Time bound project	0.223	0.039	0.472	5.328	.001

a. Dependent Variable: supply chain performance

The possible value of Y when all independent variables are equal to zero is 5.064. The data findings analyzed also showed that taking all other independent variables at zero, a unit increase in Continuous improvement will lead to a 0.262 increase in supply chain performance; this means that there is a significant relationship between Continuous improvement and supply chain performance. The *P*-value was 0.003 and thus the relationship was significant. A unit increase in JIT will lead to a 0.323 increase in supply chain performance; this means there is a significant relationship between JIT and supply chain performance. The *P*-value was 0.000 and thus the relationship was significant. A unit increase in TQM a 0.17 increase in supply chain performance. The *P*-value was 0.004 and thus the relationship was significant. Lastly, a unit of time bound project leads lead to a 0.223 increase in supply chain performance; this means there is a significant relationship between time bound project and supply chain performance in Kenya. The *P*-value was 0.001 and thus the relationship was significant. This infers that Just in Time influences the supply chain performance most followed by continues improvement; time bound projects, and finally total quality management.

Summary of Findings

At 95 % level of significance continuous improvement was found to be statistically significant in affecting supply chain performance. The respondents agreed with 44.8 %, that planning affect supply chain performance. Again the respondents agreed with a 32.1% that product design affect supply chain performance; respondents agreed with 38.4% that process design lead to supply chain performance. Respondents agreed with 64.1% that proper processing checking improves profitability for Simba Colt Motors, and 57.6% agreed that proper process planning leads to low supervision cost.

This is in agreement with Taylor (2009), who stated that Continuous Improvement is arguably the most critical principle of lean manufacturing. It should truly form the basis of your lean implementation. Without continuous improvement your progress will cease. As the name implies, Continuous Improvement promotes constant, necessary change toward achievement of a desired state. The changes can be big or small but must lend itself toward improvement (often many small changes are required to achieve the target). The process is continual as there is always room for improvement. Liker, (2004) stated that all processes can be improved continuously. Some improvements may be gradual and others dramatic, but opportunities for improvement should be sought by all stakeholders all the time. In order to do this, a common method is required with a comprehensive set of tools and techniques. It is important that this is shared with all stakeholders. It is useful to have a simple, memorable improvement cycle in which to fit the tools. Many hundreds of such cycles exist. Some are better than others. The key is to select a reliable, proven cycle and then standardize it.

According to the findings in the study, the respondents disagreed with 55% that there organization practiced inventory forecasting. Again 45% of the respondents disagreed that they have minimum stock levels within Simba Colt Motors. Majority of the respondents 40% disagreed that they have maximum stock levels, 70%) agree that they have software's for managing inventories while 60% disagreed that they don't hold inventory.

According to Ondiek (2013), mentioned that Capacity utilization in Kenyan sugar industries stands at less than 70% and coupled with factory time inefficiencies translates into high production costs according to Centre for Governance and Development (CGD) Bills Digest (2005). By global standards, factory time efficiencies (FTE) stands at 91.7% while the average in Kenya is 57% and best performing factory manages just over 86%. Indeed, lost time has been cited as the single largest operating problem of the sugar industries in Kenya as concluded in CGD Bills Digest (2005). In summary he concluded that to improve on factory performance

Just InTime prodution coupled with timely maintenance of the milling and processing plants is required to achieve optimum effeciency. Our study agree with Bills Digest who stated that JIT will enhance optimum effeciency on production.

According to the findings in the study, almost half of the respondents (60%) disagreed that top management support lean production, (50 %) of the respondents disagreed with the statement that customer information are used to ensure TQM, (40%) indicated that the organization plans for seminars and training for employees, while (70%) of the respondents disagreed that customer feedback are used to improve service given to them

According to the management research by Ahire *et al.*, 2006, the success of any effort targeted at changing the operational philosophy of any organization is strongly linked with the top management commitment. It is very difficult to change the behavior of the members of the organization without the support of the top management.Top management leadership is the degree of which top management sets up TQM objectives and strategies, provides and allocates necessary resources, contributes in quality improvement efforts, and assesses TQM implementation and performance (Saraph *et al.*,1989).

Studies conducted on the role of top management in guiding TQM practices in an organization shows higher positive relationship between top management and effective implementation of TQM practices. For instance, top management conveys its commitment to quality through: provision of adequate resources to the implementation of quality management efforts, assigning a higher priority to quality over cost or schedule, investing in human and financial resources as well as making quality a dimension in performance evaluation for every one in the organization.

According to the findings, 70% of the respondents indicated that they outsource for none core service, 80 % of the respondents indicated that they sign service level agreement with

engineers, 70% of the respondents indicated that they have software's for sharing information on operation while 75% of the of the respondents disagreed that they don't have clear time on assembly.

The study is in agreement with the study by Rothenberg & Cost (2004) on its study which focuses on a multinational group of firms and how the parent company attempts to implement strategy without a comprehensive performance management system and foster alignment and co-ordination across all the companies in the group. Furthermore the sample size used is too small to adequately give statistically significant findings, this is because the study was done in one multinational corporation that have 60 subsidiaries which was the sample size of the study and only 44 responded. This makes the research in adequate to represent the whole population.

Reichhart and Holweg, (2007) in their study on supply chain Strategy implementation: a role for the balanced scorecard was not able to analyze other frameworks to strategy implementation and ascertain whether they would be effective in the achieving proper execution of strategy within an organization.

Conclusion of the study

From the findings the study concludes that continuous improvement was found to be statistically significant in affecting supply chain performance. The respondents agreed with that planning affect supply chain performance. Again the respondents agreed with that product design affect supply chain performance; respondents agreed with 38.4% that process design lead to supply chain performance. Respondents agreed that proper processing checking improves profitability for Simba Colt Motors, and that proper process planning leads to low supervision cost. Further, the study concludes that organization should practice inventory forecasting. Again respondents disagreed that they have minimum stock levels within Simba

Colt Motors. Majority of the respondents disagreed that they have maximum stock levels, and that they have software's for managing inventories.

Again respondents disagreed that top management support lean production, and that customer information is used to ensure TQM, and that the organization plans for seminars and training for employees. According to the findings, the respondents indicated that they outsource for none core service, and they sign service level agreement with engineers, and that they have software's for sharing information on operation and this have led performance of supply chain. This infers of the study have indicated that Just in Time influences the supply chain performance most followed by continues improvement, time bound projects, and finally total quality management.

Recommendation

From the summary and conclusions, the study recommends that organization needs training programmers' on the issues of lean production, TQM and continues improvement. This will help to give guidelines on critical stages of implementation process. The study also recommends that management to be commitment to implement the lean production and encourage staff to accept the new system. The study further recommends that the top management to come up with benchmarking programs which will equip end users with competence thus streamlining the implementation of lean production process.

Recommendation for further research

This study is a milestone for future research in this area, particularly in Kenya. The four independent variables that were studied, explain 96.14% of the supply chain performance as represented by adjusted R square. This therefore means that other variables not studied in this research contribute 3.86% of the lean production on supply chain procurement performance. Therefore, further research should be conducted to investigate the other variables and factors (3.86%) influence the lean production on supply chain procurement performance in auto

motive industry in Kenya.

REFERENCES

A. Gunasekaran, C. Patel, and E. Tirtiroglu, (2001) "Performance measures and metrics in a supply chain environment", International Journal of Operations & Production Management, Vol. 21 1 2, 7187 .

Aberdeen Group (2006) "The Lean Supply Chain Benchmark Report "

Achanga, E. Shehab, R. Roy & G. Nelder, (2005) "Critical success factors for lean implementation within SMEs", Journal of Manufacturing Technology Management 17 4 460471

Adrian. T. (2006) "Lean Procurement: The Future of Supply Chain Management in a Demand-Driven World", CPM (CSS International)

Agarwal, R. and Shankar, (2002) "Analyzing alternatives for improvement in supply chain performance", Work Study 51 1 3237 N. G. Akel, I. D. Tommelein, J. C.

Al-Hakim, L.(2005) 'Identification of waste zones associated with supply chain integration', Proceedings of the SAPICS 27th Annual Conference and Exhibition, Sun City, South Africa, 5-8 June, 113 .

Anand G., and R. Kodali, (2008). 'A conceptual framework for lean supply chain and its implementation', Int. J. Value Chain Management, 2 3 2008 313 EOF357

Ariff F.M and S. Ahmed, (2005) 'Making the lean manufacturing supply chain leap across small and medium scale industries (SMIs) in Malaysia', Proceedings of the

International Conference on Recent Advances in Mechanical & Materials Engineering (ICRAMME 05), Kuala Lumpur, 30-31 May, Paper 37 278284 .

Boyers, (2004) 'Application of lean supply chain concepts to a vertically-integrated company: a case study', Proceedings of 12th Annual Conference of the Group for Lean Construction (IGLC 12), Copenhagen, August, 114 .

Christopher M., (1998) Logistics and Supply Chain Management: Strategies for Reducing Cost and Improving Service, 2nd ed., Financial Times/Prentice Hall, London.

Christopher M., (2000). 'The agile supply chain: competing in volatile markets', Industrial Marketing Management, 29 3744 .

Cigolini, M. and Cozzi, M. (2004) "A new framework for supply chain management Conceptual model and empirical test", International Journal of Operations & Production Management 24 1 741

Cullen P., and Towill D, (2002) "Diagnosis and reduction of bullwhip in supply chains", Supply Chain Management, 7 3 164179 .

Ducharme L, and LucanskyP. (2002). "The Lean Supply Chain", PharmaChem Magazine.

EOF APICS(2004). "Lean Supply Chain Best Practice Process Benchmark Framework", APICS, Oracle, Southern Georgia University, Supply Chain Vision

Fassoula E.D, (2005). "Transforming the supply chain", Journal of Manufacturing Technology Management 17 6 848860

Gomes, J. T., (1999) 'A systems approach to the investigation of just-in-time', Journal of Business Logistics, 9 2 7188 .

Harland C.(1996). "Supply network strategies- the case of health supplies", European Journal of Purchasing and Supply Management, Vol. 2 4 183192.

Karlsson, P. (1996). "Assessing changes towards lean production", International Journal of Operations & Production Management 16, 2441 .

Kinoro, A. J. (2013). Factors affecting new vehicle sale in the Kenya motor industry: A case of General Motors (East Africa) Limited. International Journal of SocialSciences and Entrepreneurship, Vol.1, Issue 2, 2013, 1 (2), 664-687

Lewis M., (2000) "Lean production and sustainable competitive advantage", International Journal of Operations & Production Management, 20 214 .

LikerJ. K., (2004) 'The Toyota Way 14 Management Principles from the World Greatest Manufacturer', McGraw Hill, 0-07139-231-9

Lin, C. Hui, (1999) "Should lean replace mass organization systems?", Journal of International Business Studies, 30 216 .

Lummus, L. & Duclos, R., (2003) 'The impact of marketing initiatives on the supply chain', Supply Chain Management: An International Journal, 8 4 317323 .

Manrodt, J. and Abott, K. (2005) "Understanding the Lean Supply Chain: Beginning the Journey 2005 Report on Lean Practices in the Supply Chain", APICS, Georgia Southern University, Oracle and Supply Chain Visions.

Martin J.(2007) "Deploying Lean Six Sigma Projects Using Lean Tools", McGraw-Hill

McKee R &, D. Ross, (2009) "From Lean Manufacturing to Lean Supply Chain: A Foundation for Change", LAWSON White Paper.

Monden Y., (1998) Toyota Production System: An Integrated Approach to just-in-time,

N. Bhuiyan, A. Baghel, 2005 "An overview of continuous improvement: from the past to the present", Management Decision 43 5 761771

Ndubisi, M. and Jantan, L., (2005) "Supplier selection and management strategies and manufacturing flexibility", Journal of Enterprise Information Management, 18 3 330349 .

Ramaswami S, (2004) "A benchmarking scheme for supply chain collaboration", An International Journal 11 1 930

Reichhart, M. (2007) 'Lean distribution: concepts, contributions, conflicts', International Journal of Production Research, 45 36993722 .

Rozhan, A. G., (2008) "Supply chain management and suppliers 'HRM practice", Supply Chain Management: An International Journal 13/4 259262

RShah, P. T. W, (2007) "Defining and developing measures of lean production", Journal of Operations Management 25, 785805 .

Sánchez M. P, (2001) "Lean indicators and manufacturing strategies", International Journal of Operations & Production Management 21, 14331451 .

SBarla S.B, (2003) "case study of supplier selection for lean supply by using a mathematical model", Logistics Information Management 16 6 451459

Shah, P. T. (2003) "Lean manufacturing: context, practice bundles, and performance", Journal of Operations Management 21, 129149 .

Shankar. R. Mohammed, D., &Banweet K, (2008) "Creating flex-lean-agile value chain by outsourcing An ISM-based interventional roadmap", Business Process Management Journal 14 3 338389

TaylorD. H. (2006). 'Strategic considerations in the development of lean agri-food supply chains: a case study of the UK pork sector', Supply Chain Management: an International Journal, 11 3 271280 .

Taylor D., Pettit S., (2009). "A consideration of the relevance of lean supply chain concepts for humanitarian aid provision", International Journal of Services Technology and Management Issue: 12 4 2009 430444

Taylor L. and R. Martichenko, (2006). "Lean Transportation- Fact or Fiction?" Fedex and LeanCor White paper.

U. Sekaran U. (2003) Research Methods for Business: A Skill-Building Approach

Vonderembse, M.,(2006). "Designing supply chains: towards theory development", International Journal of Production Economics, 100 2 223238 .

Wee H.M, (2009). "Lean supply chain and its effect on product cost and quality: a case study on Ford Motor Company", Supply Chain Management: An International Journal 14/5 335341.