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Role of Multi-Echelon Distribution Systems on Supply Chain Performance in Manufacturing Sector In Kenya: A Case of Toyota Kenya

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Abstract: **Recent studies have shown interest and the benefits of implementing multi echelon supply chains and inventory systems. However, these studies are found to have a number of notable limitations. For instance transportation and distribution are barely touched on as inputs into a complete operational supply chain. This study therefore aimed at finding out the role of multi-echelon distribution system on supply chain performance in manufacturing in Kenya a case study of Toyota Kenya. The specific objectives of the study were to determine the level of process integration on supply chain performance in manufacturing companies in Kenya, to find out the influence of inventory policy on supply chain performance in manufacturing companies in Kenya, to examine the influence of supplier management on supply chain performance in manufacturing companies in Kenya and to evaluate the effect of lead-time management on supply chain performance in manufacturing companies in Kenya. The research questions of the study reads as: What is the level of process integration on supply chain performance in manufacturing companies in Kenya? What is the level of cost efficiency on supply chain performance in manufacturing companies in Kenya? What is the influence of inventory policy on supply chain performance in manufacturing companies in Kenya? What is the influence of supplier management on supply chain performance in manufacturing companies in Kenya? And what is the effect of lead-time management on supply chain performance in manufacturing companies in Kenya? The study's scope is limited to Toyota in Kenya. The study captures theoretical literatures on systems theory, transaction cost economics, just in time, network perspective and theory of constraints. A clear illustration is used to demonstrate the conceptual framework of the study with the independent variables in question being process integration, cost efficiency, inventory policy, supplier management and lead-time management. The study will employ the use of questionnaire to collect data. Descriptive research design will be used. The study will adopt simple random sampling techniques approach to analyze the data. Statistical package for social science (SPSS) version 24 will be used to report the descriptive statistics for various variables in the study. The study recommends that manufacturing companies especially the assembly industries should have well established distribution systems to ensure efficient and effective supply chains. These distribution systems would help greatly reduce delivery times, costs of production, information flow stagnation and supplier disagreements and even ensure a holistic integration of the entire supply chains of their organisations.**

Keywords: **Role, Distribution Systems, Supply Chain Performance.**

1. INTRODUCTION

Background of the Study:

In supply chain (SC) context, continuous performance improvement has become a topic of serious concern for each and every supply chain partner. In practice, supply chain based companies (e.g., Dell, Wal-Mart, Samsung, Lenovo, Gome, Toyota etc.) have used different performance management tools to support their supply chain strategies. The organizations

are finding the activities of continuous monitoring and improvement of supply chain performance (SCP) as an increasingly complex task (Morgan, 2007). Coordination of the supply chain has become strategically important as new forms of organizations, such as virtual enterprises, global manufacturing and logistics evolve. During the last few years, focus has shifted from the factory level management of supply chains to enterprise level management of supply chains (Gunasekaran, Williams, & McGaughey, 2005).

Multi-echelon inventory and distribution theory has been successfully used in various industries. Cohen et al. in the year 1990 develop efficient algorithms and sophisticated data structures to achieve large scale systems integration. Integration, collaboration, and the use of IT are all depicted as 'building blocks' of 'house of supply chain' (Stadtler, 2005) and as such, recent technological developments in information systems and technologies have shown the potential to facilitate the coordination among different functions, allowing the virtual integration of the entire supply chain.

Accordingly (Bertsimas & Ryzin, 2001) suggest that the inventory holding cost at a given warehouse of the distribution network is a linear function of the inventory level, and that the total procurement cost is a general piecewise-linear function of the quantities shipped to and from the warehouse. Bullwhip costs money, wastes resources, and loses customers and drawing on a basis of analytical, simulation and experiential techniques (Mc.Cullen & Towill) recommended a four echelon material flow principles as strategies to reduce the bullwhip effect.

With an aim to better understanding of effective distribution systems and its corresponding relationship with SCP this study was focused at determining the role of multi- echelon distribution systems on supply chain performance in the manufacturing industry. Multi echelon capability is much visualized by the ability of software to see the entire supply network and manage the inventory in that network as a "pool," rather than as a group of independent locations. The concept of Multi echelon distribution system has been widely used in the attainment of optimal purchasing and shipping quantities over a finite planning horizon (Akbari, 2015).

Local Perspective on Multi echelon Systems:

According to the statistics generated by (Pricewaterhouse Coopers, 2012) Kenya has a large manufacturing sector serving both the local market and exports to the East African region. The sector, which is dominated by subsidiaries of multi-national corporations, contributed to approximately 13% of the Gross Domestic Product (GDP) in 2004.

(Pricewaterhouse Coopers, 2012) As detailed in the main Kenya Medical Supplies Authority (KEMSA) report, the first step in the modeling a multi echelon distribution system a process of building a baseline model that depicts the current situation and current network structure in Kenya. The central warehouse is located in Nairobi, which delivers products directly to the districts. As illustrated by the greater number of district warehouses, the majority of the Kenyan population is focused in the south/southwest of the country. One of the main tradeoffs analyzed in this scenario is the one between the transportation costs and the facility operating costs. (Blanchard, 2004) The inbound transportation costs to the distribution centers (from air or sea ports) are though not taken into account because this would be accurate under the assumption that each of the distribution centers would conduct its own procurement. The facility operating costs account for fixed operating costs based on the square footage of the facility and the wages of personnel needed to operate a facility of a particular size (Beretta , 2002) . The property value of the land at the different sites and the road networks are not taken into account at this level of analysis.

(Crainic, 2008) An analysis on transportation costs for the year 2020 under the centralized and three decentralized scenarios is further done. Although the forecast show there is a decrease in the transportation costs with the increasing number of distribution centers, the most significant cost reduction is seen in the scenario with two distributions centers. (Cooper & Lambert, 2000) A caveat of this is that the transportation costs arising from interfaculty flows are not accounted for. In the case of a stock out of a particular product at one the locations, a transfer of that product between the facilities would take place (Beretta , 2002). This would depend on where the safety stock would be located.

The Kenya Motor Industry Association (KMI), the representative body of the corporate participants in the motor industry, has been lobbying hard to exalt the sector's performance. Most of the measures taken have helped the industry recover from its lowest point in 2000, when only 5,869 units were sold, these include providing competitive environments to the companies thereby becoming more innovative through acquisition of raw materials, product design, assembly and distribution systems in responding to customer needs (Pricewaterhouse Coopers, 2012).

(Pricewaterhouse Coopers, 2012) The Automotive industry in Kenya is primarily involved in the retail and distribution of motor vehicles. Through the aid of multi echelon distribution systems, there are a number of motor vehicle dealers operating in the country, with the most established being Toyota (East Africa), Cooper Motor Corporation, General Motors, Simba Colt and DT Dobie. There also exists three vehicle assembly plants in the country, which concentrate on the assembly of pick-ups and heavy commercial vehicles, these are further imported to the neighboring countries using the concept of multi echelon distribution systems. (Pricewaterhouse Coopers, 2012) However the rising levels of poverty coupled with the general slowdown of the economy has continued to inhibit growth in the demand of locally manufactured goods, as effective demand continues to shift more in favor of relatively cheaper imported manufactured items. In addition, the high cost of inputs as a result of poor infrastructure has led to high prices of locally manufactured products thereby limiting their competitiveness in the regional markets and hampering the sector's capacity utilization. With the highest investments being in housing and the auto mobile industries in Kenya, the established dealers therefore face intense competition from imported second-hand vehicles, mainly from Japan and United Arab Emirates. These imports now account for about 70% of the market. The last decade witnessed a significant decline in the number of new vehicles sold in the Country (Pricewaterhouse Coopers, 2012).

Moreover, Grocery distribution presents also heterogeneous group chains which are based on distribution systems presenting several echelons, mainly after the development of new services for the end-consumer supply, like e-commerce and proximity deliveries (Gonzalez- Feliu & Ambrosini, 2012).

Toyota Kenya Supply Chain Management:

Founded in 1937, (Nkomo, 2013) Toyota Motor Corporation is a Japanese company that engages in the design, manufacture, assembly, and sale of passenger cars, minivans, commercial vehicles, and related parts and accessories primarily in Japan, North America, Europe, and Asia. Current brands include Toyota, Lexus, Daihatsu and Hino. Toyota Motor Corporation is the leading auto manufacturer and the eighth largest company in the world (Axsater, 2000).

The company encompasses markets across the globe with different characteristics that warrant different supply chain configurations. In addition, differences among the brand vehicles warrant different unique supply chain processes (Iyer, Seshadri, & Vasher, 2009). These processes span the supply chain and have enabled Toyota to deliver remarkably consistent performance over decades.

The core competence of Toyota Motor Corporation is its ability to produce automobiles of great quality at best prices, thereby providing a value for money to the customers. This core competence of quality can be attributed to its innovative production practices. The quality aspect of Toyota's products have revolutionized the automobiles in the past and almost all the automobile companies had to try and better the quality of their products. It is a cornerstone of the cost leadership strategy that the company pursues (Nkomo, 2013)

Lee, Peleg, and Whang explain that just as Toyota has a set of central core values but allows individual divisions to customize to local conditions, when it comes to supplying to different geographies, different products, or at different times in the product life cycle, "the company adapts the design and control of its demand chain so that it has the right demand chain for the right product, in the right place, and at the right time." (Iyer, et al., 2006).

Statement of the problem:

Specific objectives

1. To determine the level of process integration on supply chain performance in manufacturing companies in Kenya.
2. To establish the extent to which lead-time has effect on supply chain performance in manufacturing companies in Kenya.

2. THEORETICAL REVIEW

This section contains theories relevant to the study. A theory is a set of statements or principles devised to explain a group of facts or phenomena especially one that has been repeatedly tested or is widely accepted and can be used to make predictions about natural phenomena. Theories are analytical tools for understanding, explaining, and making predictions about a given subject matter.

Systems Theory:

System Theory (ST) brings together various components of a complex supply chain (that is the human, capital, information, materials, financial resources and even the suppliers etc.) to form a subsystem which is then part of a larger system of supply chains or network. The theory argues that for a holistic perspective ST must be employed to understand the internal and external factors that shape an organization's supply chain performance.

Companies for a longer time kept "safety stock" on hand as a solution to deal with stock outs, however on the other hand it adversely added cost to the process. Later supply chain management took a broader perspective that carefully put into picture the entire supply chain incorporating integration of activities of multiple suppliers (Jespersen & Skjott- Larsen, 2005).

In 1992, Lee and Billington wrote about the importance of managing the supply chain and common mistakes that companies made, as well as opportunities that supply chain management presented. Computer models for supply chain management were limited at that time, but the authors noted that it was still possible to establish metrics for each link in the supply chain and begin to hold each link accountable for their performance. By taking this approach, and by using the burgeoning power of computers to integrate information systems, companies would be able to adopt a system-wide approach to their supply chain that would give them a significant competitive advantage over the rest of the market (Lee & Wu, 2006).

When considering supply chain management, systems theory is used to integrate the various participants in the supply chain into a cohesive whole that can be analyzed and managed. Despite the many challenges faced in the integration process, supply chain management remains a critical success factor even for the smaller companies and viewing it as a system, and implementing processes-including computing resources-that assist in managing the supply chain-can provide a competitive advantage (Sabbaghi & Vaidyanathan, 2007)

By the late 20th century, supply chains were recognized as systems nearly universally, involving external participants and influences as well as internal ones. Recognizing what many managers already intuitively accepted was an important step as it focused resources on ways to manage entities that were formerly considered outside the span of control of an organization. Throughout the 20th century, managers knew that some suppliers had long lead times while others might have quality issues, for example; it was by recognizing the effect of these variables on the system as a whole that managers began to understand the potential that minimizing negative effects could have on their competitive position. Companies began to approach their supply chains as integrated whole systems rather than as individual suppliers, a move that changed the overall approach to the entire supply chain process, from evaluating suppliers to the procurement and payment process (Ivanov, et al, 2010).

Therefore, the study explained the importance of integrating the entire company supply chain and information systems to ensure successful management of supplying raw materials, production, distribution and selling of a particular product.

Theory of Constraints:

In general, the solution for supply chains is to create flow of inventory so as to ensure greater availability and to eliminate surpluses a factor of lead time management. The theories' distribution solution is effective when used to address a single link in the supply chain and more so across the entire system, even if that system comprises many different companies. The purpose of the theory of constraints distribution solution is to establish a decisive competitive edge based on extraordinary availability by dramatically reducing the damages caused when the flow of goods is interrupted by shortages and surpluses.

According to (Stevenson, Hendry, , & Kingsman, 2005), the core concept of the theory of constraints is that every process has a single constraint and that total process throughput can only be improved when the constraint is improved. A very important corollary to this is that spending time optimizing non-constraints will not provide significant benefits and that only improvements to the constraint will further the goal which mainly is achieving more profit.

In general, the solution for supply chains is to create flow of inventory so as to ensure greater availability and to eliminate surpluses. Drum-Buffer-Rope scheduling embraces the concept that there is one constraint for the entire organization. If the constraint is internal, the company cannot sell all that is demanded from the company. Due-date performance is probably less than 99%, and lead-times may be longer than desired (Lang, 2009). She further argues that if the constraint is external, the company does not have enough sales to fully utilize its available resources. Implementing brings a company to 99+% due-date performance and maintains that level even with rapid sales growth. Typically, 50% capacity can be freed up to sell with little or no investment or added expense.

According to Stephen Corbett theory of constraints and Lean have a common foundation, the identification and elimination of waste. Lean focuses its efforts on using pull and flow to identify problems for elimination, while theory of constraints uses extensive analysis, which is not a major difference. When they are compared in theory there are no major problems between them. It is in the area of problem resolution where they differ (Rattner, 2006). He furthers that the two approaches vary in their approach to problem resolution and that the fundamental differences come in their focus. Theory of constraints uses the bottleneck process to drive the entire process, while lean focuses on pull. The material flow in a theory of constraints facility is much more complicated than in a lean facility. Theory of constraints is based upon a PUSH system. Theory of constraints uses a hybrid Material Resource Planning (MRP) process to release materials at the rate the constraint process can handle, which is pushing the material through the system. Toyota production system (TPS) on the other hand is a pull system that cascades that customer demand through the system, replenishing what the customer has withdrawn. These two approaches are mutually exclusive, and as such the two manufacturing philosophies cannot be combined.

However, during the late 1980's and early 1990's American industry in particular became acutely aware of the time and quality advantages that just-in-time (JIT) and total quality management (TQM) afforded to different specific companies . Drum-buffer-rope through its focus on increasing throughput also substantially reduced overall lead time and improved product quality more rapidly than other methods available and thus appeared to be a perfect mechanism to attain the "new" aspect of competitive advantage. The lean production process had given Toyota control of fine scales of detail as yet inaccessible to its mass-production-based rivals. The customers could tell the difference and called it 'quality.' Toyoda and Ohno did not invent a technology so much as they invented a social process that changed the technical system. Their subsequent success was the result not just of introducing new technology but of introducing a new sociotechnical system." Drum-buffer-rope especially the 3rd step of the focusing process of subordination introduces a new social process that changes the technical system (Youngman, 2009).

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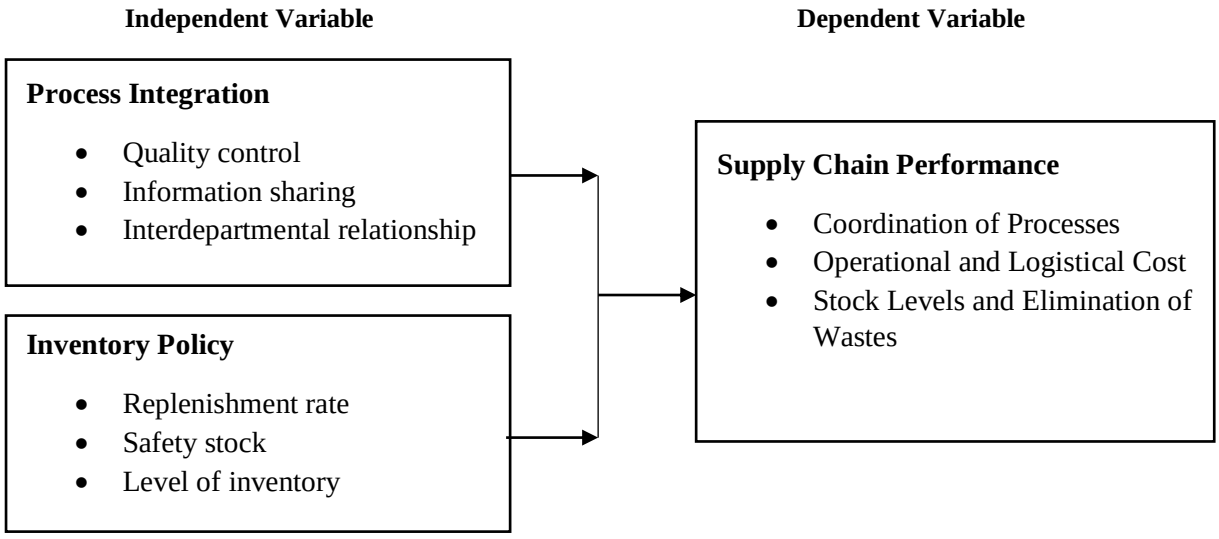

Research Gap:

This study arbitrates on quality and affordable products of Toyota but fails to look at the status of its spare parts availability and distribution. A wide variety of fields have developed multi-echelon transportation approaches. Such systems are found in the automotive industry, more precisely in spare parts supply, motor vehicle distribution and urban freight distribution. For many types of products, spare parts are used for service purposes when routine maintenance is done and/or problems are encountered with the original equipment. Surprisingly little modeling of a broadly applicable nature has been done in connection with the inventory management of such service parts.

For future research, due to unavoidable constraints this study therefore skips the distribution of spare parts.

3. RESEARCH FINDINGS AND DISCUSSION

Level of management:

The study sought to establish the level of management the respondents occupied at Toyota Kenya that participated in the study. A majority of the respondents profile constituted of the middle level management team (74.20%) followed closely by the lower level managers (19.35%) with few top managers. This is because both low level and middle level managers are directly involved in implementation of multi echelon distribution systems. Top management are involved in strategic decision making related to both distribution systems and supply chain performance. The research findings were as listed in the table 4.5

Process integration:

The study sought to determine the level of process integration on supply chain performance in manufacturing companies in Kenya. Process integration is among the strongest pillars that ensure supply chain performance. Keen application of process integration helps to improve the visibility of the supply chain which in turn leads to improved decision making.

Percentages distribution of respondents' perception on process integration

Process integration	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Quality control on inputs, processes and output has an effect on supply chain performance	74.20%	21.00%	4.80%	0.00%	0.00%
The level of information sharing has an effect on supply chain performance	33.90%	61.30%	0%	4.80%	0%
The level of interdepartmental relationship has an effect on supply chain performance	46.80%	43.50%	4.80%	4.80%	0%
The level of service delivery has an effect on supply chain performance	87.10%	8.10%	0%	3.20%	1.60%

Source; Author, 2017

Majority of the respondents agreed to the fact that process integration affects supply chain performance in the manufacturing sector. This is evident from the table where 4.8% were not sure whether quality control on inputs, processes and output has an effect on supply chain performance followed by 21.0 who agreed to the fact while the another 74.20% strongly agreed that quality control on inputs, processes and output has an effect on supply chain performance. The findings are in agreement with (Berente, et al., 2009) who argues that activities become more tightly coupled with each other by minimizing the human effort associated with communication and coordination of their inputs and outputs. As the majority of business processes deal primarily with information-based inputs and output, improving the timeliness, accessibility, granularity, and transparency of information flows between activities in a process is key to business process integration.

When asked whether the level of information sharing has an effect on supply chain performance in the manufacturing sector, 4.80% disagreed, 33.9% strongly agreed while the majority 61.3% agreed that information sharing has an effect on supply chain performance.

When asked whether interdepartmental relationship has an effect on supply chain performance in in the manufacturing sector, 4.80% disagreed another 4.8% were not sure while 43.50% and 46.80% 73.5% agreed and strongly agreed respectively. Generally, interdepartmental relationship ensure mutual engagement and efficient flow of communication between the supply chain department and the other departments within the organization this helps in disseminating information which is a major driver of the supply chain. Information makes the supply chain to be visible.

When asked whether level of service delivery has an effect on supply chain performance in the manufacturing sector, 1.60% strongly disagreed, 3.20% disagreed, 8.10% agreed while the majority of 87.1% strongly agreed with the statement.

Inventory policy:

The study sought to establish the significance of inventory policy on supply chain performance in state corporations in Kenya

Percentages distribution of respondents' perception on inventory policy

Inventory policy	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean
The level of replenishment rate has an effect on supply chain performance	54.80%	33.90%	6.50%	1.6	3.2	4.3548
The level of safety stock has an effect on supply chain management	58.10%	35.5	3.2	1.60%	1.6	4.4677
The level of inventory held has an effect on supply chain performance	51.60%	48.4	0%	0%	0%	4.5161
The length of lead- time has an effect on supply chain performance	45.20%	51.60%	0%	1.60%	1.60%	4.371

Source; Author, 2017

Majority of the respondents agreed to the fact that the level of inventory policy has an effect on supply chain performance. This is evident from the table where 3.2% strongly disagreed to the fact that the level of replenishment rate has an effect on supply chain performance, followed by a 1.6% who disagreed too but not strongly. A percentage of 6.5% were not sure while 33.9% and 54.8% agreed and strongly agreed respectively that the level of replenishment rate has an effect on supply chain performance. The findings are in agreement with Shale (Friedman, 2006) who had a generally view on various key performance indicators are used to assess the efficiency of a SC, some are cost based, while others are based on service levels. Cost related indicators include inventories carrying costs, order setup costs and shipping costs. On the other hand, indicators related to service levels are usually based on the percentage of satisfied customers and the average number of lost customers. Other service related indicators include the average number and quantity of back orders and on hand inventories levels.

When the respondents were asked whether the level of safety stock has an effect on supply chain performance, 1.6 % strongly disagreed while 1.6% disagreed. 3.2% were not sure. 35.5% agreed while 58.1% strongly agreed.

All the respondents were in agreement that the level of inventory held has an effect on supply chain performance with 51.6% strongly agreeing while 48.4% agreed.

When asked whether the length of lead- time has an effect on supply chain performance, 1.6% strongly disagreed with another 1.6% disagreeing, 51.6% agreed while 45.2% strongly agreed.

4. SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary of Findings:

This study sought to ascertain the role of multi echelon distribution systems on supply chain performance in the manufacturing sector in Kenya a case of Toyota Kenya. The specific objectives that guided the study included; To determine the level of process integration on supply chain performance in manufacturing companies in Kenya a case of Toyota Kenya; To establish if lead-time has effect on supply chain performance in manufacturing companies in Kenya a case of Toyota Kenya; To find out the influence of inventory policy on supply chain performance in manufacturing companies in Kenya a case of Toyota Kenya and to examine the influence of supplier management on supply chain performance in manufacturing companies in Kenya a case of Toyota Kenya. This study employed a case study research design to achieve these study objectives.

The study population comprised of 300 staff at Toyota Kenya and specifically the Top management, Finance Department, Supply-chain Department, ICT Department, and the Engineering Department. These departments directly or indirectly get involved in the strategic involvement of multi echelon distribution systems. This study used stratified random sampling technique. The sample size was 75 respondents achieved by use of Mugenda and Mugenda (2003). Structured questionnaire containing close-ended questions was used to collect primary data for this study. The questionnaires were distributed using drop-and-pick later method to the respondents. A pilot study was carried out among Toyota Kenya staff who did not take part in the main study. Data collected was analyzed using descriptive and inferential analysis methods. A multiple linear regression analysis was used to analyze the effects of process integration, lead time, inventory policy and supplier management on supply chain performance. SPSS version 24 was used to perform data analysis. Data analysis results were presented using tables. Multiple linear regression results have shown that four predictors can explain 79.1% of change in supply chain performance namely: process integration, lead time, inventory policy and supplier management.

Process integration effect on supply chain performance:

The findings have revealed that Toyota Kenya has a holistic approach to process design which emphasizes the unity of the processes and considers the interactions between different unit operations from the outset, rather than optimizing them separately. This is because the company has put in place adequate measures which ensure that the target group can access the relevant information pertaining procurement preference. The findings show that Toyota Production system or TPS is a process integrated manufacturing system whose philosophy is to 'eliminate all waste from manufacturing processes. The system is based on Just-in Time concept. TPS has become very successful in allowing the company to increase production efficiency, decrease manufacturing time and simplify its processes. All of which resulted in lower costs and better quality vehicles. The results revealed that process integration affect supply chain performance at Toyota Kenya. The results have also shown that process integration positively and significantly affected supply chain performance at Toyota Kenya.

Inventory policy effect on supply chain performance:

The study further determined that inventory policy affects supply chain performance. The findings indicate that inventory policy can help to achieve supply chain performance within an organization. The company through the use of JIT, Kaizen and TPS it has managed to control stock levels within its production. When everything has been well done, TPS fetches order of great improvements in inventory, material handling, scheduling, and customer satisfaction. The payoff to dealers and shareholders is important and well acknowledged (Chen & Paulraj, 2004).

The results have also revealed that inventory policy affect preference regulation at Toyota Kenya. Inventory policy was as well found to positively and significantly affect supply chain performance.

Supplier management effect on supply chain performance:

The results have revealed that supplier management has an effect on supply chain performance at Toyota Kenya. Good relationships with suppliers ensure smooth flow of quality raw material into the production system. Supplier management was also found to positively and significantly affect supply chain performance at Toyota Kenya.

The study found out that Toyota Kenya has maintained its good relationship with its supplies through providing all the relevant necessary information to them, ensuring prompt payment to the and making sure all alteration on supply schedule is made available to them early enough.

Conclusions:

Following the results of the study, it is worthwhile to conclude that there is a positive relationship between multi echelon distribution systems and supply chain performance. Through process integration, lead time, inventory policy and supplier management, Toyota Kenya has been able to achieve optimum supply chain performance. It is therefore clearer that the application of multi echelon distribution systems in the manufacturing sector can be used to achieve more benefits than the previously forecasted to achieve. It provides means for achieving coordinated process and reduced costs. Manufacturing organizations use multi echelon distribution systems with 3PLs to achieve benefits such as increased reduced distribution costs, distribution time and stock holding costs in the purchase and transportation of raw materials and finished goods through its production processes to ensure achievement of improved efficiency and effectiveness and quality outputs both at reduced operational costs.

Recommendations:

Given the role multi echelon distribution systems have on supply chain performance, it is imperative that manufacturing firms start to view multi echelon distribution systems a strategy to ensure efficiency and effectiveness of their operations : that they will have a strong capability to increase the inventory turnover through properly established and right-sized safety stock buffers across the entire supply chain, taking into account the complex interdependencies between stages, as well as variables that cause chronic excess inventory, such as long lead times, demand uncertainty, and supply volatility .

Since most respondents agreed that multi echelon distribution systems have led to increasing the level of supply chain performance, manufacturing firms should be encouraged to adopt multi echelon distribution systems since it will assist them achieve their business goals.

The application of multi echelon distribution systems play a critical role in ensuring the holistic process integration, lead time management, inventory policy and supplier management as observed in the study.

Process integration:

Companies began to approach their supply chains as integrated whole systems rather than as individual suppliers, a move that changed the overall approach to the entire supply chain process, from evaluating suppliers to the procurement and payment process (Ivanov, et al, 2010). Ivanov further argues that distribution costs of a manufacturing firm accounts to approximately 25% of the total operational costs.

Manufacturing companies should therefore consider the application of multi echelon distribution systems in both their upstream and downstream distribution systems to ensure they enjoy quality production of goods at optimally reduced distribution costs. This will ensure margins of revenue realization against total costs is high enough to earn adequate profits, thus competitive edge.

Inventory policy:

Just in Time, Stockless Production, World Class Manufacturing, Demand Flow Technology and several other terms are mostly the variations of Toyota's Six Sigma system. Lean Manufacturing, given by James Womack, is a name that appears to sticking very firmly (Axsater, 2000).

The key decision in manufacturing, retail and some service industry businesses is how much inventory to keep on hand. Inventory is usually a business's largest asset. The instant inventory levels are established, they become an important input to the budgeting system. Inventory decisions involve a delicate balance between three classes of costs: ordering costs, holding costs, and shortage costs (Lee & Wu, 2006).

Areas for Further Research:

This study was not exhaustive by any means and therefore it is recommended that another study be replicated in other sectors of the economy, such as the service industries and most importantly the transport sector. This is because the studies on application of multi echelon distribution systems is still not exhaustive with gaps on how to introduce multi echelon distribution system on work in progress much evident. The study therefore provides a research field that is still evolving and besides the research as well has provided great contribution to the body of knowledge. A similar research in the other economic sectors will also need to be carried out over time to see if they validate, support or contradict the findings of this particular study.

REFERENCES

[1] Aastrup, J., & Halldorsson, A. (2008). Epistemological role of case studies in logistics: a critical realist perspective. International journal of physical distribution \& logistics management, 746--763.

[2] Akbari, H. (2015, January 7). Transaction cost economics. Boston, USA.

[3] Akintoye, A., McIntosh , G., & Fitzgerald, E. (2000). A survey of supply chain collaboration and management in the UK construction industry. European Journal of Purchasing \& Supply Management, 159--168.

[4] Anderson, E. J., & Coltman, T. (2011). What drives the choice of a third-party logistics provider? Journal of Supply Chain Management, 97--115.

[5] Aoki, M. (2013). Toward an Economic Model of the Japanese Firm. Edward Elgar Publishing.

[6] Axsater, S. (2000). Invetory Control. Boston: Kluwer Academic Publishers.

[7] Babbie, E. (2002). The Practice of Social Research (2E), Wadsworth, a division of Thomson Learning. Inc.

[8] Barabasi, A. L. (2009). Scale-free networks: a decade and beyond. science, 412- 413.

[9] Beamon, B. M., & Chen, V. C. (2001). Performance analysis of conjoined supply chains. International journal of production research, 3195- 3218.

[10] Berente, et al. (2009). Information flows and business process integration. Business Process Management Journal, 119--141.

[11] Beretta , S. (2002). Unleashing the integration potential of ERP systems: the role of process-based performance measurement systems. Business Process Management Journal, 254--277.

[12] Bertsimas, D. J., & Ryzin, G. V. (2001). Stochastic and Dynamic Vehecle Routing in the Euclidean Plane with Multiple Capacitated Vehecles.

[13] Blanchard, B. S. (2004). Logistics engineering and management. Prentice Hall.

[14] Blazenko, G. W., & Vandezande, K. (2003). Corporate holding of finished goods inventories. Journal of Economics and Business, 255--266.

[15] Boute, et al. (2007). An integrated production and inventory model to dampen upstream demand variability in the supply chain. European Journal of Operational Research, 121--142.

[16] Boute, R. N., Disney, S. M., Lambrecht, M. R., & Van , H. B. (2007). An integrated production and inventory model to dampen upstream demand variability in the supply chain. European Journal of Operational Research, 121--142.

[17] Bowen, et al. (2009, March). Management of business challenges among small and micro enterprises in Nairobi Kenya. KCA journal of business management: vol. 2 issue 1. Retrieved from Working for a World Free of Poverty.

[18] Brintrup, A., Kito, T., Lopez, E., News, S., & Reed-Tsochas, F. (2011). The structure of the Toyota supply network: the emergence of resilience. CABDyN working paper.

[19] Bullmore, E., & Sporns, O. (2009). Complex brain networks. Nature reviews neuroscience, 186- 198.

[20] Chandra, C., & Kumar, S. (2000). Supply chain management in theory and practice: a passing fad or a fundamental change? Industrial Management \& Data Systems, 100--114.

[21] Chen, F. (2003). Information sharing and supply chain coordination. Handbooks in operations research and management science, 68-83.

[22] Chen, H., & Mattioda, D. D. (2007). Firm-wide integration and firm performanc. The International Journal of Logistics Management, 5--21.

[23] Chen, I. J., & Paulraj, A. (2004). Towards a theory of supply chain management: the constructs and measurements. Journal of operations management, 119- 150.

[24] Chen, J., Li, J., & Wang, S. (2011). Introduction. In Risk Management of Supply and Cash Flows in Supply Chains (pp. 1--48).

[25] Chen, X. D., & Fu, L. S. (2001). IT adoption in manufacturing industries: differences by company size and industrial sectors—the case of Chinese mechanical industries. Technovation, 649--660.

[26] Choi, T. Y., & Wu, Z. (2009). Taking the leap from dyads to triads: Buyer--supplier relationships in supply networks. Journal of Purchasing and Supply Management, 263--266.

[27] Cigolini, R., Cozzi, M., & Perona, M. (2004). A new framework for supply chain management: conceptual model and empirical test. International Journal of Operations \& Production Management, 7--41.

[28] Cooper, D. R., Schindler, P. S., & Sun, J. (2006). Business research methods. McGraw-Hill Irwin New York.

[29] Cooper, M. C., & Lambert, D. M. (2000). Issues in supply chain management. Industrial marketing management, 65--83.

[30] Cowan, R., & Jonard, N. (2007). Structural holes, innovation and the distribution of ideas. Journal of Economic Interaction and Coordination, 93-110.

[31] Crainic, T. G. (2008). City logistics. In T. G. Crainic, State-of-the-Art Decision-Making Tools in the Information-Intensive Age (pp. 181--212). INFORMS.

[32] Critical Analysis of the Supply Chain Management Theories: Toward the Stakeholder Theory'. (2010). In K. M. Lavassani, & B. Movahedi, POMS 21st Annual Conference, Vancouver. Ottawa: Carleton University.

[33] Cropanzano , R., & Mitchell, M. S. (2005). Social exchange theory: An interdisciplinary review. Journal of management, 874--900.

[34] Cummings , T. G., & Worley, C. G. (2014). Organization development and change. Cengage learning.

[35] da Silveira, G. J., & Arkader, R. (2007). The direct and mediated relationships between supply chain coordination investments and delivery performance. International Journal of Operations \& Production Management, 140--158.

[36] da Silveira, G. J., & Cagliano, R. (2006). The relationship between interorganizational information systems and operations performance. International Journal of Operations \& Production Management, 232--253.

[37] De Treville, S., Shapiro, R. D., & De Treville, S. (2004). Journal of Operations Management, 613--627.

[38] De Treville, S., Shapiro, R. D., & Hameri, A.-P. (2004). {From supply chain to demand chain: the role of lead time reduction in improving demand chain performance. Journal of Operations Management, 613--627.

[39] Deloof, M. (2003). Does working capital management affect profitability of Belgian firms? Journal of business finance \& accounting, 573--588.

[40] Ellram, L. M., Tate, W. L., & Billington, C. (2004). Understanding and managing the services supply chain. Journal of Supply Chain Management, 17--32.

[41] Eskigun, E., Uzsoy, R., Preckel, P. V., Beaujon, G., Krishnal, S., & Tew, J. D. (2005). Outbound supply chain network design with mode selection, lead times and capacitated vehicle distribution centers. European Journal of Operational Research, 182- 206.

[42] Farhoomand, A. F., & Ng, P. (2000). Dell: Selling Directly, Globally. In Proceedings, 13th International Conference on Electronic Commerce.

[43] Fawcett , S. E., & Magnan, G. M. (2002). The rhetoric and reality of supply chain integration. International Journal of Physical Distribution \& Logistics Management, 339--361.

[44] Field, J. M., & Meile, L. C. (2008). Supplier relations and supply chain performance in financial services processes. International Journal of Operations \& Production Management, 185--206.

[45] Field, J. M., & Meile, L. C. (2008). Supplier relations and supply chain performance in financial services processes. International Journal of Operations \& Production Management, 185--206.

[46] Flynn, B. B., Baofeng, H., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. Journal of operations management, Elsevier.

[47] Flynn, B. B., Huo, B., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach.

[48] Forslund, H., & Jonsson, P. (n.d.). Dyadic integration of the performance management process: a delivery service case study. International Journal of Physical Distribution \& Logistics Management, 546--567.

[49] Friedman, D. (2006). No Light at the End of the Tunnel. Los Angeles Times.

[50] Fujiwara, Y., Souma, W., Aoyama, H., Kaizoji, T., & Aoki, M. (2003). Growth and fluctuations of personal income. Statistical mechanics and its applications, 598-604.

[51] Fynes, B., & Voss, C. (2005). The impact of supply chain relationship dynamics on manufacturing performance. International Journal of Operations \& Production Management, 6--19.

[52] Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: an integrated model. MIS quarterly, 51- 90.

[53] Gonzalez- Feliu, J., & Ambrosini, J. L. (2012). New trends on urban goods movement: Modelling and simulation of e- commerce distribution. European transport.

[54] Gonzalez-Feliu, J. (2012). Cost optimization in freight distribution with cross-docking: N- echelon location routing problem. PROMET- Trafic and transpotation, 143-149.

[55] Gracin, J., & Stipeti, A. (2009). Designing Postal Network Units. PROMET-Traffic\&Transportation, 387--394.

[56] Graves, S. C. (2003). Supply Chain Design: Safety Stock Placement and Supply Chain Configuration.

[57] Gumus, T. A., & Guneri, F. A. (2007). Multi- echelon inventory management in supply chains with uncertain demand and lead times : Litrature review from an operational research perspective. Proceedings of the institution of mechanical ngineers, Part B: Journal of Engineering Manufacture.

[58] Gunasekaran, A., Williams, H. J., & McGaughey, R. E. (2005). Performance measurement and costing in new enterprise . USA.

[59] Hearnshaw, E. J., & Wilson, M. M. (2013). A complex network approach to supply chain network theory. International Journal of Operations \& Production Management, 442-469.

[60] Hendricks, K. B., & Singhal, V. R. (2003). The effect of supply chainglitches on shareholder wealth. Journal of operations management, 501-522.

[61] Hulley, et al. (2013). Designing clinical research. Lippincott Williams \& Wilkins.

[62] Human , S. E., & Provan, K. G. (2000). Legitimacy building in the evolution of small-firm multilateral networks: A comparative study of success and demise. Administrative Science Quarterly, 327-365.

[63] IBM Business Consulting Services. (2010). Challenges for the automotive industry.

[64] Ivanov, et al. (2010). A multi-structural framework for adaptive supply chain planning and operations control with structure dynamics considerations. European Journal of Operational Research, 409--420.

[65] Iyer, A. V., Seshadri, S., & Vasher, R. (2009). Toyota supply chain management. McGrow Hill.

[66] Iyer, et al. (2004). Supply chain B2B e-commerce and time-based delivery performance. International Journal of Physical Distribution \& Logistics Management, 645--661.

[67] Iyer, et al. (2006). Toyota supply chain management. McGrow Hill.

[68] Jespersen, B. D., & Skjott- Larsen, T. (2005). Supply chain management: in theory and practice. Copenhagen Business School Press DK.

[69] Kargari, M., & Sepehri, M. M. (2012). Stores clustering using a data mining approach for distributing automotive spare-parts to reduce transportation costs. Expert Systems with Applications.

[70] Karim, M. R. (2013). Analysing the Role of Triangulation in Research. GRIN Verlag.

[71] Keller , S. B., Savitskie, K., Stank, T. P., Lynch, D. F., & Ellinger , A. E. (2002). summary and analysis of multi-item scales used in logistics research. Journal of Business Logistics, 83--119.

[72] Kenneth, L., & Brian, F. (2006). Purchasing and supply chain management. Harlow: Financial Times Prentice Hall.

[73] Kothari, C. R. (2004). Research methodology: methods and techniques. New Delhi: New age International (P) Ltd.

[74] Kozlenkova, I. V., Hult, G. M., Lund, D. J., Mena, J. A., & Kekec, P. (2015). The role of marketing channels in supply chain management. Journal of Retailing, 586--609.

[75] Lambert, D. M., Knemeyer, A. M., & Gardner, J. T. (2004). Supply chain partnerships: model validation and implementation. Journal of business Logistics, 21--42.

[76] Lang, L. (2009, October 30). Maximizing profitability with theory of constraints.

[77] Lee, H. L., & Wu, J. C. (2006). A study on inventory replenishment policies in a two-echelon supply chain system. Computers \& Industrial Engineering, 257--263.

[78] Liker, J. K., & Choi, T. Y. (2004). Building deep supplier relationships. Harvard business review, 104--113.

[79] Lusch, R. F., Vargo, S. L., & O'Brien, , M. (2007). Competing through service: Insights from service-dominant logic. Journal of retailing, 5--18.

[80] Mancini, S. (2013). Muti-echelon distribution systems in city logistics. European Transport, 1-2.

[81] Manufacture's Institute, National Association of Manufacturers & Manufaturers Alliance for Productivity and Innovation. (2012). Facts about Manufacturing.

[82] Mc.Cullen, P., & Towill, B. (n.d.). Practical Ways of Reducing Bullwhip.

[83] Meixell, M. J., & Gargeya, V. B. (2005). Global supply chain design: A literature review and critique. Transportation Research Part E: Logistics and Transportation Review, 531- 550.

[84] Mettler, T., & Rohner, P. (2009). Performance management in health care: the past, the present, and the future.

[85] Min, H., & Zhou, G. (2002). Supply chain modeling: past, present and future. Computers \& industrial engineering, 231--249.

[86] Monk, E., & Wagner, B. (2012). Concepts in enterprise resource planning. Boston: Cengage Learning.

[87] Morgan, C. (2007). International Journal of Logistics Management. Supply Network Performance Measurement: Future Challenges.

[88] Mugenda, O., & Mugenda, A. (2003). Research methods, quantitative and qualitative approaches. Nairobi: ACCTS.

[89] Neuman, L. W. (2000). Social Research methods: qualitative and quantitave approaches 4th edition. Boston: Allyn and Bacon.

[90] Newman, J. (2001). Modernizing governance: New Labour, policy and society.

[91] N'Geno, N. K. (2003). Regional integration study of East Africa: The case of Kenya. Kenya Institute for Public Policy Research and Analysis.

[92] Nkomo, T. (2013). Analysis of toyota motor corporation.

[93] Orodho, A. O. (2003). Research methodology, descriptive research design. Nairobi: Acts Press.

[94] Oso, , W. Y., & Onen, D. (2009). A general guide to writing research proposal and report. Nairobi: Jomo Kenyatta Foundation.

[95] Petersen, K. J., Handfield, R. B., Robert , B., & Ragatz, G. L. (2005). Supplier integration into new product development: coordinating product, process and supply chain design. Journal of operations management, 371--388.

[96] Piplani, R., & Fu, Y. (2005). A coordination framework for supply chain inventory alignment. Journal of Manufacturing Technology Management, 598--614.

[97] Podani, J., Oltyai, Z. N., Jeong, H., Tombor, B., Barabasi, A. L., & Szathmary, E. (2001). Comparable system-level organisation of archaea and eukaryotes. nature genetics, 54-56.

[98] Prahinski, C., & Benton, W. C. (2004). Supplier evaluations: communication strategies to improve supplier performance. Journal of operations management, 39--62.

[99] Pricewaterhouse Coopers. (2012). industrial- manufacturing. Retrieved from Pricewaterhouse Coopers Website.

[100] Rai, A., Patnayakuni, R., & Seth, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. MIS quarterly, 225--246.

[101] Ramasco, J. J., Dorogovtsev, S. N., & Pastor-satorras, R. (2004). Self organisation of collaboration networks. physical review.

[102] Rattner, S. (2006, August 9). Retrieved from Lean enterprise institute: http://www.lean.org/common/display/?o=223

[103] Robb, D. J., & Silver, E. A. (2006). Inventory management under date-terms supplier trade credit with stochastic demand and leadtime. Journal of the Operational Research Society, 692--702.

[104] Ross, D. F. (2013). Competing through supply chain management: creating market-winning strategies through supply chain partnerships. Springer Science \& Business Media.

[105] Sabbaghi, A., & Vaidyanathan, G. (2007). Efficiency of RFID in supply chain management: Strategic benefits and challenges. Issues in Information Systems, 443--448.

[106] Sako, M. (2006). Does trust improve business performance. Organisafional trust: A reader, 267-294.

[107] Sanyal, S. (2014, january tuesday, 28th). Supply chain management. A collection of resources and commentary providing an introduction to supply chain management and related systems for students, practitioners, and anyone else Multi-echelon inventory optimization. USA.

[108] Saunders, R. (2010). Validity of social-cognitive measures for physical activity in middle-school girls. Journal of pediatric psychology, 72--88.

[109] Schmenner, R. W. (2001). Looking ahead by looking back: swift, even flow in the history of manufacturing. Production and Operations Management, 87- 96.

[110] Seggie, S. H., Kim, D., & Cavusgil, S. T. (2006). Do supply chain IT alignment and supply chain interfirm system integration impact upon brand equity and firm performance? Journal of business research, 887--895.

[111] SEO. (2017). Supply chain glossary of terms. Retrieved from Logistics Bureau Pty Ltd.

[112] Shah, R., & Shin , H. (2007). Relationships among information technology, inventory, and profitability: an investigation of level invariance using sector level data. Journal of Operations Management, 768--784.

[113] Sherbrooke , C. C. (2006). Optimal inventory modeling of systems: multi-echelon techniquest. Management science.

[114] Shofer, K. R., & Murphy, C. O. (2005). Psychological testing : principles and applications. Upper Saddle River, N.J.: Pearson/Prentice Hall.

[115] Silver, E. A., Guide , J., V , D. R., Jayaraman, V., Srivastava, R., & Benton, W. (2000). Supply-chain management for recoverable manufacturing systems. Interfaces, 125--142.

[116] Sivakumar, A. (2000). A simulation based analysis of the effect of scheduling and lot release on cycle time distribution and throughput in semiconductor backend. In Proceedings of the International Conference on Modeling and Analysis of Semiconductor Manufacturing (pp. 206--211).

[117] Skilton, P. F., & Robinson, J. L. (2009). Traceability and normal accident theory: how does supply network complexity influence the traceability of adverse events? Journal of Supply Chain Management, 40-53.

[118] Soko Directory Team . (2015, December 8). State of the manufacturing industry in Kenya. Nairobi, Kenya.

[119] Sole, R. V., & Montonya, M. (2001). Complexity and fragility in ecological networks. Proceedings of the royal society of London B: Biological Sciences, 2039- 2045.

[120] Stadtler, H. (2005). supply chain management and planning: basics, overview and challenges . European Journal of Operations Research.

[121] Stevenson, M., Hendry, , L. C., & Kingsman, B. (2005). A review of production planning and control: the applicability of key concepts to the make-to-order industry. International journal of production research, 869--898.

[122] Storhagen, N. (2003). Logistik. Malm{\"o}: Liber ekonomi.

[123] Suhong, L., Ragu- Nathan, B., Ragu- Nathan, T. S., & Rao, S. S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. Omega, 107--124.

[124] Supply Chain Council. (2003). A conceptual model of supply chain flexibility.

[125] Supply Chain Council. (2003). Supply- chain operations reference- model. Overview of SCOR Version 6.0.

[126] Tan, K. C. (2001). A framework of supply chain management literature. European Journal of Purchasing \& Supply Management, 39--48.

[127] Thoumrungroje, A., & Tansuhaj, P. (2007). Globalization effects and firm performance. Journal of International Business Research, 43.

[128] Tracey, M., & Leng Tan, C. (2001). Empirical analysis of supplier selection and involvement, customer satisfaction, and firm performance. Supply Chain Management: An International Journal, 174--188.

[129] Tsiakis, P., Shah, N., & Pentelides, C. C. (2001). Design of multi-echelon supply chain networks under demand uncertainty. Industrial \& Engineering Chemistry Research, 3585- 3604.

[130] Ulbrich, F. (2006). Improving shared service implementation: adopting lessons from the BPR movement. Business Process Management Journal, 191--205.

[131] Van der Vaart, T., & Van Donk, D. P. (2008). A critical review of survey-based research in supply chain integration. International journal of production economics, 42--55.

[132] Vastag, G., & Whybark, D. C. (129--138). Inventory management: Is there a knock-on effect? International Journal of Production Economics, 2005.

[133] Vereecke, A., & Muylle, S. (2006). Performance improvement through supply chain collaboration in Europe. International journal of operations \& production management, 1176--1198.

[134] Watts, R. L. (2003). Conservatism in accounting part I: Explanations and implications. Accounting horizons, 207--221.

[135] Womack, , J. P., & Jones, ,. T. (2010). Lean thinking: banish waste and create wealth in your corporation. Simon and Schuster.

[136] Womack, J. P., & Jones, D. T. (2010). Lean thinking: banish waste and create wealth in your corporation. Simon and Schuster.

[137] Womack, J. P., & Jones, D. T. (2010). Lean thinking: banish waste and create wealth in your corporation. Simon and Schuster.

[138] Xu, L., & Beamon, B. M. (2006). Supply chain coordination and cooperation mechanisms: an attribute-based approach. Journal of Supply Chain Management, 4--12.

[139] Youngman, K. J. (2009). strategic advantage. Retrieved from A guide to implementing the theory of constraints: http://www.dbrmfg.co.nz/Strategy%20Strategic%20Advantage.htm

[140] Zhou, H., & Benton, W. (2007). Supply chain practice and information sharing. Journal of Operations management, 1348--1365.