THE ROLE OF SUPPLY CHAIN TOOLS AND TECHNIQUES ON THE EFFECTIVENESS OF PROCUREMENT PROCESS AT EGERTON UNIVERSITY

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ABSTRACT

The increasing complexity of products and process coupled with high performance place unprecedented challenges and opportunities on the development of organizations. It is important for organizations to ensure customers are fully satisfied by ensuring all the processes are put in place and are easily flowing. This research critically examined the supply chain tools and techniques and how they can be a powerful business improvement methodology for enhancing the effectiveness of procurement process in public universities in Kenya. This was achieved using a case study design approach where Egerton University was used as the case. Data was obtained seeking opinion from sampled procurement staff, and other staff handling procurement at departmental levels. The target population was 174 from which a sample of 121 was selected. Data was collected by administering questionnaires to the sampled respondents. Quantitative data was analyzed using descriptive statistics which included mean, mode, frequency and percentages. Inferential statistics used included Pearsons correlation to show the relationships between the supply chain tools and performance of procurement in the organization. The major findings of the study were that, although there was a scanty application of the procurement tools studied, that is: six sigma, continuous improvement, just in time procurement, and lean management, there was a positive correlation between the level of application and efficiency levels of procurement. Therefore, these tools played a significant role in enhancing efficiency in procurement. The study therefore recommends that the university should relook into the tools that contribute to the procurement objectives of the organization and design a structured procedure of implementing to the full so as to harness the full benefits of these tools.

Key Words: *Supply chain tools and techniques, lean management, six sigma, continuous improvement and just in time*

Introduction

Any enterprise is required to review its activities and planning to deal with the fiercely competitive, rapidly changing and dynamic shrinking world market. Owing to these changes, focus has now been shifted from selling the product or service to capturing the voice of the customer more satisfactorily. The information about customer requirement may come from different sources, in different forms and patterns. To incorporate the changes, driven by such information, it is prerequisite to establish a corporate culture to continuously look for the means and mediums to improving their productivity and operating performances (Tiwari *et al.*, 2008). The best companies around the world are discovering a powerful new source of competitive advantage. It is called supply-chain management and it encompasses all of those integrated activities that bring product to market and create satisfied customers (Tiwari *et al.*, 2008). In today's high technology, quality and cost driven, competition oriented business world, supply chain tools and techniques play a prominent role in enhancing the performance, productivity and profitability of many firms. It alleviates defects, waste, lead time and inventory simultaneously through improving quality, reliability, availability and by building consensus amongst employees for improvement initiatives (Pyzdek, 2009). In the current competitive market, service companies are pushing this defect reduction methodology to a new level, Banks are trying to use it to jump-start growth, telecommunication giants are aiming at cost reduction and even retailers are trying it out to serve their customers better (Dustin, 2010).

Statement of the Problem

Effective supply chain management is treated as key to building a sustainable competitive edge through improved inter and intra-firm relationships (Fergueson, 2000). Similarly, an international study of modern manufacturing practices reported moderate uptake and perceived effectiveness of supply chain management (Clegg *et al.*, 2002). In view of these modest levels of uptake and effectiveness, one would expect interest in developing measurement systems and metrics for evaluating supply chain performance to be burgeoning. Moreover, it has been argued that measuring supply chain performance can facilitate a greater understanding of the supply chain, positively influence actors' behavior, and improve its overall performance (Chen and Paulraj, 2004). Egerton University audit report (2012), on the procurement process, noted that delays in the procurement process had driven departments, especially the Income generating units to carry out cash purchase using petty cash or through imprest on approval by Procurement Department. The practice had gone to the extent of spending revenue on the cash purchases of which it interfered with the cash flow process making it hard to account for revenue and attain maximum profits. PPOA report (2011) review team identified various deviations from the procurement process that was lack of operating ICT systems and applications covering all aspects of procurement and inadequate training in the procurement law and the supporting documentation for the persons involved in the procurement related functions.

Specific Objectives

1. To identify the role of lean management on the effectiveness of the procurement process.
2. To assess the role of six sigma on the effectiveness of the procurement process
3. To look at the role of continuous improvement on the effectiveness of the procurement process
4. To identify the role of J.I.T on the effectiveness of the procurement process

Literature Review

Introduction to Procurement

The complete procurement cycle begins with the procurement planning, a step closely linked with the process. It is followed by procurement initiation, bidder selection, notification award, procurement. Commitment contract signing, contract administration, receipt and acceptance of goods, works, services or consulting services, and the storage and inventory management of the goods and supplies received. The procurement cycle may also involve administrative review. In short, the procurement cycle starts with the identification of the procurement requirement and ends with registration of the assets procedure into the procuring entities. Procurement Planning directly links the procurement function to budget preparation. Budget execution is affected by procurement. Unless procurement has been planned adequately, with realistic times taken into account for the preparation of procurement requirements and allotments of budget, the budget execution will be hampered (PPDA, 2006)

Introduction to Supply Chain Management

Supply chain management may be thought of as the management of all activities aimed at satisfying the end consumer; as such it covers almost all activity within the organization. It has been suggested that it incorporates a number of key success factors which include a clear procurement strategy, effective control systems, and development of expertise. Supply chain management therefore represents and reflects a holistic approach to the operation of the organization. In other words, supply chain management relates to the entire procurement cycle not just at the end (which is the commonly-held view). In particular it has a pivotal role to play in the development of an initial sourcing strategy, several supply chains coming into (upstream), going through and going out of (downstream) the organization. Supply chain management is the management of the whole demand process, starting with the end customers' requirements – be that external customers (e.g. consumers) or internal customers (e.g. end users) - and managing the meeting of their requirements right up to, and in some cases, beyond the supplier of the required goods or services (Zygiaris, 2000).

Supply Chain Tools and Techniques

Lean Management

Lean is the setting of standards aimed at continuous improvement by all team members; however it is often perceived as merely a series of tools and improvement methods. In reality, it is a complete system affecting the entire enterprise in every function. It takes several years to master

implementation, and it takes discipline in the enterprise to foster long term continuous improvement (Scaffede, 2002). Lean focuses on eliminating (or reducing) eight major wastes or muda. Wastes are non-value added activities or activities for which the customer is not willing to pay. Wastes interrupts the flow of products and services throughout the value chain (Dennis, 2002).The eight wasted include: waste of overproduction. waste of motion, waste of waiting, waste of defects, waste of inventory, waste of transportation, waste of underutilized people or knowledge disconnection and waste of extra (or non-value added) processing, although lean production is focused on effectiveness in the production process, lean thinking is more focused on the effectiveness in the production process, and on the efficiency in the company as a whole, including offices (Chiarini, 2011). It is focused on the extreme simplification of the mainstream with the intent of avoiding any kind of waste and accelerating the flow, the typical goals to follow are linked to waste reduction and customer satisfaction (George, 2002).

Six Sigma

Six-Sigma is a methodology that enables world class quality and continuous improvement in achieving the highest level of customer satisfaction. Metrics are established that align a company's strategic goals and values to that of their customer's needs and expectations. Six Sigma is a metric of how well a process is performing with six-sigma as the standard of excellence at only 3.4 defects per million opportunities (Picard, 2002). Measurement standards entered the scientific and management literature later but the term Six-Sigma was coined by a Motorola engineer named Bill Smith. In the early and mid-1980's with Chairmann Bob Galvin, Motorola engineers decided that the traditional quality levels that measured defects in thousands of opportunities did not provide enough quality results: Instead, they wanted to measure the defects per million opportunities (DPMO) (Chiarini, 2012). Six-Sigma is a management system similar to TQM, BPR or Lean. It is considered a system for reaching business excellence and it focuses on a precise application pattern called DMAIC (Klefsjo *et al.*, 2001).It improves customer satisfaction along with all organization performance (Przekop, 2003) Six Sigma was strategically developed by Motorola in the 1980's and popularized by General electric and others in the 1990's (Pande *et al.*, 2000).A defect occurs when a measured attribute is outside the tolerance limit, which typically results in customer dissatisfaction. The six sigma quality concept recognizes that variations or defects are inevitable due to insufficient design margin, inadequate process control, imperfect parts and materials, fluctuations in environmental conditions, operator variations among others (Narahari *et al.*, 2000). However as product and process defects are driven out, value for the customer goes up, customer satisfaction increases, the company captures market share with higher quality at low price, with profits and company stakeholder value maximized (McCarthy and Stauffer, 2001).

Continuous Improvement

Continuous improvement (CI) is an ongoing activity aimed at raising the level of organization-wide performance through focused incremental changes in processes Chen (2006). While CI

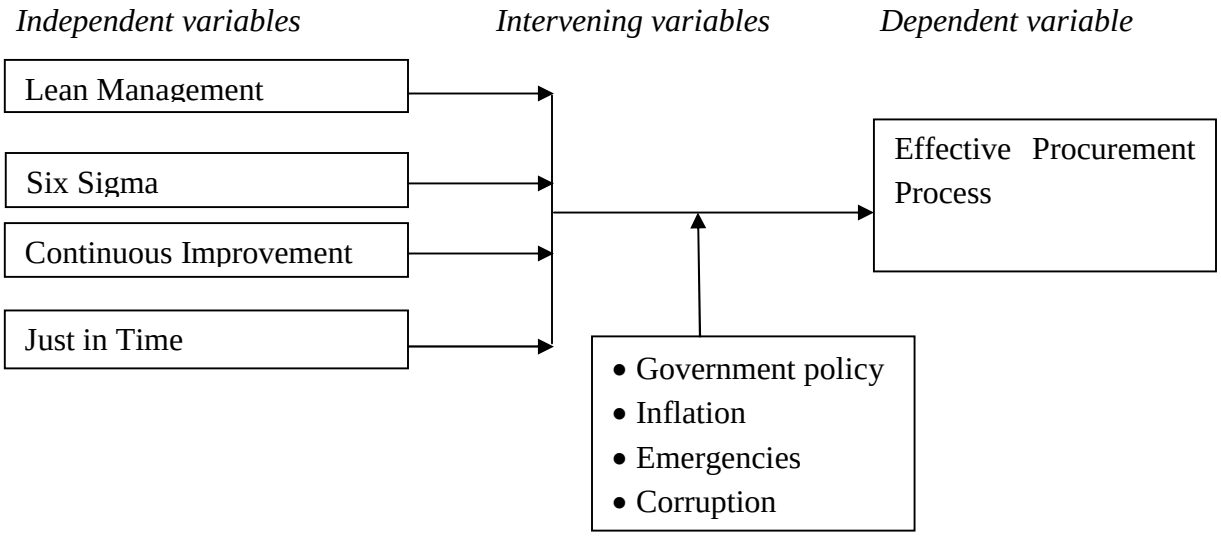
infrastructure should support both execution and coordination of projects, several organizations deploy CI initiative simply by executing ad-hoc projects using tools and techniques popular at the time in doing so, these organizations ignore the more difficult to imitate project coordination and supporting activities of CI initiatives such as those for systematically selecting and reviewing projects, preserving lessons learned from projects , and training and motivating employees for participating in CI. A number of researchers have observed that CI deployments that lack adequate coordination and support lose traction and become ineffective after realizing initiative gains (Choo *et al.,* 2007). As defined by (Fiol and Lyles, 1985) organizational learning involves improving actions through better knowledge and under carrying out processes. Which include selecting among alternate action paths in response to changes in operating conditions. These routine operating processes are changed from time to time to improve performance- for instance, to increase production efficiency or improve customer responsiveness (Zahra *et al,* 2006). The ability to make changes to routine operating processes through organizational learning is a dynamic capability. Examples of other dynamic capabilities include alliance-forming and acquisition- making capabilities (Helfat *et al*., 2007)Performance-enhancing changes in routine operating processes can be discovered and implemented through projects executed using CI protocols and practices, The two nested activities noted above- the routine selection among alternate path s in a process, and the adaptation or updating of routine ways of operating the process- are referred to as single-loop and double- learning . CI initiatives can play a major role in double-loop learning resulting in the creation of knowledge about process changes (Lin- derman *et al.,* 2004).

J.I.T

Just-in-time (JIT) is defined in the APICS dictionary as “a philosophy of manufacturing based on planned elimination of all waste and on continuous improvement of productivity”. It also has been described as an approach with the objective of producing the right part in the right place at the right time (in other words, “just in time”). The idea of implementing JIT practices upstream along the supply chain is probably as old as the JIT concept. In his book on the Toyota Production Systems (Monden, 1983) reports the problems the company had with unions and the Japanese Communist Party in 1977 when implementing kanban pull system on deliveries by suppliers. In a detailed analysis and review of JIT practices (Cua *et al.,* 2001) explicitly mention JIT delivery by suppliers and identify five seminal studies including this practice among those commonly associated with JIT. The primary goal of JIT is commonly indicated in the continuous reduction and ultimately elimination of all forms of waste. Recently, (Mackelprang and Nair’s, 2010) have conducted a meta-analytic investigation of empirical studies on the relationship between JIT practices and performance and have concluded that this relation is significant and positive when considering operational measures such as manufacturing costs, inventory costs, cycle time, speed and on-time delivery. According to Liu *et al.,* (2009) these performance measures reflect two different underlying dimensions: the first three refer to overall efficiency, while the last two are related to delivery. It has been demonstrated that the positive association

between JIT production and efficiency and delivery performances generally holds over different empirical studies (Mackelprang and Nair, 2010).

Conceptual framework



Methodology

The researcher used a case study of Egerton University. Case study designs are useful in studying phenomena, such as organizational restructuring, that would be difficult to separate from the context in which it would take place (Feagan, Orum, and Sjoberg, 1991). The target population constituted 174 employees from procurement, teaching and other non teaching department drawn from Egerton University. The main reason for selecting Egerton University to conduct this research was that it exhibits an elaborate procurement process and makes use of the supply chain tools and techniques. The sampling frame constituted of 53 departments drawn from Egerton University This study applied proportionate random sampling techniques. The researcher used primary and secondary sources of data. The primary data was collected by use of questionnaires which were self-administered to the sample chosen from all the user departments and the procurement department. The data was collected by use of questionnaires which were self-administered to the sample population from the user departments.

Research Findings

Lean management

Role of Lean Management on Effectiveness of Procurement Process

This section was meant to establish whether lean management was adopted in any way in the organization.

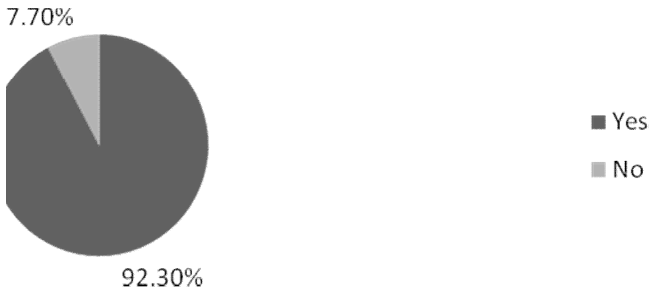


Figure 1: Lean Management was considered in Procurement

A large proportion of procurement staff (92.3%) indicated that lean management practice was adopted in procurement in their institution.

Use of Vision Statements to Motivate Staff

Lean management requires leadership and motivation of staff through visions and missions.

Table 1: Use of Vision Statements to Motivate Staff

	Frequency	Percent
Never used	0	0.0
Rare	9	8.7
Sometimes	41	39.4
Very often	34	32.7
Always	20	19.2
Total	**104**	**100.0**

Majority, 39.4% cited sometimes, 32.7% very often while 19.2% cited always the use of vision statements in setting the strategic direction in the operations of procurement department in the institution.

Consultation in Making Key Procurement Decisions

Consultation is also a key element in lean management especially when key decisions are being passed. Therefore the study sought to establish the extent to which this was practiced.

Table 2: Extent of consultation

Extent	Frequency	Percent
Very less extent	2	1.9
Less extent	0	0.0
Moderate	76	73.1
Large extent	0	0.0
very large extent	26	25.0
Total	**104**	**100.0**

The biggest proportion of procurement staff (73.1%) indicated that consultation was moderately applied in procurement decision making, none cited less extent while only 1.9% cited very less extent, which implies that the staff were in agreement on the moderate application of consultation in decision making.

Key Performance Indicators in Evaluating Procurement Performance

Lean management also involves performance evaluation and tracking the key performance indicators.

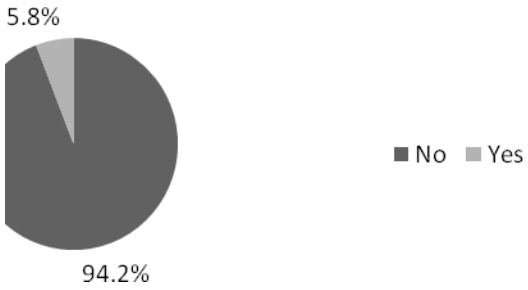


Figure 2: Whether there are KPIs

Majority of the staff, 94.2%, agreed that there were performance indicators in place to track and evaluate performance in the procurement department.

Frequency of Audit of KPIs

In addition to the existence, the audit on KPIs was also established.

Table 3: Procurement department audit

Frequency of Audit	Frequency	Percent
Very rare	0	0.0
Rare	24	23.8
sometimes	19	18.8
Often	60	56.4
very often	1	1.0
Total	**104**	**100.0**

Audit on the KPIs was often done according to 56.4% of the respondents, although 23.8% cited that audit was rarely done.

Testing of New Materials and Procedures

Table 4: Testing New Materials and Procedures

Frequency of testing	Frequency	Percent
Very rare	2	1.9
Rare	19	18.3
Sometimes	6	5.8
Often	46	44.2
Very often	31	29.8
Total	**104**	**100.0**

The findings on Table 4 show that the procurement department emphasizes on testing new materials and procedures before the full adoption since 44.2% of the staff indicated that this was often done while 29.8% cited very often.

Getting Concerned Staff to a Room

Table 5: Getting Concerned Staff to a Room

	Frequency	Percent
Strongly disagree	8	7.7
Disagree	8	7.7
Not sure	5	4.8
Agree	59	56.7
Strongly agree	24	23.1
Total	**104**	**100.0**

Majority (56.7%) of the staff agreed while 23.1% strongly agreed that the management of the university gets all concerned parties into a room to gain consensus on contagious procurement decisions. This means consensus building is highly practiced at the university in making procurement decisions.

Relationship between Application of Lean Management and Procurement Efficiency

In testing Hypothesis 1, Pearson correlation analysis was used to determine whether there was any relationship between the level of application of lean management and the rating on procurement efficiency.

H_{01} $\rho = 0$

H_{11} $\rho \neq 0$

Table 6: Correlation between Lean Management and Procurement Efficiency

		Procurement Efficiency	Lean management
*Procurement efficiency	Pearson Correlation	1	0.213*
	Sig. (2-tailed)		0.026
	N	104	104
Lean management	Pearson Correlation	0.213*	1
	Sig. (2-tailed)	0.026	
	N	104	104

*Significant at 5% level

Although the adoption of lean management was scanty in Egerton university, the results indicate that there was a significant positive correlation between implementation of lean management and efficiency of procurement. The corresponding critical value at p = 0.05, correlation coefficient is 0.213 and is positive though weak; therefore the null hypothesis is rejected. There was a significant correlation between the level of adoption of lean management and procurement efficiency. Therefore adoption of lean management plays a key role in enhancing efficiency of procurement.

Six Sigma and Effectiveness of Procurement Process

This section presents the level of implementation of the different components of six sigma in procurement either consciously of unconsciously and its relationship with effectiveness in procurement.

Application of Six Sigma in Procurement

Rating on the application of the components of six sigma are presented on Table 7. They are measured on the scale of 5 – very good, 4 good, 3- moderate, 2 – poor, 1 – very poor.

Table 7: Application of Six Sigma in Procurement

Elements of six sigma	5	4	3	2	1	Mean
Clearly defined quality standards in the procurement process	19.2%	44.2%	26.0%	8.7%	1.9%	3.70
Procedures for measuring the level of quality attainment	18.3%	38.5%	37.5%	3.8%	1.9%	3.67
Criteria for analyzing the quality the level of quality achievement in relation to set	1.0%	39.8%	57.3%	0.0%	1.9%	3.39
Provisions for incorporating suggested quality improvement in the supply chain	3.9%	33.0%	61.2%	0.0%	1.9%	3.37
Control procedures for containing defects within acceptable limits	25.2%	36.9%	27.2%	10.7%	0.0%	3.77

From the findings, generally the five elements of six sigma under investigation have been moderately implemented. Majority of the staff (44.2%) rated good the definition of quality standards, 19.2% rate it very good whereas, 1.9% rate very poor. Procedures for measuring the level of quality attainment were rated good by 38.5%, and moderate by 37.5%, 1.9% however rated them very poor. The criteria for analyzing the level of quality achievement was rated moderate by 57.3% and very poor by 1.9% the provisions for incorporating suggested quality improvements were rated moderate in application by 61.2% of the procurement staff and very poor by 1.9%. Control procedures for maintaining defects of goods procured within acceptable limits were rated as good by 36.9% and moderate by 27.2%, however 10.7% rated the procedures as poor. From the findings also, according to the application of an average majority of (3.77) indicated that there were control procedures for containing defects within acceptable limits and there was least application of criteria for analyzing the quality level of quality achievement in relation to set with an average of (3.39).

Alignment of the Quality Management Matrices with Customer Needs

This was mean to establish whether the quality management matrices aligned their goals and values with the needs and expectations of the customers or consumers of the goods and services procured..

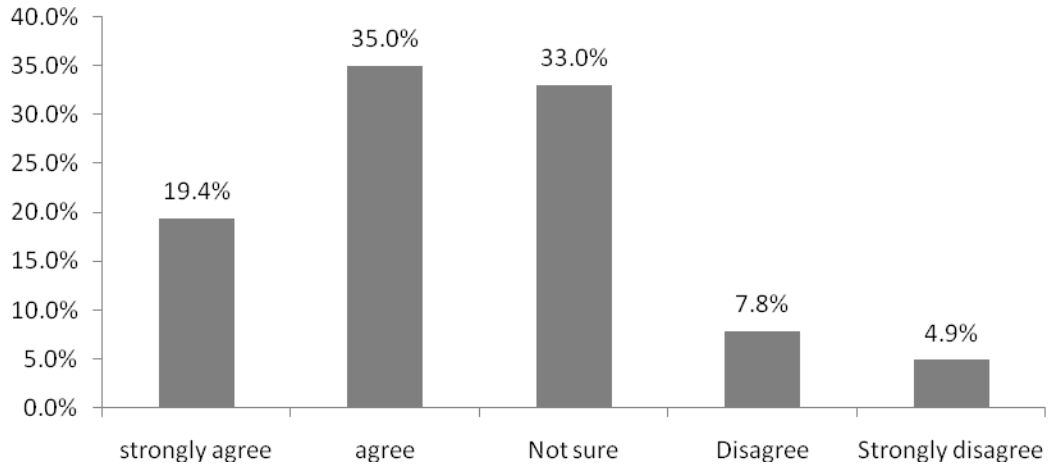


Figure 3: Alignment of the Quality Management Matrices with Customer Needs

A big proportion of the staff 35.0% agreed that the quality management matrices aligned their goals and values with the needs and expectations of the customers or consumers, while 33.0% were not sure.

Effects of Defects Control on Customer Value

This was meant to establish the effect of defect control on customer value.

Table 8: Effects of Defects Control on Customer Value

Level of agreement	Frequency	Percent
Strongly disagree	6	5.8
Disagree	12	11.7
Not sure	34	33.0
Agree	33	32.0
Strongly agree	18	17.5
Total	**104**	**100.0**

Majority of the staff 33.0% were not sure of whether reducing process defects would improve customer value and satisfaction, 32.0% agreed.

Quality Management and Problem Solving

This was meant to determine the role of six sigma in resolving organizational problems. See findings on Table 9.

Table 9: Quality Management Process as Path of Problem Solving

Level of agreement	Frequency	Percent
Strongly Disagree	4	3.9
Disagree	0	0.0
Not sure	8	7.8
Agree	43	41.7
Strongly agree	48	46.6
Total	**104**	**100.0**

Majority of staff strongly agreed 46.6%, and agreed 41.7% that quality management was an efficient method of problem solving.

Defects Minimization and Quality of Goods Delivered

This was meant to determine whether the availability of defects control procedures in the procurement process enabled the organization to deliver good quality goods. The findings indicated that most of the staff agreed 46.6%, followed by 40.8% who strongly agreed that the availability of defects control procedures in the procurement process enabled the organization to deliver good quality goods.

Table 10: Defects Control Mechanisms in the Procurement Process and Delivery of Good Quality

Level of agreement	Frequency	Percent
Strongly disagree	4	3.9
Disagree	0	0.0
Not sure	9	8.7
Agree	48	46.6
Strongly agree	42	40.8
Total	**104**	**100.0**

Continuous Improvement in Defect Minimization

The Continuous Improvement in Defect Minimization was also examined to determine whether it improved the procurement process.

Table 11: Continuous Improvements in Defect Minimization for Quality Improvement

	Frequency	Percent
Strongly disagree	0	0.0
Disagree	0	0.0
Not sure	14	13.6
Agree	30	29.1
Strongly agree	59	57.3
Total	**104**	**100.0**

Majority of the staff strongly agreed 57.3% while 29.1% agreed. This implies that the defect minimization played a significant role in ensuring continuous improvement in the procurement process.

Relationship between Application of Six Sigma and Procurement Efficiency

In Hypothesis 2, Pearson correlation analysis was used to determine whether there was any relationship between the level of application of six sigma and procurement efficiency.

H_{02} $\rho = 0$
H_{12} $\rho \neq 0$

Table 12: Correlation between Application of Six Sigma and Procurement Efficiency

		Six sigma	Performance
Six sigma	Pearson Correlation	1	.706**
	Sig. (2-tailed)		0.008
	N	104	104
Performance	Pearson Correlation	0.706**	1
	Sig. (2-tailed)	0.008	
	N	104	104

*Correlation is significant at the 0.01 level (2-tailed).

The results of Pearson correlation indicate that there was a moderately strong and significant positive correlation between implementation of lean management and efficiency of procurement. There is a significant correlation between the level of application of six sigma and procurement efficiency at Egerton University with r = 0.706, p = 0.008. Therefore, the application of six sigma, though it has been done in a scanty manner, has a significant influence on the level of achievement of procurement efficiency at Egerton University.

Continuous Improvement

Continuous Improvement and Effectiveness of Procurement Process

Continuous improvement was the third supply chain tool under consideration. Fist the study examines on extent to which the elements of continuous improvement were considered at Egerton university procurement.

Emphasis on Continuous Improvement

The extent of emphasis was examined on the scale: 5 – Highly emphasize, 4- Emphasize, 3- somehow emphasize, 2- Rarely emphasize, 1- Never emphasized at all.

Table 13: Emphasis on Continuous Improvement

Elements of Continuous improvement	5	4	3	2	1	Mean
Stakeholder analysis for all	6.8%	27.2%	12.6%	24.3%	29.1%	2.58
Training for procurement staff on improving procurement operations	5.8%	50.0%	42.5.%	1.9%	0.0%	3.60
Strategies for anticipating and mitigating supply chain risks	10.6%	7.7%	20.2%	26.0%	35.6%	2.32
Provisions for ensuring quality at source	13.5%	24.0%	18.3%	26.0%	18.3%	2.88

Training of procurement staff was the most widely practiced function of continuous improvement as identified by 50.0% who indicate that it was emphasized while 42.5% indicated that it was somehow practiced. Procurement staff also ensured quality from source which was cited by 24.0% as emphasized although 26.0% indicated that it was rarely emphasized. The least practiced was strategies for mitigation of supply chain risks. From the findings also on an average of (3.60) emphasis on continuous improvement has been put by training of procurement staff on improving procurement operations with less strategies for anticipating and mitigating supply chain risks being emphasized with a mean of (2.32).

Continuous Improvement and Planned System of Continuous Discovery

Findings on the role of continuous improvement in providing continual discovery of organized process change are shown on table 14.

Table 14: Continuous improvement and planned system of continuous discovery

	Frequency	Percent
Strongly disagree	18	17.5
Disagree	31	30.1
Not sure	18	17.5
Agree	28	27.2
Strongly agree	8	7.8
Total	**104**	**100.0**

Majority of the procurement staff 30.1% disagreed while 27.2% agreed. This could be as a result of the little knowledge on the roles of continuous improvement.

Continuous improvement and provision of providing Dynamic Dimensions Institutionalization

On whether continuous improvement has played a role in adding a dynamic dimension to its initiatives of institutionalization of university learning, the findings are as presented on Table

Table 15: Continuous improvement and dynamic dimensions institutionalization

	Frequency	Percent
Strongly disagree	4	3.8
Not sure	37	35.6
Agree	43	41.3
Strongly agree	20	19.2
Total	**104**	**100.0**

Majority of the procurement staff 41.3% agreed, and 19.2% strongly agreed that continuous improvement has added a dynamic dimension to its initiatives by institutionalizing university learning manifested to the process improvement.

Performance Enhancing and Routine Operating Processes

Whether continuous improvement has played a role in changing the routine operating processes

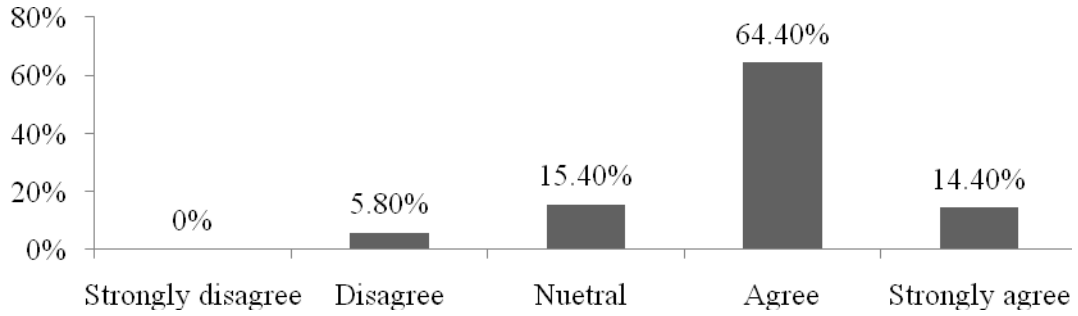


Figure 4: Performance Enhancing and Routine Operating Processes

Majority of the procurement staff 64.4% agreed that continuous improvement has enhanced performance in routine processes while none disagreed. This implies that continuous improvement can be used as a strategy to improve routine operations.

Continuous Improvement on Double Loop Learning for Process Change

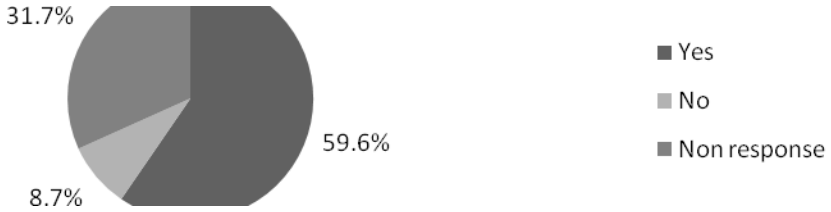


Figure 5: Continuous improvement on double loop learning for process change

Majority of the of the procurement staff 59.6% indicated that continuous improvement played a major role in double loop learning which resulted to creation of knowledge important for process change. However, a big proportion of 31.7% did not respond to this question signaling little understanding on the use of loop learning in process change.

Relationship between Application of Continuous Improvement and Procurement Efficiency

Hypothesis 3 was testing for the relationship between the use of continuous improvement and the effectiveness of the procurement process. Pearson correlation analysis was used to determine whether there was any relationship.

H_{03} $\rho = 0$

H_{13} $\rho \neq 0$

Table16: Correlation between Application of Continuous Improvement and Procurement Efficiency

		Procurement efficiency	Continuous improvement
Procurement efficiency	Pearson Correlation	1	0.233*
	Sig. (2-tailed)		0.046
	N	104	104
Continuous improvement	Pearson Correlation	0.233*	1
	Sig. (2-tailed)	0.046	
	N	104	104

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

Pearson correlation analysis revealed that there was a significant positive correlation between application of continuous improvement and efficiency of procurement at Egerton university procurement. There is a significant correlation between the level of application of continuous improvement and procurement efficiency at Egerton University with r = 0.233, and p = 0.046. Therefore, the application of the various elements of continuous improvement plays a significant role in improving level of procurement efficiency at Egerton University.

Role of JIT on Effectiveness of Procurement Process

Level of Adoption of JIT

First the level of adoption of JIT at Egerton University was established as shown on Figure

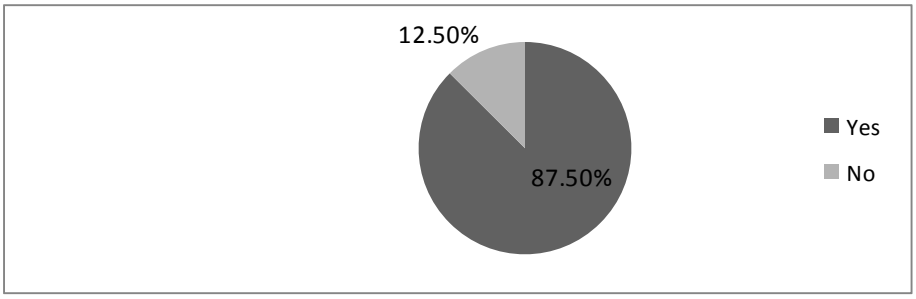


Figure 6: Use of JIT

Majority of the procurement staff 87.5% in different departments indicated that JIT was adopted in their departments which implies that JIT was widely adopted in the institution, in different departments.

How often is JIT was Adopted at Egerton

The frequency in which JIT was applied in the institution was also determined. This is illustrated in Table 17.

Table 17: How often is JIT was adopted at Egerton

Frequency	Frequency	Percent
Very rare	1	1.0
Rare	14	13.7
Sometimes	21	20.6
Often	60	58.8
Very often	8	7.8
Total	**104**	**100.0**

JIT was often adopted as identified by 58.8%, 20.6% applied it sometimes which concurs with previous findings that it JIT was widely adopted at the university in procurement.

Duration when JIT was used

The findings on the duration in which JIT has been practiced are illustrated in Figure 7.

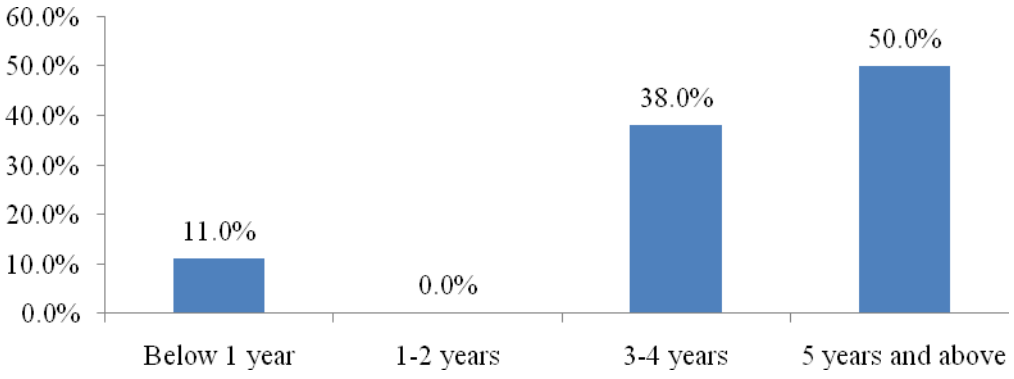


Figure 7: Duration when JIT was used

Half of the procurement staff 50.0% indicated that they have been using JIT for a period above 5 years, 38.0% had used for 3-4 years. This indicates that, JIT has been in use for considerable duration of time therefore its effects could be assessed.

Categories of Goods Procured Using JIT

On whether there were certain categories of goods which were procured using JIT. Majority 90.9% indicated that there were specific goods procured using this method. These included teaching materials, computer accessories, food stuffs, water, small electronics and goods with short shelf lives.

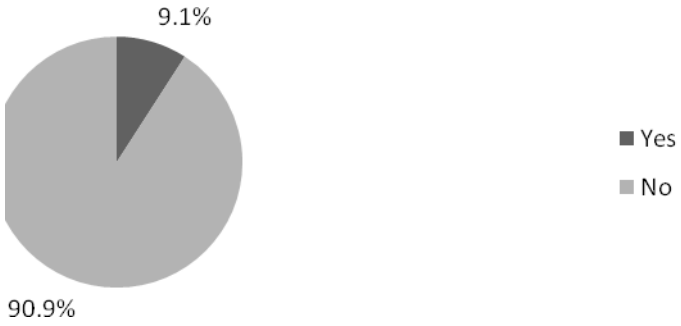


Figure 8: Categories of Goods Procured Using JIT

Effects of JIT of Procurement Efficiency

The effects of JIT were explored on profitability, utilization of capacity, procurement costs and elimination of non-value adding activities. The findings are measured on the scale 5 – strongly agree, 4 agree, 3 – neutral, 2 – disagree, 1 – strongly disagree.

Table 18: Effects of JIT of procurement efficiency

Effects of JIT	5	4	3	2	1
J.I.T has improved profits and return on investment	10.6%	76.0%	13.5%	0.0%	0.0%
Underutilized (excess) capacity us utilized instead of buffer inventories to hedge over possible crises	3.8%	66.3%	29.8%	0.0%	0.0%
J.I.T practices and performance have played major role in reducing procurement costs	25.0%	69.2%	1.9%	0.0%	3.8%
J.I.T has assisted the organization to eliminate non- value adding activities in the procurement process	23.1%	53.88%	23.1%	0.0%	0.0%

According to 76.0% of the procurement staff at who agreed, J.I.T has improved profits and return on investment. In the utilization of excess capacity, 66.3% agreed that JIT enabled underutilization of excess capacity us utilized instead of buffer inventories. Majority 69.2% also agreed that J.I.T practices have played major role in reducing procurement costs. J.I.T also assisted the organization to eliminate non- value adding activities in the procurement process according to 53.88% who agreed.

Procurement Efficiency Rating of Egerton

Table 19: Procurement Efficiency Rating of Egerton

Efficiency	5	4	3	2	1
Procurement of goods on time	14.4%	32.7%	51.0%	0.0%	1.9%
Procuring goods of the right quality	1.0%	66.3%	32.7%	0.0%	0.0%
Maintaining good relationships with suppliers	3.8%	50.0%	40.4%	5.8%	0.0%
Sharing information with user departments	29.8%	31.7%	38.5%	0.0%	0.0%
Performance monitoring	13.0%	57.0%	28.0%	2.0%	0.0%

In procuring goods on time, the organization was rated fair by half of the respondents that is 51.0%, and good by 32.7%. In procuring the right quality, 66.3% rated the organization good, while 32.7% rated it fair. In the maintenance of good relations with the customer, 50.4% rated Egerton University good, while 40.4% rated it fair. The sharing of information with used departments, 38.5% rated it fair, 31.7% good and 29.8% best. Finally the rating on procurement performance monitoring was good for 57.0% and fair 28.0% fair.

Relationship between Adoption of JIT and Procurement Efficiency

Hypothesis 4 was meant to establish testing for the relationship between the use of JIT and the effectiveness of the procurement process. This was tested using Pearson correlation analysis.

H_{04} $\rho = 0$

H_{14} $\rho \neq 0$

Table 20: Correlation between application JIT and Procurement Efficiency

		Performance	Adoption of JIT
Performance	Pearson Correlation	1	0.342*
	Sig. (2-tailed)		0.037
	N	104	104
Adoption of JIT	Pearson Correlation	0.342*	1
	Sig. (2-tailed)	0.037	
	N	104	104

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

Pearson correlation analysis results revealed that there was a significant correlation between application of JIT and efficiency of procurement at Egerton university. This implies that use of

JIT plays a significant role in enhancing procurement efficiency at Egerton University with r = 0.342, p = 0.037 hence significant at 0.05. level.

Discussions

Lean Management on the Effectiveness of the Procurement Process

Although the management does not have a structured mechanism for implementing lean management. Lean management was practiced in one way or the other since large proportion of procurement staff indicated that it was adopted in procurement in their institution. This was done through vision statements in setting the strategic direction in the operations of procurement department in the institution 39.4% cited sometimes, 32.7% very often while 19.2% cited very often. A big proportion of procurement staff 73.1% indicated that consultation was moderately applied in procurement decision making. Majority of the staff 94.2% agreed that there were performance indicators in place to track and evaluate performance in the procurement department, audit on the KPIs was often done according to 56.4%. Emphasis was also done on testing new materials and procedures before the full adoption. Whenever necessary, the management of the university also got all concerned parties into a room to gain consensus on contagious procurement decisions. An analysis of the relationship between lean management and effectiveness of procurement revealed that its adoption played a significant role in enhancing effectiveness.

Six Sigma on the Effectiveness of the Procurement Process

The application of six sigma was also a key aspect. The study observed that although the procurement function did not have a structured criteria for implementing six sigma, majority of its elements were practiced to some level. Generally the five elements of six sigma under investigation were moderately practiced. The use of defect control procedures were the most practiced, followed by definition of organizational quality standards, quality assessment criteria and the least practiced was the criteria for incorporating suggested quality improvements in the existing supply chain procedures. Application of the various elements of six sigma in procurement were found to have a significant effects on procurement efficiency. First quality management matrices aligned their goals and values with the needs and expectations of the customers, they assisted in reducing process defects which in turn improve customer value and satisfaction, Six sigma was an efficient method of problem solving especially on quality improvements. The availability of defects control procedures in the procurement process enabled the organization to deliver quality goods and finally defect minimization played a significant role in ensuring continuous improvement in the procurement process.

Continuous Improvement on the Effectiveness of Procurement Process

Several aspects of continuous improvement were applied at the university which implied that to some extent the procurement departments adopted continuous improvement. Training of procurement staff was the most widely practiced function of continuous improvement followed

by the control of quality from the source. The least practiced was strategies for mitigation of supply chain risks. These were also found to be significantly correlated with the level of attainment on procurement efficiency. There a different way in which continuous improvement was identified to affect efficiency in procurement which include: providing continual discovery of organized process change, adding a dynamic dimension to its initiatives of institutionalization of university learning, changing the routine operating processes and double loop learning which resulted to creation of knowledge important for process change.

J.I.T and Effectiveness of the Procurement Process

On the role played by JIT in enhancing efficiency in the procurement process, it was established that JIT was often adopted as identified by 58.8%. This systems has been in use for a durations up to and above 5 years. There were specific goods procured using this method which included teaching materials, computer accessories, food stuffs, water, small electronics and goods with short shelf lives. The use of JIT was found to have a significant correlation with the level of efficiency in procurement in the institution. This was achieved through several ways identified: majority of procurement staff agreed that J.I.T has improved profits and return on investment, enabled the utilization of excess capacity, 66.3%, reduced procurement costs and eliminated non-value adding activities in the procurement process.

Conclusions

The study therefore concludes that, indeed emerging procurement tools and techniques play a significant role in enhancing procurement efficiency in organizations and if adopted would play a key role in organizational procurement efficiency. Although there is a scanty application and overlap in of the various tools and techniques, their application has significant effects on the performance especially on quality, cost, and speed of procuring goods and services.

Recommendations

The study therefore recommended the following measure to the procurement function at Egerton University: That it should capitalize on maximizing the existing procurement tools that provide structured ways of enhancing procurement efficiency, that the University should develop a policy on framework contracting this will ensure availability of goods on time, that the university should develop a the DMAIC methodology on its policies where a group of personnel is trained to ensure quality of the procurement process, that clear job descriptions should be given to staff and training done on all the supply chain tools and techniques.

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