

TECHNOLOGY ADOPTION AND LEAN MANUFACTURING: A CASE OF SONY SUGAR COMPANY, AWENDO, KENYA

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Abstract: The purpose of this study is to determine, through a model that integrates the different study approaches observed in the literature, how technology adoption – via level of trialability, level of observability, degree of compatibility and degree of complexity improve organizational performance in Sony Sugar Company, Awendo, Kenya. The study objective was to establish the effect of technology adoption on organizational performance in Sony Sugar Company, Awendo, Kenya. The study used correlation research design. Questionnaires use correlation research design. Questionnaires and interview schedules were used as tools for data collection. Previous research has already tested how each indicator, considered individually, positively influences lean manufacturing. An integrated model that includes all the indicators would reveal whether they have a direct effect on organizational performance or not. Structural equation modeling is used to analyze how the indicators of the model interact among them and the testing of hypotheses, with a sample of 79 financial advisors. Results show observability as the indicator directly connected to organizational performance with a mean of 3.35 and Std.Dev of 1.328, while complexity with a mean of 3.334 and Std.Dev of 1.417, compatibility had a mean of 3.29 and Std.Dev of 1.411 and triability only affect performance indirectly through their interaction with observability with a mean of 3.26 and Std.Dev of 1.439. The results of this study also offer information on the relationship between technology adoption and lean manufacturing to improve organizational performance. This article offers the base to identify measures that can lead to an improvement in organizational performance through technology adoption and lean manufacturing.

Keywords: Technology Adoption, Lean Manufacturing, Organizational Performance.

1. INTRODUCTION

Background of the Study:

The present business landscape is characterized by global competition and high cost pressures, both of which have motivated companies to take a global approach to their supply markets. With the advent of lean thinking in the late 1980s in Japan which resulted to a revolution in the field of production which began with research in Massachusetts Institute of Technology with an intent of analyzing the production system behind Toyota's success. The research took a time frame of five years resulting to a book "The Machine that Changed the World", one of the most cited references in operation management over the last eighteen years (Holweg, 2001). Through this research a new name for a system was brought to board known as Toyota Production System (TPS). Despite the fact that Just in Time (JIT) production or Automation were known for more than a decade before the publishing of the book, this had a tremendous role in spreading the concept outside Japan (Holweg 2001). The western world needed a friendlier explanation, another name for such a specific system and some concrete examples to show that it is applicable in other types of cultures. During the last twenty years the lean concept was proved to be fitting not only to different cultures, but also to most of the industries.

Gamage *et al.*, (2012) looking on impact of lean manufacturing on performance and organizational culture in Sri Lanka showed that organizations in the bulk apparel production industry could achieve positive cultural shift and gain financial benefits as well through implementation of lean manufacturing practices. Similarly, Yasir and Mohammad (2015) study

on using lean techniques to reduce waste and improve performance in municipal construction project delivery in USA, concluded that many alternatives of lean techniques were identified and prioritized to support in reaching the optimum goal of waste reduction and performance improvement. Likewise, Raja *et al.*, (2015) while looking at relationship between lean production and operational performance in the manufacturing industry in Malaysia observed that problems might occur here and there in the manufacturing company. This is where LP comes in handy as it avoids problems and increase Operational Performance since it promotes conformity with specifications to deliver result and avoid waste both in the work force and the products. Kijpokin (2014) while looking at the role of lean production on organizational performance in Thailand, concluded that significant business performance enhancements can be realized through Lean Production implementation over considerable period of time. Besides that, Jeremiah *et al.*, (2012) writing on Lean Manufacturing Implementation: in South African environment showed that for lean implementation to be successful employees must be given training that is relevant to their work and senior management of the organization must display commitment towards the lean program being implemented by making necessary resources (time, funds) available for lean activities. Finally, Onyeizugbe and Ike (2016) while looking at Lean Production: in Oil and Gas Companies in Nigeria observed that lean production can be used to resolve severe organizational performance problems in the oil and gas industry in Rivers State of Nigeria. However, all these studies looked at lean manufacturing with a view of its techniques unlike this study that is addressing the aspect of its adoption in relation to; elimination adoption of technology in Sony Sugar Company, Awendo, Kenya.

Statement of the Problem:

The main goal of a lean manufacturing system is to produce products of higher quality at the lowest possible cost and in the least time by eliminating wastes (Dennis, 2007). In the financial year ended 30th June 2015 Sony Sugar Company registered pretax loss of KShs. 1,154 million up from KShs. 529 million of the previous year Gross sales of the year was KShs. 4.5 billion compared to 5.3 billion achieved in the previous year. All these were as a result of operating below capacity (Auditor General Report, 2014/2015). Sugar production cost in Kenya is higher than those in other producing countries in East Africa and COMESA member states. The Kenya Sugar Industry Strategic plan (2010-2014) puts the cost of producing sugar in Kenya at 415-500 USD/ tonne while that of Uganda 180-190 USD/ tonne and Tanzania at 140-180 USD/ tonne. This is due to but not limited to: use of outdated technology, organizational culture, improper waste elimination process and use of employees physically and not intellectually (KSB, 2013).

Objectives of the Study:

This study was guided by the following objectives:

To establish the effect of technology adoption on organizational performance in Sony Sugar Company, Awendo, Kenya.

Research Hypotheses:

H₀₁ There is a significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya.

2. LITERATURE REVIEW

Resource Based View Theory:

This study was modeled on resource-based view theory advanced by Penrose (1959). In the resource-based view theory, firm's performance is affected by firm-specific resources and capabilities. In view of RBV theory, technology adoption and lean manufacturing are taken as a strategic decision which can be used to fill gaps in the firm's resource and capabilities. This implies that, the adoption of lean manufacturing will result to firms' ability to utilize resources and capability to ring shortened time between customer order and the product build/shipment by eliminating sources of waste hence resulting to increasing firms' competitive edge.

Theory of Constraints:

This study was also be guided by theory of constraints developed by Eliyahu (1984). In the theory of constraints any element or factor that limits the system from doing more of what it was designed to accomplish (i.e., achieving its goal) is a constraint. In view of theory of Constraints, organizational performance is directly uplifted with the blending of

technology adoption and lean manufacturing as catalyst of elimination of constraints with a view of ensuring systems do more of what they are designed to accomplish. This implies that to initiate and implement breakthrough improvement through focusing on a constraint that prevented a system from achieving a higher level of performance directly requires lean manufacturing practices hence increasing firms' competitive edge.

Technology Adoption, Lean Manufacturing and Organizational Performance:

It has been observed that in order to handle production barriers, there is use of modern technologies like radio frequency identification (RFID) technology with Value Stream Mapping (VSM) in leading industries but the problem is the misapplication of technology-based lean concept and a lack of availability of proper implementation systems Vlachos, (2014). Rogers, (2003) suggests assessing users' perceived characteristics of innovation such as relative advantage, compatibility, complexity, trialability, and observability. In this case I consider trialability, observability, compatibility and complexity as the most essential methods of the lean approach. Furthermore, such misapplication also results in a reduction of employee confidence and the wrong usage of resources (Mostafa et al., 2013). Hence, in order to solve this issue a comprehensive, unidirectional and suitable implementation approach is required that combines a lean implementation with technology (RFID) Muhammad et al (2017). Keeping in view the previous literature, there is a research work by Olesen et al (2015) related to this topic, and they offered an implementation approach for intermodal container facilities which utilizes technology like RFID and Barcode for lean implementation. But they did not discuss what steps or methodology can be utilized to attain a technology combined lean implementation. However, Jasti and Kodali (2015) considered an IT system (comprising an auto scanning and information recording) as one of the leading pillars out of nine pillars in their lean supply chain management framework.

Conceptual Framework of Lean manufacturing and organizational performance:

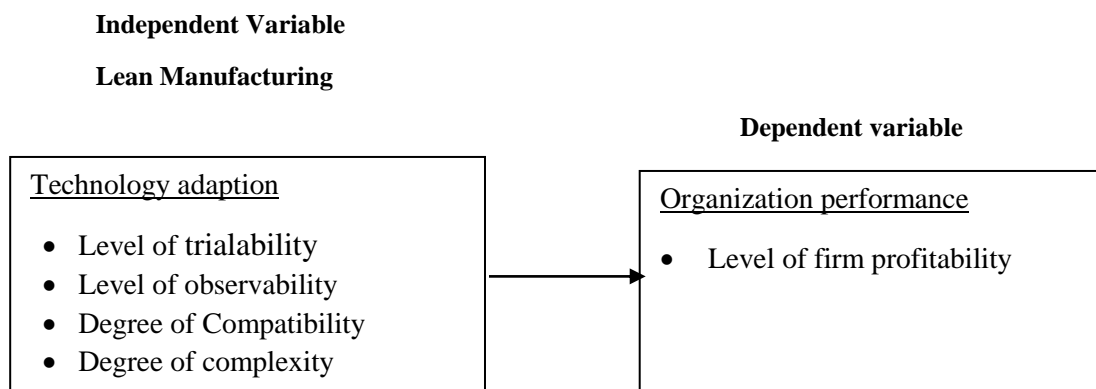


Figure 1: Conceptual framework on effect of lean manufacturing on organizational performance

Source: Researchers own concept

3. RESEARCH METHODOLOGY

The researcher used descriptive research design method in carrying out his study. The study targeted HoDs, Divisional HoDs and Supervisors of Sony Sugar Company in nine departments namely Manufacturing Department, Agricultural Department, Human Resource Department, Finance and Accounting Department, General Administration Department, Procurement Department, Company secretary Department, Sales and marketing Department and ICT Department with a sample size 79 out of 371 targeted population. Data was collected using questionnaires and interview schedules.

The quantitative data was analyzed through descriptive statistics and inferential analysis by use of statistical package for social sciences (SPSS) version 21 software. Data analyzed descriptively was presented in tables because they gave a systematic record of analysis. Both Correlation and Multiple Regression analysis was used to test the relationship between the independent variables and the dependent variables.

Regression model: the equation was expressed as follows:

$$Y = \beta_0 + \beta_1 X_1 + \epsilon \dots$$

Where,

Y–Organizational performance,

ϵ -is the Model error variable

β_0 – is a constant term of independent variables, β_1X_1 and β_2X_2 ,

X_1 - denotes technology adoption,

β_0, β_1 and, 0,1, is model co-efficient

Study Findings:

Table 1: Technology adoption and organizational performance (n=65)

Statement for respondents	SD	D	N	A	SA	Mean	Std.Dev
Trialability provides observable predictions of change results and minimized perceived risk.	11(16.9%)	10(15.4%)	12(18.5%)	15(23.1%)	17(26.2%)	3.26	1.439
Observability makes an innovation visible to others	8(12.3%)	10(15.4%)	13(20.0%)	19(29.2%)	15(23.1%)	3.35	1.328
Compatibility of an innovation largely depends on users’ lifestyles, situations, beliefs, and values.	11(16.9%)	8(12.3%)	13(20.0%)	17(26.2%)	16(24.6%)	3.29	1.411
Complexity of an innovation has to be assimilated into an employee’s working style.	10(15.4%)	9(13.8%)	13(20.0%)	15(23.1%)	18(27.7%)	3.34	1.417

Four statements were developed to measure the extent of effect of lean manufacturing on organizational performance. The statements were, trialability provides observable predictions of change results and minimized perceived risk, observability makes an innovation visible to others, compatibility of an innovation largely depends on users’ lifestyles, situations, beliefs, and values and Complexity of an innovation has to be assimilated into an employee’s working style.

Statement (1) trialability provides observable predictions of change results and minimized perceived risk had a mean of 3.26 and a standard deviation of 1.439. This results indicate that majority 17(26.2%) of respondents strongly agreed that trialability provides observable predictions of change results and minimized perceived risk, this was followed by 15(23.1%) who agreed and the mean was lowest at 10(15.4%) who disagreed. Statement (2) Observability makes an innovation visible to others had a mean of 3.35 and a standard deviation of 1.328. This results indicate that majority 19(29.2%) of respondents agreed Observability makes an innovation visible to others, this was followed by a score of 15(23.1%) who strongly agreed and the score was lowest at 8(12.3%) who strongly disagreed. (3) Compatibility of an innovation largely depends on users’ lifestyles, situations, beliefs, and values had a mean of 3.29 and a standard deviation of 1.411. This results indicate that majority 17(26.2%) of respondents strongly agreed Compatibility of an innovation largely depends on users’ lifestyles, situations, beliefs, and values, this was followed by a score of 16(24.6%) who strongly agreed and the score was lowest at 8(12.3%) who disagreed. Statement (4) Complexity of an innovation has to be assimilated into an employee’s working style had a mean of 3.34 and a standard deviation of 1.417. This results indicate that majority 18(27.7%) of respondents strongly agreed that knowledge application results to accessibility, quality, and use of knowledge earned, this was followed by a score of 15(23.1%) who agreed and the score was lowest at 9(13.8%) who disagreed.

This results indicate that a majority 19(29.2%) of the respondents agreed that their observability makes an innovation visible to others this was followed by a score of 15(23.1%) who strongly agreed and the score was lowest at 10(15.4%) who disagreed. Conclusively, statement 4 (Complexity of an innovation has to be assimilated into an employee’s working style.) with a mean of 3.34 and standard deviation of 1.417. This result indicate that the majority 18(27.7%) of the respondents strongly agreed that complexity of an innovation has to be assimilated into an employee’s working style. Statement 3 sought the opinion of the respondents whether compatibility of an innovation largely depends on users’

lifestyles, situations, beliefs, and values the score was lowest at 3.29 with a standard deviation 1.411, this implies that majority 17(26.2%) of the respondents agreed that their Compatibility of an innovation largely depends on users' lifestyles, situations, beliefs, and values.

Data was also collected using observation and in-depth interviews.

Variability among the respondents themselves was higher ($\sigma = 1.439$) on statement 1 and lower ($\sigma = 1.328$) for statement 2. This result is in consistence with Rogers, (2003) who confirmed that assessing users' perceived characteristics of innovation such as relative advantage, compatibility, complexity, trialability, and observability had a positive impact on organizational performance. Technology adoption could result to maximum utilization of resource with reduction in the production cost and time with n intent of producing a high quality product or service affect organizational performance. For example, Mostafa et al., (2013) suggested that misapplication also results in a reduction of employee confidence and the wrong usage of resources

Jasti and Kodali (2016) further looking on lean production systems, utilization of technology systems was again considered as a leading tier for lean implementation in their research work but details or steps regarding how to implement technology are not provided at all. Hence, keeping this in view, the availability of an implementation approach seems to be lacking in the previous literature (to the best of our knowledge) which must be capable of implementing technology combined lean implementation with detailed availability of each and every step required for that. This is in line with the findings of this study whose correlation output showed that all the technology adoption characteristics were statistically significant ($P < 0.05$). As such, the technology adoption dimension of lean manufacturing may be an appropriate precursor to effective organizational performance if the component of recognition is enhanced. Technology adoption practices may serve to empower organizations to realize competitive edge and resulting to dynamics in innovation and empowering employee working style, however, Jasti and Kodali (2015) considered an IT system (comprising an auto scanning and information recording) as one of the leading pillars out of nine pillars in their lean supply chain management framework. Further similarity to this finding is with Hagen, (2010) who concluded that IT is being used by organizations to improve performance, communication, motivate employees, increase competitiveness, improve market dynamics, and repositioning the company against its competitors facilitating entry into new markets.

Qualitative data were further supported with the following views from the managers that technology adoption affects organizational performance. These findings are in parallel with the research conducted by (Kamil 2001; as cited by Sobhani 2008), who states that efficient usage of IT in companies increases productivity through increasing the capital, while investing in IT, improving the growth of Total Factor Productivity in industries producing information technologies, and speeding up the growth of TFP in industries using information technologies

Hypothesis 1:

The study sought to examine the relationship between technology adoption and and organizational performance. Pearson correlation coefficient was used to test the relationship between technology adoption and organizational performance and; this was done at 95% level of confidence. To test the extent of the relationship between technology adoption and organizational performance several characteristics of intellectual knowledge were computed based on the following hypothesis;

H_{o1} There is no significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya.

The corresponding mathematical model for the hypothesis was identified as follows: technology adoption = f (technology adoption).The data that was used to test this hypothesis were obtained from items 1technology adoption to 4 technology adoption measuring the effect of technology adoption on organizational performance. Using 95% level of confidence, the null hypothesis, H_{o4} There is no significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya was tested and all the P-values under significant 2-tailed in Table 4.9 (trialability, P-value= 0.000, observability, p-value=0.000, compatibility, p-value 0.000 and complexity, p-value=0.000) were all less than the threshold of $\alpha = 0.05$ implying that there is a significant relationship between technology adoption and organizational performance leading to rejection of the null hypotheses. The decision criterion used was that any P-value

less than the threshold of $\alpha=0.05$ would be considered significant and subsequently lead to the rejection of the null hypothesis or fail to reject the null hypothesis when the P-value obtained is greater than the threshold of $\alpha=0.05$. The results obtained are indicated in Table 2.

Table 2: of correlation technology adoption and organizational performance

Lean manufacturing (technology adoption)		profitability	firms sales	Customer satisfaction	return on investment
Trialability	Pearson Correlation	.973**	.955**	.978**	.986**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	65	65	65	65
Observability	Pearson Correlation	.957**	.956**	.977**	.975**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	65	65	65	65
Compatibility	Pearson Correlation	.964**	.955**	.976**	.976**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	65	65	65	65
Complexity	Pearson Correlation	.975**	.955**	.974**	.981**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	65	65	65	65

The correlation output table 2 shows that all the technology adoption characteristics were statistically significant (P-values under significant 2-tailed were all less than $\alpha=0.05$) against the four indicators of organizational performance, (trialability, observability, compatibility and complexity) similarly there was relatively high degree of positive correlation exhibited between the various bivariate variables implying that the more the Sony Sugar employ technology adoption practices the more the organizational performance was realized and were operational in production of high quality products at least cost and within the stipulated time. The small p-values under significant (2-tailed) indicated in Table 2 were all less than the threshold $\alpha=0.05$, implying that there is a significant relationship among the variables leading to rejection of the null hypothesis (Ho4There is no significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya) and acceptance of the alternative hypothesis, and hence the research findings conclude that there is a significant relationship between elimination of waste and organizational. This is in agreement with Sobhani, (2008) productivity analysis exposes the positive correlations between IT, Total Factor Productivity and Labor Productivity.

This finding concur with deduction Chong et al (2001), who observed that adoption of the ICT is considered as a way to enable businesses to compete on a global scale with increased efficiency and closer customer and supplier. The more the organization adopts technology practices, the less is the need to incur more cost in the production process with increase in quality of its output with the least cost of production. Additionally, Gakuo, (2011) asserted that ICT has been characterized as an invaluable platform for any organization’s economic growth. Moreover, Kadakanchi et al (2006) reaffirms that ICT has revolutionized the global economy through changes in different economic activities for it has become a pivot for economic growth.

Descriptive Analysis for Dependent Variable:

The dependent variable for this study is organizational performance. Organizational performance was measured in terms of level of firm’s profitability. The descriptive analysis for level of firm’s profitability is of firm performance is discussed as follows:

Table 3: Organizational performance (n=65)

Statement for respondent	SD	D	N	A	SA	Mean	Std.Dev
Gradual profitability growth	10(15.4%)	12(18.5%)	8(12.3%)	15(23.1%)	20(30.8%)	3.35	1.473
Significant growth in your firms sales	4(6.2%)	11(16.9%)	13(20.0%)	20(30.8%)	17(26.2%)	3.54	1.226
The company’s customers are increasingly satisfied with its products	9(13.8%)	12(18.5%)	11(16.9%)	19(29.2%)	14(21.5%)	3.26	1.361
Generally, the growth of the firm has been steady and very satisfactory in terms of return on investment and sales	8(12.3%)	12(18.5%)	13(20.0%)	15(23.1%)	17(26.2%)	3.32	1.371

Four statements were developed to measure the extent of effect of lean manufacturing on organizational performance. The statements were gradual profitability growth, significant growth in your firms sales, the company’s customers are increasingly satisfied with its products, generally, the growth of the firm has been steady and very satisfactory in terms of return on investment and sales

Statement (1) Gradual profitability growth had a mean of 3.35 and a standard deviation of 1.473. This results indicate that majority 20(30.8%) of respondents strongly agreed that gradual profitability growth, this was followed by 15(23.1%) who agreed and the mean was lowest at 8(12.3%) who strongly disagreed. Statement (2) Significant growth in your firms sales had a mean of 3.54 and a standard deviation of 1.226.

This results indicate that majority 20(30.8%) of respondents agreed significant growth in your firms sales, this was followed by a score of 17(26.2%) who strongly agreed and the score was lowest at 4(6.2%) who strongly disagreed. (3) The company’s customers are increasingly satisfied with its products had a mean of 3.26 and a standard deviation of 1.361. This results indicate that majority 19(29.2%) of respondents agreed that the company’s customers are increasingly satisfied with its products, this was followed by a score of 14(21.5%) who strongly agreed and the score was lowest at 9(13.8%) who strongly disagreed. Statement (4) Generally, the growth of the firm has been steady and very satisfactory in terms of return on investment and sales had a mean of 3.32 and a standard deviation of 1.371. This results indicate that majority 17(26.2%)of respondents strongly agreed that generally, the growth of the firm has been steady and very satisfactory in terms of return on investment and sales, this was followed by a score of 15(23.1%)who agreed and the score was lowest at 8(12.3%)who strongly disagreed.

This result indicate that the majority with a mean of 3.54 and a standard deviation of 1.226 of the respondents agreed amount of sales measures organizational performance, statement 1 sought the opinion of responder whether profitability growth results to gradual firm performance, the mean was the lowest at statement 3 of 3.26 and standard deviation of 1.361. As a result the study found that the firm performance can be measured by profitability growth, firm sales customer satisfaction and return on investment. This finding is in line with Richard et al. (2009), who highlights that organizational performance encompasses three specific areas of firm outcomes: financial performance (profits, return on assets, return on investment, etc.); product market performance (sales, market share, etc.); and shareholder return (total shareholder return, economic value added), however he did not conduct it in the context of lean manufacturing as the independent variable.

Correlation and Regression Analysis Summary:

The data obtained from summarizing the responses obtained from the research questions was further analyzed by use of both Pearson’s correlation and multiple regression models.The findings are summarized below.

Correlation of Main Variables:

The results of the correlation of the main variables –, technology adoption and organizational performance are tabulated below.

Table 4: Correlation analysis

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.997 ^a	.994	.992	.135

a. Predictors: (Constant), elimination of waste, intellectual knowledge, andon, technology adoption

b. . Dependent Variable: Organizational Performance

From table above, R value was .997 showing a positive direction of R is the correlation between the observed and predicted values of the dependent variable. The values of R range from -1 to 1 (Saunders et al, 2012). The sign of R indicates the direction of the relationship (positive or negative). The absolute value of R indicates the strength, with larger absolute values indicating stronger relationships. Thus the R value at .997 shows a stronger relationship between observed and predicted values in a positive direction.

The coefficient of determination R2 value was 0.994. This shows that 99.4 per cent of the variance in dependent variable (organizational performance) was explained and predicted by independent variable (technology adoption)

Table 5: ANOVA

ANOVA ^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	138.039	20	7.265	397.702	.000b
Residual	.822	45	.018		
Total	138.862	65			

a. **Dependent Variable: Organizational Performance**

b. **Predictors: (Constant), technology adoption**

The ANOVA illustrates whether the model can predict organizational performance using the independent variables. The F statistic (F=397.702) was significant at a 95% confidence level (Sig. F < 0.05). This means that the model has predictive power. There exists a statistically significant relationship between technology adoption and organizational performance.

Table 6: Regression Coefficient Table

Model	Coefficients ^a			t	Sig.
	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta		
(Constant)	4.924	0.724	1.572	3.537	0.037
Technology adoption	0.507	0.282	0.552	4.001	0.000

a. Dependent Variable: Organizational Performance

Table gives the results for the regression coefficient for the multiple linear equation. $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \epsilon$ which by supplying the coefficients becomes:

$$Y = 4.924 + 0 + 0.507X_1 + 0.612X_2$$

Where:

Y = Organization performance

The t-value of constant produced (t = 3.537) was significant at 95 per cent level (Sig. F < 0.05), thus confirming the fitness of the model. Therefore, there is statistically significant relationship between lean manufacturing, technology adoption and organizational performance.

Technology adoption was significant in organizational performance with a p value of 0.000 (p < 0.05). This implies that technology adoption affects organizational performance.

4. SUMMARY, CONCLUSION AND RECOMMENDATIONS

From the study findings, the view of the respondents was that cost reduction through lean manufacturing affects organization performance to a great extent by maximizing utilization of inputs through technology adoption to reduce the waste in the production line with an intent of producing products and services at low cost and of high quality within the stipulated time and giving an opportunity for employees to interact with the production system to boost production process. From the correlation analysis, technology and organization performance had a significant strong positive relationship as implied by (r=.960, p=0.000). The more the technology is adopted the more the organization performs. The findings of this study support Hagen, (2010) who concluded that IT is being used by organizations to improve performance, communication, motivate employees, increase competitiveness, improve market dynamics, and repositioning the company against its competitors facilitating entry into new markets.

The study found that reduction of waste, improvement on quality and production of products within the stipulated time at as a result of lean manufacturing affected organization performance to a big extent. Majority of technology indicators had an average mean of 3.54. The implication was Observability makes an innovation visible to others. From the correlation analysis lean manufacturing and organization performance had a significant moderate positive relationship as shown by correlation coefficient of 0.525 and a p value of 0.010.

As for the effect of technology adoption achieved from outsourcing on organization performance, the view from respondents was that this was only to a moderate extent. This implied that the outsourced firms did not always match their services to the emerging technologies. However results from correlation analysis showed that there was a significant positive relationship between technology adaption and organization performance ($r=0.670$, $p=0.012$).

Conclusions and Recommendations:

As per the regression equation established, holding all independent factors constant, then organization performance will be 4.924 units. From the regression equation holding all other independent variable a constant, a unit increase in cost will lead to a 0.507 technology adoption in in organization. However, at 5% level of significance and 95% level of confidence, technology adaption has a significance influence on the organizational performance with p-values of 0.000 and therefore their coefficients should be retained in the final model.

Based on the objective and conclusions this study recommended as follows In management of organizations, technology adoption has become an important element that reflects innovation within lean manufacturing and organizational performance with positive effect on the performance of organizations, the study established that Observability makes an innovation visible to others $p<0.038$ and an explanatory mean of 3.35 and standard deviation of 1.328. As a result, the study recommends that organizations should include technology adoption in their strategic plan and in particular investment in information technology which may make it easy to bring about innovation in the firm and good information sharing to both suppliers and customers. Additionally, the study recommends investment on technology adoption is useful to managers in manufacturing operations to bring about quality products and reduce the cost of transformation of goods.

REFERENCES

- [1] Chong, S Pervan,G,&Baner,C(2001) Implementation success of Internet based Enterprises. *Eletronic Commerce for small and medium sized Enterprises* 14th International Bled Commerce conference, Bled Slovenia, June 25-26- Australia
- [2] Dennis, P. (2007). *Lean production simplified*. New York: Productivity Press.
- [3] Gamage, K.A.A., Joyce, M.J., Taylor, G.C., 2012. A comparison of collimator geometries for imaging mixed radiation fields with fast liquid organic scintillators. *IEEE Trans. Nucl. Sci.* 59 (4), 1432e1437. <http://dx.doi.org/10.1109/TNS.2012.2185710>.
- [4] Jasti, N. V. K., &Kodali, R. (2015b). Lean production: Literature review and trends. *International Journal of Production Research*, 53(3), 867 –885.
- [5] Jasti, N. V. K., &Kodali, R. (2016). Development of a framework for lean production system: An integrative approach. Proceedings of the Institution of Mechanical Engineers, Part B: *Journal of Engineering Manufacture*, 230(1), 136 –156.
- [6] Jeremiah K. M., Danny L. M., and Bruce R. 2012. Lean Manufacturing Implementation: A perspective on key success factors, University of Kwazulu Natal, South Africa.
- [7] *Kenya Sugar Board (KSB). Year Book of Sugar Statistics (2013). Nairobi: KSB.*
- [8] *Kenya Sugar Board (KSB). Year Book of Sugar Statistics (2010). Nairobi: KSB*
- [9] Kenya Sugar Industry Strategic plan (2010-2014). Retrieved from <http://www.kenyasugar.co.ke/downloads/KSI%20Strategic%20plan.pdf>
- [10] Kijpokin Kasemsap, 2014. The Role of Lean Production on Organizational Performance. Suan Sunandha Rajabhat University, Thailand
- [11] Mostafa, S., Dumrak, J., &Soltan, H. (2013). A framework for lean manufacturing implementation. *Production & Manufacturing Research*, 1(1), 44 –64.
- [12] Muhammad Z. R, MohdNizam A. R, Nizaroyani S &Norhana A. (2017) A systematic review of lean implementation approaches: a proposed technology combined lean implementation framework, *Total Quality Management & Business Excellence*, DOI: 10.1080/14783363.2017.1308818

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- [13] Olesen, P., Powell, D., Hvolby, H.-H., & Fraser, K. (2015). Using lean principles to drive operational improvements in intermodal container facilities: A conceptual framework. *Journal of Facilities Management*, 13(3), 266 –281.
- [14] Onyeizugbe Chinedu Uzochukwu and Ike Felix Ossai (2016) Lean Production: A Frontier for Improving Performance of Oil and Gas Companies in Nigeria. *Pyrex Journal of Business and Finance Management Research*
- [15] Raja Zuraidah RM Rasi, UmolSyamsyul Rakiman, MdFauziBin Ahmad 2015. Relationship Between Lean Production and Operational Performance in the Manufacturing Industry. Universiti Tun Hussein Onn Malaysia
- [16] Rogers, E.M., 2003. *Diffusion of innovations*. 5th ed. New York: The Free Press.
- [17] Sobhani (2008). Impact of Information technology on Productivity, *Lulea University of Technology publications* , pp 1
- [18] Vlachos, I. P. (2014). A hierarchical model of the impact of RFID practices on retail supply chain performance. *Expert Systems with Applications*, 41(1), 5– 15.
- [19] Yasir E. A., M.S., Mohammad N. 2015. Using lean techniques to reduce waste and improve performance in municipal construction project delivery, The University of Texas at Arlington