

# EFFECT OF LEAN MANUFACTURING ON PERFORMANCE OF MANUFACTURING ORGANISATIONS IN NIGERIA

<sup>1</sup>Chimeziem C. Gabriela Udeze, <sup>2</sup>Ogechukwu Charles Ugbam & <sup>3</sup>Joy N. Ugwu

<sup>1&3</sup>Department of Accountancy/Business Administration and Management

Faculty of Management and Social Sciences

Federal University, Ndufu Alike Ikwo (FUNAI) Ebonyi State

[chimeziemudeze@gmail.com](mailto:chimeziemudeze@gmail.com), [nonnyjoy08@yahoo.com](mailto:nonnyjoy08@yahoo.com)

<sup>2</sup>Department of Management, Faculty of Business Administration

University of Nigeria Enugu Campus

[charlse.ugbam@unn.edu.ng](mailto:charlse.ugbam@unn.edu.ng)

## ABSTRACT

*This study investigated the effect of Lean Manufacturing on performance in the Nigerian manufacturing sector. Specifically the study sought to establish the nature of the relationship between leanness and organizational efficiency in Nigerian manufacturing organizations and to ascertain the extent lean supply chain integration can affect competitiveness in the Nigerian manufacturing organisations. To achieve these objectives, two research questions along with two hypotheses were raised. The population of the study was 2703 employees of the selected manufacturing organizations; a sample size of 336 was obtained using Godden (2004) statistical formula for determining sample size for finite population. Out of the 336 copies of the questionnaire distributed, 326 copies were returned and used for analysis. Hypothesis one was tested using Pearson Product-Moment Correlation Coefficient while hypothesis two was tested with linear regression analysis. After the analysis, the study revealed that: there was a positive correlation between leanness and organizational efficiency ( $r = .663, p < .05$ ) and that lean supply chain integration significantly affected competitiveness in the manufacturing organizations ( $t = 25.146, F = 0.000 < 0.05$ ). This implies that leanness in the organization results to efficiency; hence the leaner the entire production processes of an organization, the better its chances to sustain competitiveness. Based on the findings, the study recommends that as a matter of policy, leanness should be practiced in every facet of the organization to enhance efficiency.*

**Keywords:** Lean Manufacturing, Organisational Efficiency, Lean Supply Chain Integration, Organisational Competitiveness

## INTRODUCTION

With the continuous advancement in technology around the world, globalization has been institutionalized through the emphasis on the knowledge and usage of telecommunication, satellite and internet facilities and services. Technologizing trade has compressed the world to what a Canadian scholar, Marshal Mchihan, called the "global village" in (Udeze, 2011).

The recommendation of free-trade has popularized trade that in the recent times

many economies now depend largely on trade; people daily consume in large quantities, products made in their nations and other nations. To a large extent, countries now depend on one another for goods and services. More business organizations evolve as international trade and transactions became popular; thus increased global competitiveness which has forced firms to look for measures to improve performance while sustaining competitiveness. Presently, the Nigerian

manufacturing industry has not only been beaten by the challenge of staying competitive but also by outrageous high production cost which has impeded profitability in most of these firms (Udeze, 2014).

This was the case of Toyota Manufacturing Company in Japan half a century ago, they were faced with the challenge of high production cost which reduced their profit margin and also challenged their competitiveness. Sugimori, Kusunoki, Cho and Uchikawa (1977)

The Toyota Manufacturing discovered that to stay competitive, it is not enough for a firm to cut down on production cost; the mere cutting down on the use of raw materials and other resources in the name of being cost effective only translates to the miserly use of production resources which consequently affected their product quality. In the course of taking care of this worrisome situation, the Toyota Manufacturing discovered a strategy that not only minimized production costs but also improved the product quality; this made them stand tall amongst their competitors till date (Ohno, 1988).

This strategy is now applied as a principle, philosophy, practice and strategy in most organizations all over the world today in the name of Lean theory or Lean Manufacturing (LM) which has been seen as an organisational process that reduces waste without additional resource (Bhuma and Sangwam, 2014).

Jordan (2001) in Kariuki and Mburu (2009) quipped that lean manufacturing is a management philosophy focusing on the reduction of many different types of waste in order to improve overall customer value by eliminating waste, quality is enhanced and production time and cost are compressed to improve organizational effectiveness (<http://www.iiste.org>).

Lean manufacturing adds value to production process as it minimizes waste in terms of materials, time, space and people. Staying competitive is not just

about cutting down on production costs which could at the long run jeopardize the quality of products; it is more about instituting workable processes that will improve product quality, on time delivery, cost efficiency, management and development of employees while creating room for profit (Page, 2003).

Every organization, whether profit or "not for profit" organization, engage in production/ operations. The type of production is therefore what differentiates these organizations. Production is indeed one of the basic functions within an organization; the difference between organizations could be seen mostly in the type of operation. Some organizations engage in service operations while others in manufacturing. While manufacturing organizations are into production of tangible goods, the service organizations are into rendering of services to the consumers. Manufacturing and service organizations are often similar in terms of what is done but different in terms of how it is done (Onah, 2008).

This study focused on manufacturing organizations; most manufacturing organizations often times may be referred to as: factories, plants, mills, industries etc. Manufacturing firms spring up in Nigeria frequently; the numbers of registered members of the Manufacturers Association of Nigeria (MAN) have increased from a handful of 300 manufacturers (which the association recorded at its inception) in 1978 to over 2000 members. This number is only for registered manufacturing firms; so many others still exist though not registered with MAN (MAN, 2012).

The rate at which these organizations start off only to wind up soon after is alarming, the ones that manage to stay in business are unable to maintain competitiveness at home not to mention globally. This study was carried out to level the gap.

### **Statement of the problem**

Some manufacturers are inspired by their entrepreneurial qualities, creativity and innovativeness, some by their drive to put their numerous brilliant business ideas into practice, some by just profit making purposes and others by several other reasons. The overwhelming competition amongst manufacturing firms is understandable. This has generated a kind of competitive atmosphere amongst manufacturers, every one of them trying to gain the greatest share of the market in order to maintain competitiveness by any workable means. Though manufacturing business could be a very lucrative and interesting business, a good number of manufacturing firms constantly fold up soon after their inception or long after (due to poor performance attributed to high production costs, defective products, non value adding activities to mention but a few), some of them (still on the race) staggering far behind a few others panting their way to the top (success).

In a typical Nigerian manufacturing organisation, if we take for example, competitors in a certain industry may decide to use low product pricing as a strategy to gain more market share; that will certainly push other competitors (especially the young ones) to a tight corner since they cannot fix prices below production cost. To fix price lower than their production cost will mean bad business and fixing higher than their competitors' price of same product (of similar quality) could lead to their exit from the market. The above situation has put numerous manufacturers into a dilemma. Never the less, the success of any manufacturing firm depends largely on the strategies, policies, methodologies, processes laid down by its management. Some firms are lucky and able to make it through their teeming competitors, go beyond just recouping production costs and maintaining a larger part of the market share with their strategies, policies,

methodologies and processes. However, while some others just manage to recoup their production costs after sales with a few market shares, some others are unable to recoup their invested capital and are more or less standing alone in the market with no market share. This study therefore was carried out to investigate the extent at which manufacturing organizations can improve performance amidst stiff competition applying lean theory.

### **Objectives of the Study**

The broad objective of the study was to investigate the effect of lean manufacturing on the performance of manufacturing organizations in Nigeria with the following specific objectives, to:

- i. Establish the nature of the relationship between Leanness and organisational efficiency in manufacturing organizations.
- ii. Ascertain the extent lean supply chain integration can affect competitiveness in manufacturing organisations.

### **Research Questions**

The study has the following research questions:

- i. What is the nature of the relationship between Leanness and organizational efficiency in manufacturing organizations?
- ii. What extent does lean supply chain integration affect competitiveness in the manufacturing organizations?

### **Research Hypotheses**

- i. H<sub>1</sub>: There is a positive relationship between leanness and organizational efficiency in manufacturing organisations
- ii. H<sub>2</sub>: Lean supply chain integration has a significant effect on organization competitiveness in manufacturing organizations

## Review of Related Literature

### Concept of Lean Theory/ Manufacturing

Lean means the improvement of value of products while eliminating as much waste as possible during production. Lean is a management philosophy that frowns at waste and promotes value during production. By “value”, we mean any product a consumer derives utility from enough to make him willing to pay for it (Vengopal and Yadhu, 2003).

Lean theory is a process of reform that showcases principles that help any organization to cut down on wasteful expenditures, wasteful usage of time, workers and other organizational resources during production. When lean principles are incorporated in the processes of any firm (be it manufacturing or service oriented firm), it disciplines the system into having zero tolerance for unnecessary/wasteful/ non value adding decisions, activities, programmes that could only result to high production costs and thereby limit the profitability and productivity of the firm (Petersen, 2009).

### Origin of Lean

Lean manufacturing is a management philosophy derived popularly from Toyota Production System (TPS) in the 1990's ([www.en.wikipedia.org/wiki/lean-manufacturing](http://www.en.wikipedia.org/wiki/lean-manufacturing)).

It has its roots from the efficiency movement, “Taylorism”, “Fordism” etc. Lean manufacturing is often seen as a more refined version of earlier efficiency efforts built upon the works of Fredrick Taylor and Ford while improving on their mistakes (<http://www.consultvoc.co>).

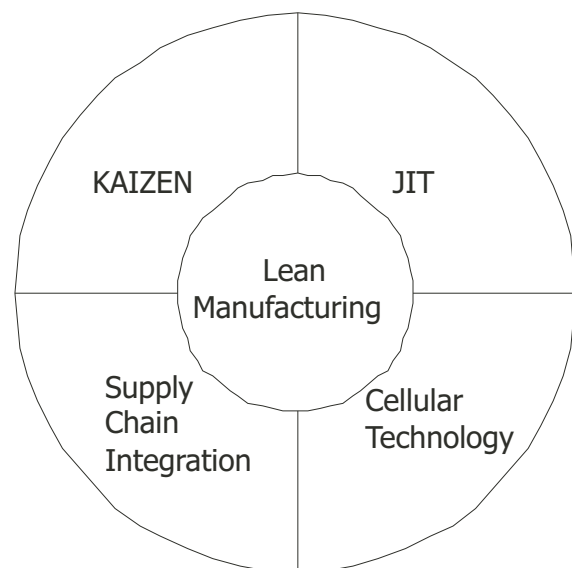
Never the less, the term “Lean Production System” was according to ([www.en.wikipedia.org/wiki/lean-manufacturing](http://www.en.wikipedia.org/wiki/lean-manufacturing)) first coined by Krafcik in 1988 based on his Masters Degree thesis which he titled “Triumph of the Lean Production System” (<http://wikivisually.com/wiki/toyota-production>).

Subsequently, another book titled “The machine that changed the world” written by Womack, Jones and Ross (1990) came up as a result of a research which was a continuation of Krafcik's Work at MIT Sloan School of Management. Lean has been looked at from the approaches of banishing/eliminating waste while improving quality, the flow/smoothness of work, removal of hiccups in work process which is being promoted by Toyota manufacturing (<http://issuu.com/iilm-institute-for-higher>).

### Elements/ Pillars of Lean

Lean also operates on the wheels of four pillars/ elements: Just in time, Cellular Manufacturing/ Continuous product flow, supply chain integration and Kaizen (Martand, 2000).

These principles have been modified into what Martand (2000, p.201) identified as the four pillars of Lean manufacturing



Pillars of Lean Production

**Source:** Martand, T. T (2000) *Production Management*. New Delhi: S Chand and Co Ltd

### Just in Time (JIT)

This concept saves some inventory costs, it emphasizes the procurement of raw materials exactly the amount and time it's needed. According to the Boeing Frontiers, JIT is a Toyota's term for its own production



system. The concept refers to producing or conveying only the components that are needed, when they are needed and in the amount needed by the next process, with a minimum of inventory kept on hand (<https://www.bts.boeing.com>).

### Cellular Technology

This pillar as much as possible helps in reducing non value added activities. This is achieved by building/designing the machines in cellular firms, where each cell is made to process parts of the product in different cells (<https://zh.scribd.com/doc/116119086>).

### Supply Chain integration

This involves all the production chain like the supplier's supplier and the consumer's consumer. If every link in the production chain is integrated effectively, production process will be effective and efficient. On the other hand, if one single member along the chain has problem and cannot deliver, it can affect the entire production process.

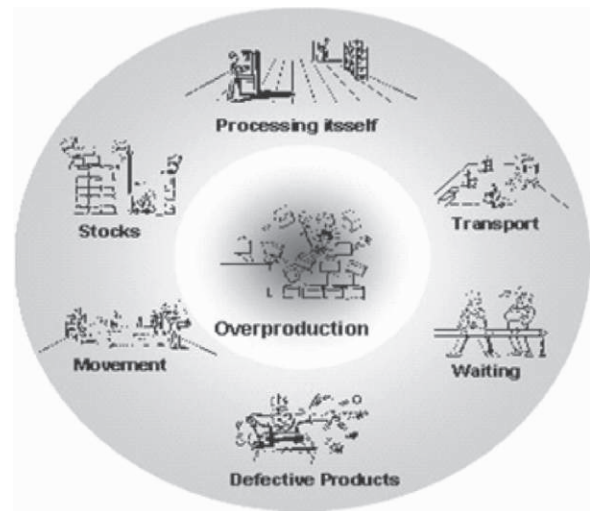
### Kaizen

Kaizen demands prioritization of demands, standardization and continuous improvement from the entire workforce. Kaizen means continuously improving the production system with the sole objective of sorting out and eliminating all manner of waste in the whole system (Martand, 2000).

### Continuous flow production

Although Continuous flow production is not in the drawing of the pillars of Lean production, Page (2003) has identified it as one. In this case items are produced and moved from one processing step to the next, one unit at a time. Each process makes only the one piece that the next process needs (<https://www.bts.boeing.com>).

### Types/ Forms of Waste



**Source: Ohno, T (1988) Toyota Production System, Beyond Large- Scale Production, Oregon: Productivity Press**

In the production process the wastes targeted at being eliminated include waste from:

**Over production:** over production is against the principles of Leanness, when products are produce more than the consumers' require the remaining is non value added to the organization, therefore its waste.

**Defective products:** when products are bad, below standard due to mistakes they are considered defective; too many of it can increase production cost and constitute waste.

**Waiting time:** this is considered idle time, time as an organizational resource should not be wasted.

**Over Processing:** when processing jobs are done excessively beyond requirement it constitute waste/additional cost

**Stocks:** Inventory/warehouse costs

**Transportation:** cost of transportation

**Movement:** Unnecessary motion that is non value adding during the production process can result to waste

In the study of Lean theory waste have been classified into three major types in the Production process wherein the aforementioned forms of waste fall into:

- i. Waste arising from non-value adding activities (muda)
- ii. Waste arising from unevenness, fluctuation and hitches in between work schedules (mura)
- iii. Waste arising from unreasonable work i.e. unnecessary activities imposed on man or machine thereby stretching these resources beyond their limits. This is normally caused by poor organization (muri) i.e. overburdened system (<https://www.scribd.com/doc/351177>).

### **Leanness and Organisational efficiency**

Organisational leanness involves series of activities where waste and non value added (NVA) operations are being eliminated as much as possible from the entire production process, starting from the beginning to the end of production; i.e. from product planning and design, through the procurement of raw material up unto the end of the supply chain; with the aim of improving the value added (VA) process within the organization (Vengopal and Yadhu, 2003).

Although management of many organisations is aware of the great value added to their organisations through leanness, they are yet to take the huge step from merely having the knowledge to implementing it in their supply chain (<http://cerasis.com/2015/05/06/lean-supply-chain/>).

Organisational efficiency implies that organizations achieve their production goals within the lowest cost possible as they maximize the available resources. A good number of studies on organizational efficiency have shown that several factors improve or work against efficiency in organizations: Quality controls, profitability, organizational performance and productivity, which are in one way or

the other related to staying, thinking and going lean. The efficient performance of every organisation (in the amount of profit generated, the market share it has, sales volume, product quality and its competitiveness) is determined by the methodology, processes, philosophy and strategies adopted and approved by its management (Ahrens, 2006).

Bayou and De Korvin, ( 2008) suggests that the overall efficiency of the manufacturing process is measured by considering both input and output used the production process; which can be translated thus: Efficiency = (output value) × 100% (input resource) = no. of output × average pitch time × 100% no. of workers × total allocated time ([www.slideshare.com](http://www.slideshare.com)).

In (<https://www.scribd.com/presentation/2411>), Efficiency compares input and output such that it favours production; a reduction in input while output stays same or increases or an increase in output while input remains the same describes efficiency in the production process.

The crux of the matter being that Lean Theory/Manufacturing by all standards helps organizations to be efficient and thus improve performance. To measure Performance of lean in organizations, the following according to ([www.lean-alliance.com](http://www.lean-alliance.com)) were recommended: The financial inventory turns, customer product returns measured in PPM (parts per million), OTD (on-time delivery) to customer that want date and Lean Policy Deployment matrix(Ahrens, 2006).

Tilson (2001) stressed that performance targets on these metrics should be set aggressively and raised as they are neared and an audit mechanism should be build to ensure that the lean program proceeds on track(<http://www.lean-alliance.com>).

### **Lean Supply Chain integration and Organisational Competitiveness**

In (<http://cerasis.com/2015/05/06/lean->

supply-chain/), lean supply chain is described as a system of interrelated and mutually dependent affiliates that collaborate to accomplish supply chain objectives. Organisational supply chain will only be successful if it is effectively integrated; hence a process which involves thorough monitoring and frequent review should be in place to ensure supply chain success. Integrating lean supply chain ensures that lean supply chain objectives are secured following these procedures: to get rid of all waste in the supply chain so as to give reasonable room for only value, consideration of advancements in technology to improve the supply chain, customer usage visibility to all members of the supply chain, increasing velocity, throughout and reduce variation, collaboration and use of process discipline, reduction of lead time and use of pull systems like kanban (<http://cerasis.com/2015/05/06/lean-supply-chain/>).

The entire supply chain has to be managed to create an integrated lean supply chain (<https://www.scribd.com/document/351177>). Lean supply chain integration is not exclusively for those organizations that manufacture goods, but for all businesses who want to purge their entire chain of unnecessary wastes, streamline their processes by eliminating waste and non-value added activities ([www.logistics.about.com](http://www.logistics.about.com)).

In ([www.logistics.about.com](http://www.logistics.about.com)), organizations are charged to examine and spot areas in their supply chain where waste can be identified in form of time, costs or inventory and using unnecessary resources, which can be measured in Naira time or raw materials, in order to create leaner supply chain. (<http://www.inderscienceonline.com/doi/full/>

u). According to Murray (2014), this will improve the organisation's competitiveness as well as improve its overall profitability. Organisations who

want to adopted lean supply chain integration practices should assessed their routings, bill of materials and equipment to identify where improvements can be achieved (<http://www.wow4u.com/dc>), ([www.logistics.about.com](http://www.logistics.about.com)).

## **Theoretical Framework**

### **Total Quality Management (TQM)**

Total quality management emphasizes quality beginning from raw material through the entire process of production and employees' performances (<https://www.scribd.com/document>).

The production processes can be improved to reduce waste and resources at the same time maintaining operational performance. In lean theory, quality is an important factor. Insisting on zero defects in the production process reduces waste and increases efficiency within the organization as a whole. The greater the quality, the more likely that customers will no longer return goods or condemn services, which means fewer resources will be needed for returns and quality issues ([www.logistics.about.com](http://www.logistics.about.com)).

### **Methodology**

The study made use of the survey research design; the questionnaire was used as measuring instrument. Through purposive sampling, the study was narrowed to manufacturing organizations in Enugu state. Emenite Nigeria Ltd, Juhel Nigeria limited and INNOSON Nigerian Ltd.were selected out of the manufacturing organizations in Enugu on the same basis.A purposive sample includes subjects selected on the basis of specific characteristics or qualities and eliminates those who fail to meet the criteria (Wimmer, 1983), ([www.ir.canterbury.ac.nz](http://www.ir.canterbury.ac.nz)).

Target population was 2703 senior and junior employees of the three selected manufacturing organizations; they were selected based on their huge business experiences and their competitiveness within their various industries. 893 employees of Emenite limited, 802

employees of Juhel Nigeria limited and 1008 employees of INNOSON Nigerian Ltd.

A sample size of 336 was obtained using Godden (2004) statistical formula for determining sample size for finite population. Out of the 336 copies of questionnaire administered, 326copies were returned and used.

Data Analyses

Data were analyzed as follows:

Test of Hypotheses

1) *Relationship between Leanness and organizational efficiency*

Table 1: Responses on the Relationship between Leanness and Organisational Efficiency

(n = 326)			
Responses	Agreement (%)	Disagreement (%)	Total (%)
Leanness ensures that non value adding activities are expelled in the production process which can result in cost effectiveness	285 (87.0)	41 (13.0)	326(100%)
Organisational leanness can achieve organisational efficiency	270 (82.82)	56 (17.18)	326(%)

Source: Field Survey, 2017

As presented in table 1, in trying to establish if a relationship existed between leanness and organisational efficiency, 285 (87%) of the respondents agreed that Leanness ensures that non value adding activities are expelled in the production process which can result in cost effectiveness and 270 (82.82%) also agreed that organisational leanness can achieve organisational efficiency. On the other hand, a minority 41 (13%) disagree that Leanness ensures that non value adding activities are expelled in the production process which can result in cost effectiveness, 56 (17.18%) respondents also are in disagreement that organisational leanness can achieve organisational efficiency. However, to establish the significance of the result and determine if there is a correlation between leanness and organisational efficiency, the hypothesis was tested using the Pearson-Product Moment Correlation. The result was presented in tables 2 and 3 below.

Table 2: Descriptive Statistics of Responses

	Mean	Std. Dev.	N
Leanness eliminates NVA activities in organization	1.300	.46018	326
Organisational efficiency is achieved	1.283	.45251	326

The mean values and standard deviations presented in table 2 indicate that leanness eliminates NVA activities in organization and ensures organizational efficiency. This confirms the frequency responses of the respondents in table 1.

Table 3: Pearson Product-Moment Correlation Coefficient

		Practice of leanness	Organisational efficiency
Practice of leanness	Pearson Correlation	1	.860**
	Sig. (2-tailed)		.000
	N	326	326
Organisational efficiency	Pearson Correlation	.860**	1
	Sig. (2-tailed)	.000	
	N	326	326

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

As presented in table 3, the Pearson Product-Moment Correlation Coefficient is 0.860 demonstrates the correlation matrix of the practice of Leanness (L) and organizational efficiency(OE). The analysis shows that a positive correlation exists between these variables (organisational leanness and organizational efficiency) which was statistically significant ( $r = .860$ ,  $n = 326$ ,  $p$ value  $0.000 < .0005$ ). Therefore, the null hypothesis was rejected and the alternate hypothesis accepted accordingly. Hence, there is a positive relationship between the practice of leanness and organizational efficiency.

**2. Lean supply chain integration has a significant effect on organizational Competitiveness in Nigerian manufacturing organizations**

Table 4: Response on effect of lean supply chain integration on organisational competitiveness



(n = 326)

Responses	Agreement t (%)	Disagreement t (%)	Total (100%)
Lean supply chain integration ensures that every link in the supply chain is effectively integrated and enhances production process and product quality.	209 (64)	117 (36)	326(100)
Lean supply chain integration has no effect on organizational competitiveness.	90 (27.60)	236 (72.40)	326(100)

Source: Field Survey, 2017.

Table 4 shows that 209 (64%) respondents are of the opinion that lean supply chain integration ensures that every link in the supply chain is effectively integrated and enhances production process and product quality; though 117(36%) say otherwise. Also while 90(27.6%) of the respondents agree that Lean supply chain management has no significant effect on organizational competitiveness; majority, 236 (85.4%) are in disagreement.

Table 5a Model Summary<sup>a</sup> Table 5a Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.740 <sup>a</sup>	.548	.547	.63276	.142

a. Predictors: (Constant), Lean supply chain integration  
 b. Dependent Variable: organisational competitiveness

Table 5 b ANOVA<sup>a</sup>

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	253.160	1	253.160	632.300	.000 <sup>b</sup>
	Residual	208.998	324	.400		
	Total	462.158	325			

a. Dependent Variable: organisational competitiveness  
 b. Predictors: (Constant), Lean supply chain integration

Table 5 c: Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.323	.053		6.103	.000
	Promotion	.835	.033	.740	25.146	.000

a. Dependent Variable: organisational competitiveness

R = 0.740  
 R<sup>2</sup> = 0.548  
 F = 632.300  
 T = 25.146  
 DW = 0.142

**Interpretation:**

The regression sum of squares (253.160) turns out greater than the residual sum of squares (208.998), this thus indicates that majority of variations in the dependent variable are unexplained by the model. The significant value of the F statistics (0.000) is less than 0.05, which means that the variation explained by the model is not by

chance. R, the correlation coefficient which has a value of 0.740 indicates that lean supply chain integration significantly affected organisational competitiveness. R square, the coefficient of determination, shows that 0.54.8% of the variation in organisational competitiveness is explained by the model. With the linear regression model, the error of estimate is low, with a value of about .63276. The Durbin Watson statistics of 0.142, which is not more than 2, indicates there is no autocorrelation. Lean supply chain integration coefficient of 0.740 indicates a significant correlation between Lean supply chain integration and organisational competitiveness, which is statistically significant (with t = 25.146). Therefore, the null hypothesis was rejected and the alternate hypothesis accordingly accepted. Thus Lean supply chain integration positively affects organisational competitiveness.

**Findings**

Based on the analyses conducted, the study revealed that:

- i. There was a positive correlation between leanness and organizational efficiency in the manufacturing organizations (r = .663, p < .05).
- ii. Lean supply chain integration significantly affected organizational competitiveness in the manufacturing organizations (t = 25.146, F = 0.000 < 0.05).

**Conclusion**

For manufacturing organization to make reasonable profit and stay competitive, they have to sustainably minimize cost of production. Leanness is a more effective strategy if it is practiced in every facet of the organization; when employees, equipments, machines, customers, suppliers, distributors, everyone and everything connected to the production processes are so involved.

## Recommendations

Based on the findings, the study made these recommendations:

- i. Organizations who want to enhance performance should include as a policy the practice of leanness especially in every facet of the organization for effectiveness.
- ii. Owners and captains of manufacturing industries should focus on capacity building or development (by periodically sending their workforce on short term international courses and seminars) so as to empower employees with current skills which will also improve the production process and enhance their chances for favourable global competitiveness.
- iii. Government should use control bodies such as the consumer protection council (CPC) and standard organization of Nigeria (SON) to oversee and control the quality of products manufactured in Nigeria; to protect consumers from substandard, harmful and poor quality products as well as prepare manufacturing firms for global competition.

## REFERENCES

- Ahrens, T (2006) *Lean Production: Successful Implementation of Organizational Change operations instead of short term cost reduction efforts*. Germany: Lean Alliance.
- Bhamu, J. and Sangwan, K.S. (2014) "Lean Manufacturing: Literature Review and Research Issues" *International Journal of Operations and Production Management*, 34(7) pp.876-885
- Hammersky, T and Atkinson, S. (1995) in Maxwell, J. A (2009) *Designing a Qualitative study* ([www.crowin.com/upm.../23772-ch7.pdf](http://www.crowin.com/upm.../23772-ch7.pdf)) Retrieved on 22/1/13
- Murray, M. (2014) Lean Supply Chain Management <http://logistics.about.com/od/qualityintheproduction/LeanSupplyChain/TQM>
- Kariuki, B.M and Mburu, D. K (2009) "Role of Lean Manufacturing on Organisation Competitiveness" *International Journal of Operations and Production Management* 26(10) 1-23
- Martand, T.T (2000) *Production Management*. New Delhi: S Chand and Company Ltd.
- Maxwell, J.A. (2009) *Designing a Qualitative study* (<http://www.crowin.com/upm.../23772-ch7.pdf>, assessed on 13/1/13)
- Ohno, T. (1988), *Toyota Production System, Beyond Large- Scale Production*; Oregon, USA: Productivity Press
- Onah, S.C. (2008) *Elements of Production Management*, Enugu: Chimex Publications
- Page, J. (2003) *Implementing Lean Manufacturing Techniques* (<http://en.wikipedia.org/w/index.php?title=Lean-manufacturing&oldid=111111111>) retrieved on 23/2/13
- Petersen, J. (2009) "Defining Lean Production: Some Conceptual and Practical Issues" *the Total Quality Management M Journal*, 21(2), pg. 127-142.
- Sugimori, Y., Kusunoki, F., Cho, F., Uchikawa, S., (1977) *Toyota Production System and Kanban System: Materialization of Just-in-Time and Respect for Human Systems*. *International Journal of Production Research*, 15 (6), 553-564.
- Tilson, B. (2001), "Success and Sustainability in Automotive Supply Chain Improvement Programme: a Case Study of Collaboration in the Mayflower Cluster" *International Journal of Innovation management*, Vol.5, no. 4, December 2001, pg 427-456
- Udeze, C.C.G (2014) "the Effect of Lean Theory on the Performance of Manufacturing Organisations in Enugu" *Ph.D Seminar, University of Nigeria Enugu Campus*
- Udeze, S.E. (2012) *Mass Media Law and Ethics*, Enugu: RhyceKerex publishers.
- Ugwu, J.N. (2008) *Organizational*

- Behaviour*, Enugu: Malik Enterprises Nig. Revised Edition
- Vengopal, G and Yadhul, G. (2003) "Lean Strategy implementation" ([www.slideshare.net/yadhugopinath/lean-strategy-implementation](http://www.slideshare.net/yadhugopinath/lean-strategy-implementation) retrieved on 10/01/14)
- Womach, J., Jones, D. and Ross, D; (1990), *The Machine that Changed the World*, Harper Perennial: New York.
- Kariuki, B.M and Mburu, D.K. (2009) "Role of Lean Manufacturing on Organization Competitiveness" (<http://david-lean-manufacturing-individual-libre.pdf>)
- Kelchner, L (2009) "How Can Lean Manufacturing Help a Company Gain a Competitive Edge and Prepare for the Future?" *Demand Media* (<http://smallbusiness.chron.com/can-lean-manufacturing-company-gain-competitive-edge-prepare-future-21570.html>)
- <http://www.businessdictionary.com/.../...> (Retrieved on 11/1/13)
- <http://www.tutor2u.net/.../competitive-advantage> (retrieved on 10/01/14)
- <http://www.thefullwiki.org/lean-manufacturing> (retrieved on 10/01/14)
- <http://wikivisually.com/wiki/toyota-production> (retrieved on 10/01/14)
- <http://issuu.com/iilminstituteforhigher> (retrieved on 10/11/17)
- <http://everipedia.org/wiki/lean-manufacturing> (retrieved on 9/11/17)
- <https://zh.scribd.com/doc/116119086> (retrieved on 13/11/17)
- <https://www.slideshare.net/yadhugopinath> (retrieved on 6/11/17)
- <https://www.scribd.com/document/351177> (retrieved on 8/01/14)
- <http://www.inderscienceonline.com/doi/fu> (retrieved on 9/10/17)
- [www.thebalance.com/lean-supply-chain](http://www.thebalance.com/lean-supply-chain) (retrieved on 9/10/17)
- <https://www.scribd.com/presentation/2411> (retrieved on 10/10/17)
- <http://www.academia.edu/14492451/i-lean> (retrieved on 13/11/17)
- <http://www.iiste.org> (retrieved on 5/6/18)
- <http://www.consultvoc.com> (retrieved on 4/6/18)
- <http://www.slideshare.com> (retrieved on 6/6/18)
- <http://www.lean-alliance.com> (retrieved on 5/6/18)
- <http://www.logistics.about.com> (retrieved on 6/6/18)
- <http://www.ir.canterbury.ac.nz> (retrieved on 5/6/18)