# ASSESSMENT OF LEAN PRACTICES IN SMALL AND MEDIUM GARMENT MANUFACTURING COMPANIES IN SOUTH-WESTERN NIGERIA

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**Abstract:**

The Nigerian garment industry has significantly contributed to the gross domestic product. However, in this multibillion-naira market, small and medium-sized enterprises have a higher potential to generate huge revenue, provided lean manufacturing concepts are adopted. In this study, the awareness level and the adoption of lean concepts were assessed using a survey technique. In the survey, 40 complete responses were received after administering 60 copies of a structured questionnaire based on a five-point Likert scale. By analyzing the responses using descriptive statistics and the mean item score, it was deduced that teamwork is the most predominant lean concept that is currently being practiced in the South-Western Nigeria garment industry with the highest mean score of 3.63. Just-in-time supply, workforce commitment, daily schedule and product design have witnessed the influence of the implementation of lean practices. In the garment industry, the practice of the few lean concepts resulted in a significant improvement in the quality of the garments produced. However, a lack of understanding on how to implement garment industry key players the lean concepts has been a major barrier in this industry. Hence, comprehensive training, seminars, and workshops for industry key players are proposed to increase the knowledge and adoption of lean concepts.

**Keywords:** lean manufacturing; garment industry; small and medium scale enterprises; gross domestic product.

## 1. Introduction

Nigeria is the largest economy and the most populous country in Africa with an estimated population of 170 million inhabitants (Mckinsey Global Institute, 2018). In an effort to boost the economy and attract foreign direct investment, the Nigerian government has expanded its economy by creating opportunities in manufacturing industries such as garment enterprises. According to Bamisaye & Adeitan (2018), the garment industry is presently one of the profitable, fastest growing and popular businesses among the population of Nigeria. This is responsible for creating an extensive range of garments to meet several market needs. The garment industry in Nigeria can be categorized into the family of small and medium scale (SMEs) manufacturing firms. These firms are the main contributors to socio-economic development, employment (approximately 60% of the workforce), and foreign direct investment (Oloyede, 2014). Since the year 2010, the Nigerian textile and garment sector has contributed an average growth of 17% to its Gross Domestic Product (GDP) (National Bureau of Statistics, 2019). This is attributed to the increase in demand for locally manufactured garment wear and unique initiatives that continue to edge Nigeria into the global fashion notice (Stears Business, 2019). The garment sector has the potential to contribute more to the GDP, provided some continuous improvement manufacturing concepts such as lean principles are employed in its various aspects.

However, lots of indigenous firms in Nigeria mostly, SMEs manufacturing firms are yet to embrace and adopt completely the lean manufacturing (LM) concept, therefore, hindering their transformation into topnotch establishments (Abioye & Bello, 2012). This implies that the Nigerian garment industry must maintain its market competitiveness and survival by identifying and reducing non-value-added processes while maintaining quality in its manufacturing processes. According to Mezgebe et al. (2013) and Mazumder (2015), the types of wastes identified in the garment industry are: waiting (waste generated from bottlenecks, waiting for materials, waiting

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for data, waiting for tools, and waiting for equipment among others); defects (these are wastes resulting from product deviations from what the buyer wants); overprocessing (these are wastes resulting from further processing of the work beyond the client requirements); overproduction (these are wastes resulting from producing extra units); transportation (unorganized and having a manual material transportation system in the garment sections); motion (time lost during lifting operations, moving from place to place, retrieving and searching for garment materials); and excess inventory (waste resulting from purchasing extra garment materials and accessories lean implementation).

Over the years, research on the level of LM implementation has been carried out in some Nigerian sectors such as the construction industry (Babalola et al., 2018; Olatunji, 2008) and manufacturing industry (Abioye & Bello, 2012; Aigbavboa & Ohiomah, 2015; Ogedengbe et al., 2017). However, studies reporting the level of awareness, implementation, and identification of barriers to LM implementation within the small and medium garment companies in South Western Nigeria (S&M GCSWN) are rare. The objective of this work is to assess the levels of awareness, implementation, and benefits of lean manufacturing practices within the S&M GCSWN. Furthermore, the study will seek to identify the barriers to LM implementation in the S&M GCSWN. This research article offers significant contributions to knowledge in the field of LM in SMEs. This study is structured as follows: Section 2 discusses the barriers and benefits of LM implementation and the categories of LM tools. The presentation of research methodology is shown in Section 3. This is followed by an assessment of the level of awareness and implementation of LM tools, benefits of LM tools, barriers of LM tools implementation, and types of wastes in S&M GCSWN in Section 4. The conclusion and future insights for effective implementation of LM tools and techniques among the S&M GCSWN are summarized in Section 5.

## 2. Literature Review

The introduction of lean practices in manufacturing helps produce goods in shorter lead times by reducing non-value-added processes, boosts productivity and profitability, improves quality and efficiency, and satisfies customer requirements in a limited time (Ramgoolam & Ramphul, 2018), the introduction of lean practices in manufacturing helps produce goods in shorter lead times by reducing non-value-added processes, boosts productivity and profitability, improves quality and efficiency, and also satisfies customer requirements in a limited time. Therefore, lean practices will be important for the S&M GCSWN to improve the value-added processes, reduce the cycle time, and enhance the quality of services in their manufacturing processes. Lean thinking tries to reduce wastes (likened to fats) that are harmful and a burden on any system. According to Onifade & Oroye (2021) report on lean, it is defined as that portion of meat that is fat-free (i.e., primarily composed of lean muscle). As defined by Nash et al. (2006), lean is the approach used in identifying and removing waste through nonstop improvement by flowing the product or service at the pull of your customer in search of excellence. It helps in the

elimination of waste in every part of production, including customer relations, product design, supplier networks, and factory management. Lean is commonly used in businesses that are assembly-oriented or have a high volume of repetitive human procedures. The garment industry is an assembly-oriented one that starts with fabric checking, spreading, cutting, sewing, finishing, final examination, and final packing. The involvement of the human element in this process is the major cause of errors. Therefore, LM implementation in the garment industry helps reduce waste in the process and boost efficiency (Pandey, 2015). Furthermore, major benefits of LM implementation in manufacturing SMEs and garment manufacturers include: reduced space utilization, lower operational costs, increased inventory control, reduced machine breakdown, reduced waste, a reduced cycle time of operations, improved organizational productivity, improved learning management, improved flexibility, improved financial position, and reduced garment rework (Melton, 2005; Petersson et al., 2010). Other benefits are improved garment delivery time, increased workers capability, quicker work accomplishment, improved customer satisfaction, improved quality of garments, improved employee satisfaction, reduced garment defects, improve the competitive edge, economic advantages to the organization (Melton, 2005; Petersson et al., 2010; Silva et al., 2011; Kodali, 2016; Shah & Hussain, 2016; Ramgoolam & Ramphul, 2018; Islam, 2019).

Some of the main barriers to LM implementation in SME manufacturing firms are lack of top management support and knowledge, supervisor resistance, employee resistance, investment cost, lack of skilled employee, budget constraint, company culture, nature of manufacturing facility, lack of understanding to implement lean manufacturing concepts, lack of communication, lack of time to implement, lack of awareness of the lean concept, reverting to the old ways of working, the customer orders are highly fluctuating/varying, frequent design changes, lower volume of garment demand, and financial benefits of lean manufacturing are not recognized (Salaheldin, 2005; Achanga et al., 2006; Wong et al., 2009, Kodali, 2016; Nordin et al., 2010; Shah & Hussain, 2016). The accomplishments of the garment firms in their competition for the worldwide market rest on their focus on more effective and efficient manufacturing processes. The need to minimize production costs has also caused manufacturers to concentrate on waste minimization. Waste minimization in the garment industry starts with understanding what waste is and where, how, and why it exists (Mezgebe et al., 2013). A study conducted by Womack & Jones (2013), reveals that LM implementation is based on five values. The values include recognizing the value stream, forming the flow, introducing a pull system, and working in the direction of perfection. Rose et al. (2011) also listed the seventeen lean manufacturing practices that are considered practicable for the SMEs at the start of their operations. The LM tools are standard operation procedure, Kaizen, just in time, total quality management, supplier management, single minute exchange of die or reduced set-up time, Kaban pull system, value stream mapping, total production maintenance, small lot size production, 5s, equipment layout, daily schedule adherence, staff training, teamwork, cellular manufacturing, and visual management. According to Nordin et al. (2010), LM implementation tools can be

categorized into process and equipment, supplier and customer relationships, manufacturing planning and control, suppliers' and customers' relationship. Figure 1 depicts the various categories of LM practices and tools.



**Figure 1:** Categories of LM practices/tools.

As shown in Figure 1, lean tools in the process and equipment category help in removing all types of non-value-added time, such as equipment breakdown time, time expended in looking for the right tools, and material travelling time in the manufacturing system. Lean tools in the manufacturing planning and control category help in attaining the everyday operational goals of an enterprise, ensuring an efficient and operative flow of information, and eliminating all forms of waste that might start from an unstable production system. Also, lean tools in the human resources category help in boosting workers morale and skills. Lastly, the lean tools in the supplier and customer relationships category help in building a lasting relationship of trust with the two parties involved, reducing product inconsistency, and decreasing production costs.

## 3. Research Methodology

A questionnaire was designed and structured to collect data for this study. It was designed to assess the LM practices among the selected sixty S&M GCSWN. The S&M GCSWN were chosen purposively using expert sampling techniques. The sample size was determined in accordance with Bernand (2002) and Seidler (1974), stating respectively, that there is no limit to the number of respondents in a purposive sampling technique. However, for reliability of data collected from the respondents, at least five should be considered. Respondents involved in the survey are the owner/directors, operation managers, and sewing supervisors of the selected garment companies. In some cases where the owner/directors and operation managers of the companies are difficult to reach, sewing supervisors were approached to fill out the questionnaires because they also monitor production activities and are directly involved in the operating system in the companies. Efforts were made to describe the questions and the terms used in the questionnaire. The questionnaire consists of six sections. The first section

sought background information of the respondents, such as their educational qualifications, years of establishment, years of experience, ownership, and number of employees. The second section assesses the level of awareness of LM tools in the S&M GCSWN. The LM tools/practices for the S&M GCSWN identified by the researchers (Rose et al., 2011; Shah & Ward, 2003) are used for assessment in this section. A five-point Likert-type scale was used in answering the questions, in which 1 = Very Low, 2 = Low, 3 = Average, 4 = High, 5 = Very High. The third section sought to identify the implementation levels of LM practices in the S&M GCSWN. The fourth section dealt with identifying the benefits of LM practices in the S&M GCSWN. Past survey studies in the literature (Shah & Hussain, 2016; Petersson et al., 2010; Islam, 2019; Melton, 2005, Ramgoolam & Ramphul, 2018; Silva et al., 2011) described the benefits of LM practice implementation. A five-point Likert-type scale was used in answering the questions, in which 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The fifth section dealt with identifying the barriers to LM implementation in the S&M GCSWN. Past survey studies in the literature (Kodali, 2016; Wong et al., 2009; Nordin et al., 2010, Shah & Hussain, 2016; Salaheldin, 2005; Achanga et al., 2006) described the barriers to LM implementation. A five-point Likert-type scale was used in answering the questions, in which 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The last part dealt with identifying the types of wastes in S&M GCSWN. The five-point Likert scale: 1 = Very Low, 2 = Low, 3 = Average, 4 = High, 5 = Very High were used to rank the types of wastes. Sixty copies of the questionnaire were administered through a face-to-face medium to avoid delay. Only 40 copies of the questionnaire out of 60 were completed and returned, representing a 67% response rate. Descriptive statistics and mean item scores were used to analyse data for this study with the Statistical Package for Social Sciences (SPSS) v16.

## 4. Results and Discussion

### 4.1. Background of Respondents

Table 1 depicts a summary of the demographic profiles of the respondents. As seen in Table 1, the demographic profiles of the respondents show that 72.5% of the garment companies surveyed are locally owned, with 50% having 0–5 years of experience in the garment industry. Also, 85% of the companies surveyed fall under the category of small businesses, with 37.5% of respondents' companies in operation for less than three years.

### 4.2. Awareness of LM Tools in the S&M GCSWN

To confirm the level of awareness of lean tools/practices within the S&M GCSWN, the respondent companies were asked to rate the level of awareness for each of the seventeen lean tools/practices listed. According to Rose et al. (2011), the listed seventeen LM practices/tools are considered practicable for the S&M GCSWN at the commencement of their business. Figure 2 illustrates the awareness of lean tools mean scores. The total average of the levels of awareness of the investigated lean tools/practices gives a mean value of 3.21. This suggests that

**Table 1:** Demographic details of the respondents.

| | Frequency | Percentages |
|---|---|---|
| **Company ownership** | | |
| Foreign | 3 | 7.5 |
| Joint Venture | 2 | 5.0 |
| Local | 29 | 72.5 |
| Others | 6 | 15.0 |
| **Number of employees** | | |
| Medium (50 – 199) | 6 | 15.0 |
| Small (10 - 49) | 34 | 85.0 |
| **Years of experience in garment industry** | | |
| 0–5 | 20 | 50.0 |
| 6–10 | 19 | 47.5 |
| 11 -15 | 1 | 2.5 |
| **Company years of operation** | | |
| Less than 1 year | 7 | 17.5 |
| 2–3 | 15 | 37.5 |
| 4–5 | 11 | 27.5 |
| 5 and above | 7 | 17.5 |
| **Job title** | | |
| Manager | 9 | 22.5 |
| Owner/director | 19 | 47.5 |
| Sewing Supervisor | 3 | 7.5 |
| Both Owner and Manager | 9 | 22.5 |



**Figure 2:** Awareness of LM practices within S&M GCSWN.



**Figure 3:** Implementation levels of LM practices under the process and equipment category.

the perceived levels of awareness of lean tools/practices within the S&M GCSWN are sufficiently moderate. As shown in Figure 2, teamwork is found to be the most known lean tool/practice within S&M GCSWN. As a result, the level of teamwork awareness among S&M GCSWN is very high. It was also observed that other lean tools such as total quality management, staff training, supplier management, and daily schedule adherence are well known within S&M GCSWN. However, the lean tools/practices of Kaban, 5s, Kaizen, value stream mapping, and small lot size production are the least known lean tool/practices within the S&M GCSWN. These lean tool/practices have a mean score of less than 3.0, indicating a low to very low level of awareness. This result agrees with the earlier research done by Abioye & Bello (2012), which highlights that teamwork and staff training are the two most known LM tools/practices within the Nigerian Small-Scale Manufacturers (NSSM). However, 5S, Kaizen, Kaban are the least known LM tools/practices among the S&M GCSWN. Finally, the level of awareness of remaining tools/practices such as reduced setup time (mean score = 3.08), cellular manufacturing (mean score = 3.15), total production maintenance (mean score = 3.23), just in time (mean score = 3.28), visual management (mean score = 3.30), standard operation procedure (mean score = 3.33), and equipment layout (mean score = 3.35) are ranked average.

### 4.3. Implementation of LM Practices in S&M GCSWN

The status of LM practices/tools implementation under the process and equipment category in the S&M GCSWN is shown in Figure 3. The mean value under this category varies from 3.63 to 2.70. The implementation levels of product design simplicity, preventive maintenance, standard operation procedures, and continuous flow are
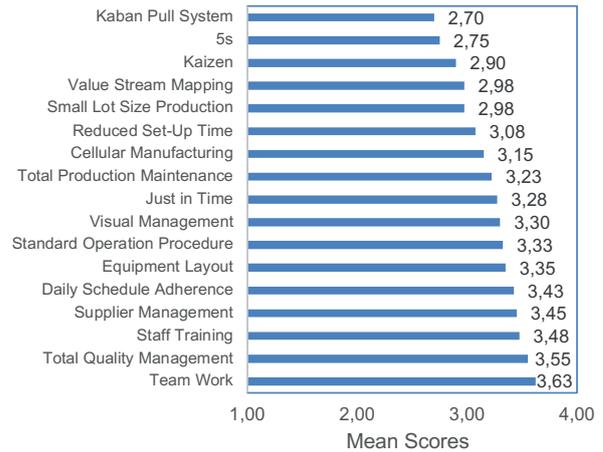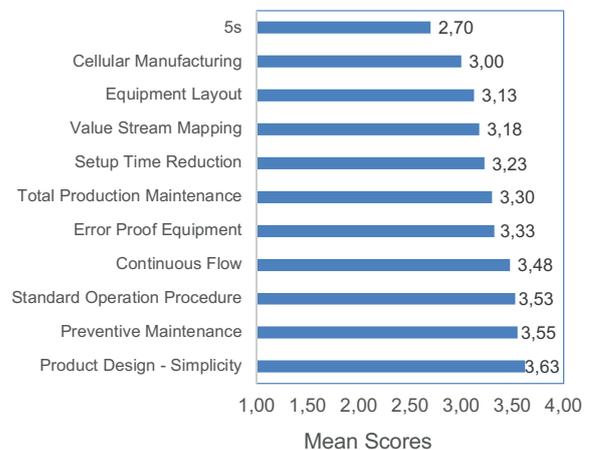
high within the S&M GCSWN. The LM tool like 5s has a low level of implementation. This result agrees with the earlier research done by Abioye & Bello (2012) which highlights that the implementation levels of 5S are very low within NSSMC. 5S is a five-step process that shares information via visual displays and controls. It is simple to execute and has led to increased productivity, improved workplace organization, and smooth production processes among manufacturing companies. Surprisingly, it has a low level of implementation within the S&M GCSWN. The low level of implementation of 5S can be attributed to its low level of awareness within the S&M GCSWN. The study also revealed that error proof equipment, total productive maintenance, set-up time reduction, value stream mapping, equipment layout, and cellular manufacturing were moderately implemented. As shown in Figure 2, the level of awareness of some of these tools such as total productive maintenance, set up time reduction, equipment layout, and cellular manufacturing is also moderate in the S&M GCSWN.

The study further reveals the status of LM practices/tools implementation under the manufacturing planning and
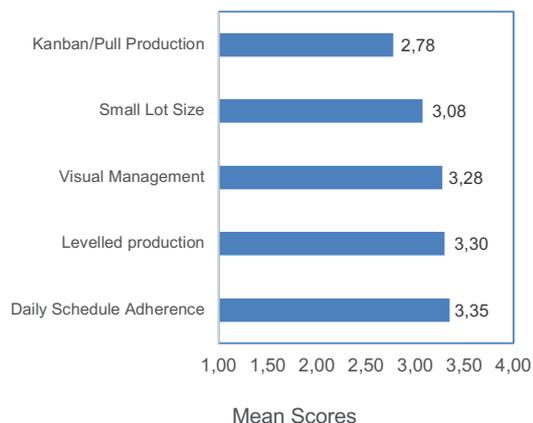
**Figure 4:** Implementation levels of LM practices under the manufacturing planning & control category.



**Figure 5:** Implementation levels of LM practices under the human resources category.

control category in S&M GCSWN, as seen in Figure 4. The study also revealed that daily schedule adherence, levelled production, visual management, and small lot sizes were moderately implemented. The Kaban/pull system has a low level of implementation within the S&M GCSWN. This result also agrees with the research conducted by Abioye & Bello (2012) which highlights that the implementation levels of the Kaban/pull system are very low within NSSMC. Fluctuations in customers' requirements have led many manufacturing companies to improve their manufacturing method by implementing the Kanban/pull system. Successful implementation of the Kanban/pull system has led to inventory reduction, increased market competitiveness, and flexibility in manufacturing. The low level of implementation of the Kanban/pull system within the S&M GCSWN can be attributed to its low level of awareness, as shown in Figure 2. As compared to other manufacturing planning and control tools such as visual management, which is simple to implement and helps in simplifying many manufacturing processes which in turn saves money and time. Another reason for the low level of implementation of the Kanban/pull system might be that visual management is simple to implement within the S&M GCSWN as compared to the Kanban/pull system that requires some advanced procedures. Such advanced procedures can be the size of the manufacturing component, the number of components of a certain category that are contained within the final product, and the standard time required for manufacturing components. As shown in Figures 2 and 4, visual management has a moderate level of awareness and a moderate level of implementation within the S&M GCSWN. It clearly shows that S&M GCSWN are aware that the implementation of visual management other than the Kanban/pull system in their manufacturing planning and control will help in saving money and time. LM practices/tools implementation under the human resources category are shown in Figure 5. The mean value under this category varies from 3.70 to 2.80. The most widely used tool in the human resources category is workforce commitment. Also, the implementation levels of employee involvement, staff training, group problem solving, and cross-functional teams are high within the S&M GCSWN. Kaizen is the least implemented LM

practices/tools under this category with a mean score of 2.80. The levels of implementation of workforce commitment, employee involvement, and staff training are ranked high because most S&M GCSWN are familiar with total quality management (TQM) principles. This is evident in the high level of awareness of TQM shown in Figure 2. TQM principles include; workforce commitment, employee involvement, staff training, customer focus, leadership, and human resource management. S&M GCSWN know that the worldwide business competitive advantage being sought after can be achieved through the TQM implementation. The demands of customers are met by providing them with quality goods and services. According to Arif & Ilyas (2011), the significance of employee involvement and workforce commitment in SMEs is well-known in TQM; it can take different forms such as teamwork, job involvement, employee empowerment, training, and development. Furthermore, constant quality improvement requires workers in the S&M GCSWN to be competent in problem-solving skills, quality upgrade skills, and statistical techniques. Therefore, S&M GCSWN owners can boost employee relationships by interacting with employees so that their designs and efforts will be recognized.

Finally, the study reveals the status of LM practices/ tools implementation under the supplier and customer relationship category, as seen in Figure 6. The study revealed that implementation levels of just-in-time supply to customers, just-in-time delivery from suppliers, supplier's quality level, information sharing with suppliers, customers' involvement in quality investment programs, suppliers' involvements in product development programs, and customers' involvements in product development programs is sufficiently moderate in the S&M GCSWN. The result can be traced to proper information sharing between the manufacturers, their customers, and suppliers throughout the supply chain. According to Adeitan et al. (2021), proper information flow between the manufacturers, their customers, and suppliers throughout the supply chain improves the quality of products at a low cost, increased productivity, and competitiveness in the manufacturing companies. Also, the addition of new and effective information to the supply chain can be found in information sharing about the production

**Figure 6:** Implementation levels of LM practices under supplier and customer relationship category.

process, delivery, inventory level, production volume, sales, and performance in companies, and among supply chain members (Patnayakuni & Rai, 2002). In order for a company to be successful in LM implementation, there must be an effective communication process at all levels. Therefore, a good communication process supports lean practices in manufacturing (Puvanasvaran et al., 2009).

The level of implementation of LM tools within the S&M GCSWN can also be traced to years of experience in the garment industry, company size, and company years of operation. As seen in Table 1, the survey revealed that 50% of respondents have less than 5 years' experience in the garment industry. Also, 85% of the companies' surveyed fall under the small businesses, with 37.5% of respondent's companies having been in operation for less than 3 years. Since most of the S&M GCSWN surveyed have less than 5 years' experience in the garment industry and years of operation, their level of implementation of most LM tools will be low. At their initial stage of operation, manufacturing SMEs main

focus is on ensuring their survival and maximizing profit. This is supported by Akhamiokhor (2017), which mentioned that survival rates of SMEs businesses have been less than 10% in Nigeria despite various government intervention programs. Also, Okezie et al. (2013) reported that 70% of SMEs fail in their first three years of operations in Nigeria because of their economies of scale. Therefore, S&M GCSWN should be made aware of LM principles/tools and understand the significant benefits of LM implementation. Furthermore, S&M GCSWN must determine the stage at which LM tools can be implemented into their manufacturing processes. Also, the LM principles/tools that will suit their manufacturing processes.

### 4.4. Benefits of LM Practices on S&M GCSWN

The present study tried to find out the benefits of lean manufacturing practices on S&M GCSWN in terms of reduced time of operations, costs, quality of garments,
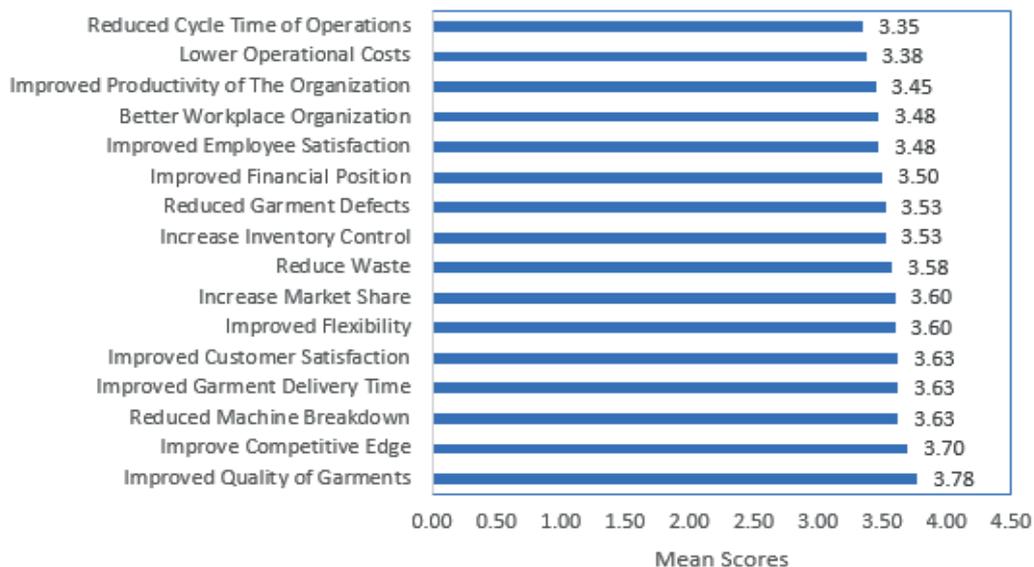


**Figure 7:** Benefits of LM practices on S&M GCSWN.

employee satisfaction, garment delivery time, improved flexibility, competitive edge, etc. The study established that S&M GCSWN benefitted from the implementation of lean manufacturing practices to a moderate extent, as evidenced in Figure 7. According to S&M GCSWN, the main benefit of implementing LM practices according to S&M GCSWN was improved quality of garments. LM enables the garment manufacturing companies to manufacture their products with high flexibility and quality, as well as fulfill customer orders in the shortest time possible. Production scrap decreases while the quality and productivity of garments manufactured improve. This finding is similar to the study conducted by Ramgoolam & Ramphul (2018) in the Mauritian textile industry. The study showed that improved quality of garments is the most important benefit of LM in the Mauritian textile industry. Other major benefits of LM according to the respondents garment companies, are: improved competitive edge: reduced machine breakdown; improved garment delivery time; improved customer satisfaction; improved flexibility; increased market share; reduced waste; increased inventory control; reduced garment defects; and an improved financial position. These findings agree with empirical studies by Kodali (2016); Ramgoolam & Ramphul (2018); Islam (2019); Petersson et al. (2010); Shah & Hussain (2016), as well as Silva et al. (2011).

## 4.5. Barriers of LM Practices on S&M GCSWN

As shown in Figure 8, the major barrier to LM in S&M GCSWN is the lack of understanding to implement LM concepts, which showed a mean score of 3.80. According to Almanei et al. (2017), the absence of knowledge on lean concept and several tools can be a great barrier to implementation. This finding is similar to those reported by Abioye & Bello (2018) and Shah & Hussain (2016) for their studies on the NSSMC. This is evident in the low level of awareness and implementation of some lean tools such as 5s and Kaizen. The S&M GCSWN needs to organize comprehensive training to create awareness of lean principles and concepts among their employees. Also shown in Figure 8, the other major barriers to implementation of LM among the S&M GCSWN are budget constraints, financial benefits of lean manufacturing not being recognized, lack of skilled employees, investment costs, lack of top management support, highly fluctuating customer orders, traffic and transportation issues. These are similar to the findings from the studies by Achanga et al. (2006), Kodali (2016), Nordin et al. (2010), Shah & Hussain (2016), Salaheldin (2005), and Wong et al. (2009). Lack of finance or budget constraints is one of the characteristics of SMEs that makes it hard for them to carry out improvement practices (Chong, 2007). According to Ihua (2009), the low performance and inability of the S&M GCSWN to coordinate various manufacturing subsystems is caused by budget constraints, poor management support, and low sales, among others. The garment industry is very competitive because the demand of the customers is increasing and highly fluctuating. Therefore, the mode and speed of garment delivery combined with garment quality and the cost of garment production play an important role in today's worldwide market. These have driven many manufacturing companies to implement new production strategies to improve their efficiency and competitiveness (Ramgoolam & Ramphul, 2018).
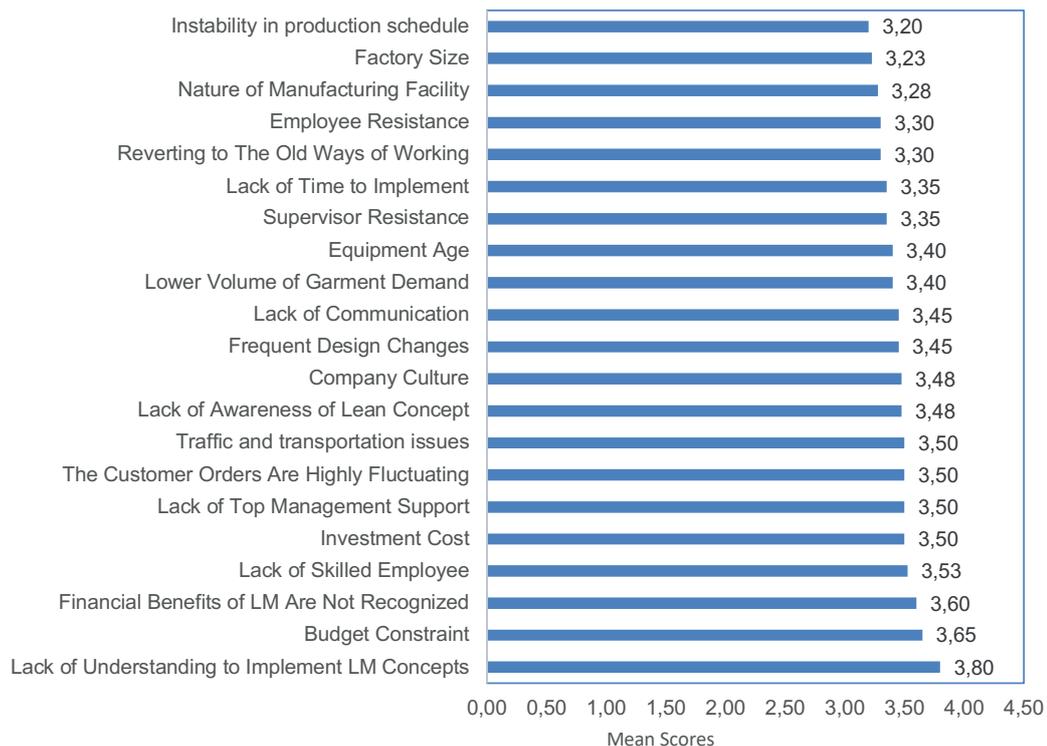


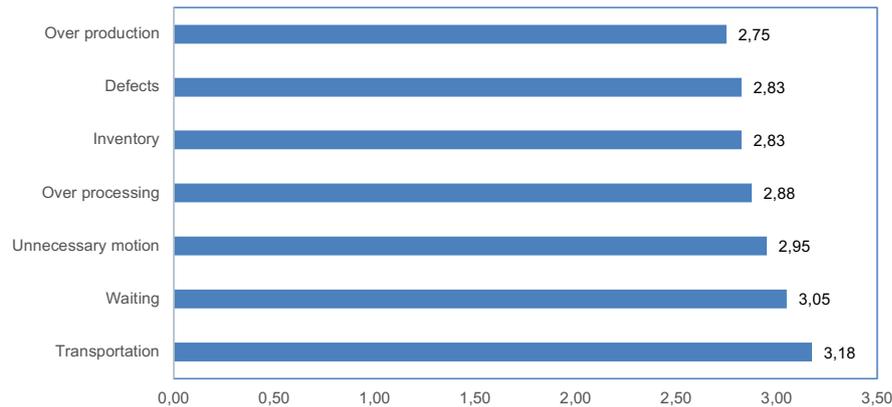**Figure 8:** Barriers of LM practices on S&M GCSWN.

**Figure 9:** Types of identified waste.

### 4.6. Types of Wastes in the S&M GCSWN

The study identifies the type of waste observed in S&M GCSWN. The wastes observed were; defects, unnecessary motion, waiting, transportation, overproduction, inventory, and over processing. Figure 9 gives the mean score values of each waste identified in the S&M GCSWN. The highest waste identified is transportation with a mean score value of 3.18. Transportation waste involves the unnecessary movement of materials within the factory. It leads to an increase in manufacturing time and also reduces expected productivity. This is followed by waiting with a mean score value of 3.05. This implies that most of the S&M GCSWN struggled with transportation and waiting in the manufacturing line, which might be one of the motives to consider in applying LM principles/tools. Waiting occurs in the S&M GCSWN when workers are waiting for raw materials, sewing machine breakdowns, or the wrong manufacturing layout. Extra waiting time in the sewing section causes an increase in the production time and reduced productivity. It can be reduced to a significant level through the line-balancing technique. According to Elnamrouty & Abushaaban (2013), waiting for parts in work-in-progress inventory may cause defects and unnecessary motion of employees and machines. Furthermore, non-standardized transportation methods increase employee's motions by double-handling and searching. This is evidenced in Figure 9, where unnecessary motion is among the highest waste identified. Overproduction is the lowest waste identified with a mean score value of 2.75. The reason is that most of the S&M GCSWN manufacture based on the actual customer orders or the garment materials given to them by the customer which is not uncommon in Nigeria.

## 5. Conclusion and future scope

The assessment of the awareness level, the adoption, and the benefits of lean concept implementation in the S&M GCSWN were successfully investigated with the following key findings deduced:

i.   Among various LM concepts, teamwork is the most prevalent lean concept known and employed in the Nigerian garment industry.

ii.  The implementation of a few LM concepts in the Nigerian garment industry has a positive influence on product design, daily scheduling, workforce commitment, and just-in-time supply to the customers.

iii. The major benefit drawn from the implementation of the lean concepts is a significantly improved quality of the produced garment in terms of the choice of materials, design, finishing, and packaging.

The most challenging barrier for the adoption and implementation of lean concepts is a lack of understanding of how to implement the concepts. Thus, comprehensive training is required to aid the understanding of lean concepts among garment industry stakeholders. This is anticipated to significantly enhance productivity and increase the contribution of this industry to the GDP of Nigeria.

The limitations and future research directions include:

i.   The survey data used in this study is limited to only 40 S&M GCSWN. Hence, the findings of this study may not be generalized to the entire S&M GCSWN. Further studies can adopt models such as the spiral of applied research model proposed by Eckert et al. (2004) to develop frameworks and procedures for lean practices in S&M GCSWN. The findings of this study and other future surveys would aid in the development of a framework for implementing lean practices in SME garment companies.

ii.  An in-depth study could be conducted on the role of cultural beliefs in the implementation of LM in S&M GCSWN.

iii. A similar study can be conducted on other SMEs operating in Nigeria. The study can focus on developing a framework that will identify the barriers, benefits, types of waste, and best LM tools that will benefit their sector.

## Conflict of Interest

There was no conflict of interest found among the authors of the present research paper.

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