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Developing Integrated Continuous Improvement Model for Competitiveness of Ethiopian Automotive Industry

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Abstract

The purpose of this study is to examine the relationship and difference among the continuous improvement tools such as just in time (JIT), total quality management (TQM), and lean six sigma (LSS). It also emphasizes these variable implementations and practices for competitiveness and achievement of integrated model development with common and unique success factors for a company's better competitiveness. Besides, it provides a case application evaluation of the model with the Bishoftu Automotive industry. Comparative study of TQM, JIT, LSS uses available literature critical analysis and knowledge of state of the art for competitive advantage. An in-depth analysis showed that a continuous improvement (CI) approach is necessary for the survival of industries in the dynamic and competitive market. Firms have employed CI strategies such as TQM, JIT, and LSS. However, most studies have demonstrated that factors concerning distinct approaches have advantages and limits in their situation. The integrated method would lead to the best competitive organization and resolve the shortcomings of each CI program. A thorough review of quality management (QM) methodology offers some possible explanations of why specific methods alone could not give an enterprise an absolute competitive advantage. This study, therefore, established an integrated model using the most commonly recognized variables by most research findings and practices. The research is exceptional in its scope by giving an insight into the advancement of CI and quality management in the context of an integrated model and introduced two new factors on existing CI factors.

Keywords: Continuous Improvement, Competitive Advantage, Integrated Model, Just in Time, Lean Six Sigma, Total Quality management

Introduction

A global industry is one in which the overall global ranking of competitors in broad regional or national markets is influenced (Chabowski & Mena, 2017; Petrillo, De Felice, & Zomparelli, 2019). Global industries require a firm to compete on a worldwide, coordinated basis or face strategic disadvantages (Collins & Porter, 2010; Dima, Begu, Vasilescu, & Maassen, 2018; Galgánková, 2020; M. E. Porter, 1980). Competitiveness usually links to productivity (Best, 2001; Dima et al., 2018; Galgánková, 2020; M. E. Porter, 1980, 1990). Competitiveness is a measure of how firms can compete with other firms (Best, 2001; M. Porter, 1990). The concept of competitiveness is then related to relative costs. If a firm operating in one particular market faces lower unit costs than other firms in the same market, the former will be more competitive than the latter. However, the concept of competitiveness may apply not only to firms but also to whole

economies. An economy is competitive if firms in that economy face lower unit costs than firms from other economies. Every factor that increases productivity and, therefore, lowers the unit costs of firms in an economy contributes to the competitiveness of the respective economy (Best, 2001; Charles & Zegarra, 2014; Dima et al., 2018; M. Porter, 1990; M. E. Porter, 1980; Vinodh, Antony, Agrawal, & Douglas, 2020; Womack, Jones, & Roos, 1990). In a competitive market, firms apply many quality initiatives such as Total Quality Management (TQM), just in time(JIT), lean, six sigma, and lean six sigma (Marchiori & Mendes, 2020; Muraliraj, Kuppusamy, Zailani, & Santha, 2020; R, Vinodh, & P, 2020; Salah, Rahim, Salah, & Rahim, 2019; Vinodh et al., 2020). World Class Manufacturing (WCM) achieved global competitive advantage through the use of its manufacturing capabilities as a strategic weapon and providing world-class performance elements like productivity, quality, safety, environment, delivery, morale, flexibility, and cost (Dahlgaard, 2006; Habidin & Yusof, 2013; Łyp-Wrońska, 2016; Näslund, 2008; Petrillo et al., 2019; R et al., 2020)**.**

Automotive industries play a significant role in developed countries' economies (Liu et al., 2018; Petrillo et al., 2019; Sakuramoto, Di Serio, & Bittar, 2019). It gives excellent economic preeminence in the leading global economy for the hosting country (Petrillo et al., 2019; Womack et al., 1990). There is intense competition to encourage and attract such industries under the assumption that they can be an engine for economic growth (Petrillo et al., 2019; Womack et al., 1990). Most importantly, the automotive industry is the home of competitive continuous improvement tools and quality management methodology (Petrillo et al., 2019; Womack et al., 1990). Ethiopian automotive industries have not shown any substantial growth in automotive production; unable to go beyond assembly and bodybuilding; rather, some are doing as a selling agent. Even in this stage, they cannot compete with the imported ones in the national market due to the low variety of products, low quality, and longer lead-time. The continuously changing market environment, organizations' ability to manage their business change, and uncertainty cause this problem. In Ethiopia, more than 50 automotive assembly and bodybuilding industries. Among the automotive sector in Ethiopia, Bishoftu Automotive is the most significant automotive industry. It represents product categories and depth, capacity, commitment to continuous improvement, and R & D.

In the continually changing business environment, organizations need continuous improvement processes (Jimoh, Oyewobi, Isa, & Waziri, 2019; Vinodh et al., 2020). By implementing total quality management (TQM) and business excellence principles in all the business processes, continuous improvement can be achieved (Beshah & Berhan, 2017; Tasleem, Khan, & Nisar, 2019)**.** Development progresses, changes, and mainly the efforts are visible. However, the successes are well from where the country is going to work. There have been various forms of studies to find and discover avenues of rapid and sustainable growth. Most stakeholders understand that quality issues are the stumbling block for most industries (Beshah & Kitaw, 2014; Tasleem et al., 2019). The Ethiopian government is trying to increase the quality of products by implementing various programs. A company cannot maintain the quality of products without properly adopting a strategic and planning instrument of quality management practice (Anil & K.P, 2019; Jimoh et al., 2019; Singh, Kumar, & Singh, 2018; Tasleem et al., 2019; G. J. Yu, Park, & Hong, 2020). However, the Ethiopian manufacturing sector lacks a practical, clear strategy for continuous improvement of quality management practice. In Ethiopian industries, TQM implementation, the most critical success parameters are leadership, policy and strategy, and customers' focus (Beshah & Berhan, 2017). This paper aims to address the research query: How can the Ethiopian automotive industry improve its competitiveness through TQM, JiT, and LSS? To

address the research question aimed to Develop an integrated continuous improvement model that improves the Ethiopian automotive industry's competitiveness. This research explores the present status of philosophies and methods for continuous quality management involving TQM, JIT, and LSS. It offers a solution to Bishoftu Automobile's underlying dilemma. The paper is done by examining the literature on academic papers, books, newsletters, guides, business studies, and field findings. Secondary data from different sources are assessed. Data collected related to the Automotive manufacturing industry's growth, opportunities, economic contribution, challenges, strengths, and performances about continuous improvement philosophy (TQM, JIT, and LSS) will be discussed. The analysis considers attempts to investigate continuous quality improvement issues on the Automotive industry, performance, competitiveness strategy, quality challenges in Ethiopia automotive, and then a case study is conducted on Bishoftu Automotive for continuous improvement effort is assessed. Finally, the analysis is concluded and recommended.

Literature Review

Global Competitiveness

Competitiveness is one of the most frequently used concepts in current economic policies, in the regional or national policy frameworks and strategies (Ferdousi, Baird, Munir, & Su, 2019; Marčeta & Bojnec, 2020; Vinodh et al., 2020; Voinescu & Moisoiu, 2015). In the modern industry, Porter conceptualizes the forces which drive industry competition. These sources, such as the threat of new entrants, the bargaining power of suppliers, the danger of replacement goods, the consumers' negotiation strength, and the industry positioning itself among current competitors, highlight the underlying economics and drive innovation within an industry (Hanafi, Wibisono, Mangkusubroto, Siallagan, & Badriyah, 2017; ME Porter, 2008). Such a framework for analyzing competitiveness is, therefore, essential in determining the potential profitability of not just the end product but of the entire scope of business (Charles & Zegarra, 2014). Most Countries attempt to progress their global competitiveness. One of the collective ways to measure global competitiveness is using the global competitiveness index (GCI) (Marčeta & Bojnec, 2020; Sakuramoto et al., 2019). The GCI ranking reveals, the higher the rank, the better for the national economy (Marčeta & Bojnec, 2020; Sakuramoto et al., 2019). Prosperity is obtained by the productivity of an economy, decided by the value of products and services generated per unit of the human and natural capital of the country (Tangen, 2005). Productivity depends on the value of a country's products and services, the costs that it is feasible to manage in free markets, and the quality with which these products can generate (ME Porter, 2008; Tangen, 2005). Productivity supports high wages, a powerful currency, and attractive returns to capital and with them a high standard of living. Competitiveness, then, is measured by productivity (ME Porter, 2008; Schwab, 2018)**.** Globalization has improved productivity returns by creating significant new markets for competitive countries. Globalization has often increased the expense of lower production by reducing the opportunity to fund businesses with poor productivity or provide low-paying work with fewer trained workers. The main goal for any country is to establish environments under which businesses and workers can increase their competitiveness throughout the economy (Schwab, 2018). The competitiveness gauges then explain the wealth created from productive economic activity that adds value to available labor and natural assets (ME Porter, 2008; Schwab, 2018). The Scientific literature has generally publicized a negative influence of resource abundance on prosperity levels, summarizing the evidence using the term resource curse (Robinson, Torvik, & Verdier, 2006). The traditional justification for this counterintuitive, finding access to valuable resources apparently should positively affect prosperity, has been the Dutch Disease (Badeeb, Lean, & Clark, 2017; Eregha & Mesagan, 2016). Here,

incomes from natural resource exports lead to an increase in the real exchange rate. As a result, Drives factor of production into local operations, such as retailing, which have a less long-term productivity growth opportunity (ME Porter, 2008; Robinson et al., 2006). The role of institutions is another reason for the resource curse: natural resources have a detrimental impact on the quality of democratic institutions and economic policy, eroding competitiveness over time (Badeeb et al., 2017; Eregha & Mesagan, 2016; ME Porter, 2008; Schwab, 2018)**.**

The Regional and Country Research indicates that all economies must invest in larger productivity initiatives to support future growth and profits (Galgánková, 2020; Marčeta & Bojnec, 2020). Countries needing continuing growth and growing incomes must invest outside their existing strength areas. With an overall score of 46.2, Sub-Saharan Africa has the lowest GCI score in all regions. The region's annual GDP growth has dipped below 5% since 2015 (Schwab, 2018). Less than half of the adults have access to the Internet, and wireless telephone subscriptions in most countries' economies are exceedingly limited. South African countries in Sub-Saharan Africa have attained comparatively greater productivity (48.0) than East Africa (46.8) and West Africa (44.5) (Schwab & Forum, 2019). Regional disparities are more robust when considering ICT implementation, expertise, and financial system pillar ratings. Any markets have arisen as regional champions in particular regions. Kenya, East Africa's most dynamic economy, is one of the region's most robust innovation centers. Rwanda has a ranking of 64,4 and leads Africa, led by Mauritius, in institutional efficiency (Schwab & Forum, 2019). Ethiopia’s leading position in the region is reflected in a GDP growth consistently above 9% since 2006. Ethiopia's competitiveness performance is relatively strong in two of 12 GCI pillars, where it ranks 63rd for market size and 98th for the labor market pillar higher. The weakest performance pillars are ICT adoption (138th), Skill (135th), and Product Market (135th) (Schwab & Forum, 2019).

Automotive Industry Competitiveness

Global Automotive industry Overview

Automotive industries play a significant role in the development of the world economy. There is also intense competition between countries to be the auto sector leader since it directly relates to the leading economy. Figure 1 shows the 78 years of global leading producers of automotive trends, share, and production volume. As shown in Figure 1, China starts automotive production in the 1980s and, after continually increasing its production, achieved covering 25% of the world production in 2018. As opposed to China, US production in 1950 covers 75 % of the world production shares and, after continually declining, arrived below 15% in 2018. according to Figure 1, the production volume of US automotive production is stable and did not decline in production volume, but the decline in the percentage share of world production due to emerging producers, mainly China’s successive production volume growth. This trend shows that the increase in production volume automotive is directly related to economic performance growth.

Manufacturing sectors of some countries in sub-Saharan Africa have witnessed strong growth rates in recent years. Botswana, Ethiopia, Kenya, Mozambique, and Rwanda have had the most significant expansion of their manufacturing sectors. However, maintaining consistently high manufacturing value-added growth rates poses a challenge. Many of these countries have undergone a process of deindustrialization since 1990. This trend highlights the vital need for competitiveness to drive structural change in Africa, thereby generating economic growth and providing jobs. South Africa's automotive industry is among the largest on the African continent (together with Tunisia, Egypt, and Morocco). South Africa can exceed 14 million dollars per year in car imports. The automotive and commercial vehicle demand is overwhelming, but, for the most part, is supplied by imports of used Vehicles (A. Black, Makundi, & Mclennan, 2017; UNIDO, 2018).

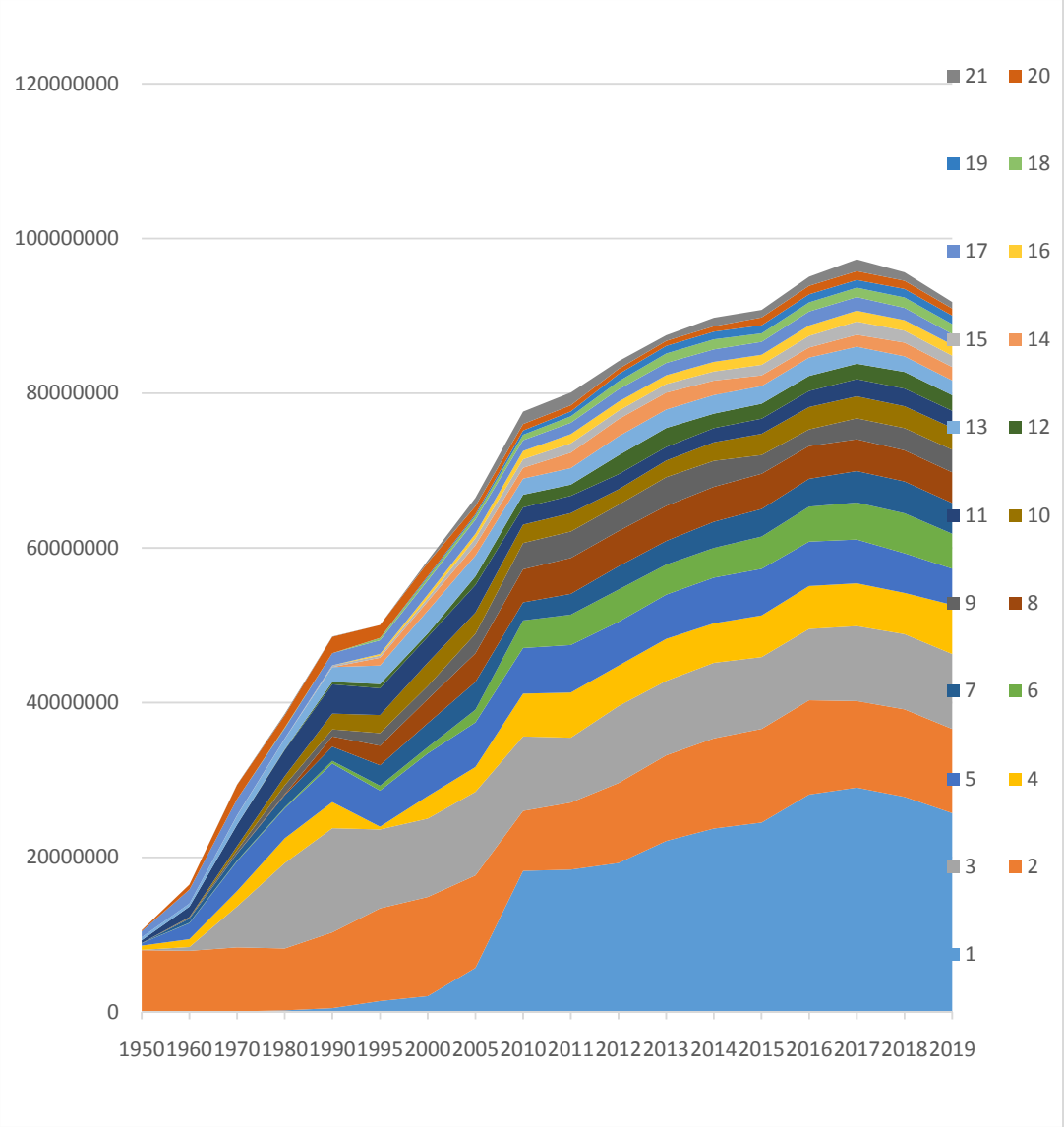

Figure 1. Leading automotive producing countries and their share volume in thousands (source OICA compiled by Authors)

In a nutshell, Automotive high in production volume means high in economic growth. Growth in Africa made favorable conditions for the development of manufacturing. Given its overall scale, its connection to a wide variety of manufacturing activities, and technological impact, the automotive industry considered a potential opportunity for development.

Global Competitiveness of Ethiopian Automotive Industry

One of the oldest companies that started vehicle assembly is AMCE in 1970. It was the sole company in Ethiopia to assemble heavy and commercial trucks founded by Italian car manufacturing company FIAT. The other automotive industries are Yangfan Motors assembles Lifan SKD kits, up to 3,000 a year, Better International Trading plc runs a plant assembling 1,000 SKD (Semi- Knockdown) BYD cars a year, Mesfin Industrial Engineering (MIE) assembles 1,000

CKD(Complete Knockdown) Geely cars a year and 2000 SKD Peugeot; Marathon Motors assembly of 1,000 SKD Hyundai per year and Belayab Enterprises assembles Dongfeng Light Commercial vehicles. There are more than 50 automotive assembly and bodybuilding medium and large Industries assembling like a motorbike, three-wheel motor, and pickups and building bodies of a truck, trailer, fuel cargo, and truck mount mixer.

According to MIDI (metal industry development Institute), automotive industries' experience concerning quality improvement, MIE and Belayab motors have successfully implemented QMS ISO 9000. Except for MIE and Belayab motors, other industries have not yet registered any quality initiative for their competitive landscape. Some industries are started implementing Kaizen with government support and initiative through Ethiopian Kaizen Institute.

Firm-level Competitiveness is at the heart of positioning as a competitive advantage(Cousins, 2005; Le & Lei, 2018). In the long run, firms succeed relative to their competitors if they possess a sustainable competitive advantage (Le & Lei, 2018; ME Porter, 2011). There are two distinct competitive advantages: lower cost and differentiation. Lower cost is the firm's capability to design, produce, and market a comparable product more efficiently than its competitors (Le & Lei, 2018; ME Porter, 2011). At prices at or near competitors, lower-cost transforms into superior returns. For this instance, Korean steel and semiconductor producers have penetrated against foreign competitors using this strategy (ME Porter, 2011). They produce equivalent products at low cost, employing low-wage but highly productive labor forces and modern process technology purchased or licensed from foreign suppliers (ME Porter, 2011). Differentiation can deliver unique and superior value to the buyer in terms of product quality, special features, or after-sale service (Cousins, 2005; Le & Lei, 2018; ME Porter, 2011). German machine tool producers, for example, compete with differentiation strategies concerning high product performance, reliability, and responsive service. Differentiation permits a firm to grasp a premium price, which leads to superior profitability, provided costs are comparable to those of competitors (Cousins, 2005; Le & Lei, 2018; ME Porter, 2011). Hence LMICs like Ethiopia for competitive advantage lower-cost strategy is significant from flying geese paradigm point of view. However, to produce at a lower cost, many companies use the implementation of continuous improvement approach involves the use of several methods and techniques to identify problems, wastes, and process variations (Bhuiyan & Baghel, 2005; Tesfaye & Kitaw, 2017); and also to improve the manufacturing processes to achieve organizational excellence (Ferdousi et al., 2019; Petrillo et al., 2019; Tesfaye & Kitaw, 2017; G. J. Yu et al., 2020; L. Yu & Ding, 2009). Though there are different continuous improvement methodologies (Antony, Gupta, Sunder M, & Gijo, 2018; Bhuiyan & Baghel, 2005; Ferdousi et al., 2019; Kannan & Tan, 2005; Munizu, 2013; Muraliraj et al., 2020; Tesfaye & Kitaw, 2017). Continuous improvement programs are commonly associated with integrated TQM, JIT, and LSS practices (Anil & K.P, 2019; Hailu, Mengstu, & Hailu, 2018; Kumar, 2010; Tesfaye & Kitaw, 2017; Vinodh et al., 2020).

Historical Development of TQM and JIT

Methods for attaining quality were probably first applied by prehistoric humans crafting pottery, clothing, tools, and weapons. Since then, quality methods have evolved along a path that roughly parallels the evolution of the method of production. However, methods of production have only been a part of the quality story. Increasingly complex products, more demanding customers, and the growing ferocity of competition have also spurred growing attention toward quality. With these factors as background, the evolution of quality can be traced through four distinct phases: inspection, statistical quality control, quality assurance, and modern quality management (Nicholas, 1998). There is confusion among continuous improvement methods Toyota production system, just

in time system and Lean production system. The Toyota Production System (TPS) provided the basis for what is now known as lean thinking, as popularized by (Dennis, 2015; Pepper & Spedding, 2010; Womack et al., 1990). US and European companies began adapting the TPS under the title of just-in-time (JIT) to remain competitive with the Japanese industry (Pepper & Spedding, 2010). JIT is also called Lean Production (Nicholas, 1998). Ford Company generated the assembly line in 1913 due to the father of scientific management Frederick W. Taylor. The high volume in the assembly line caused the issue of Inspection quality control. Inspection practices were officially recognized as common during this time (Aized, 2012). Since 1930 Quality inspection has been expensive since process quality is not commendably regulated. As a result of his experience in Bell Laboratories, Walter Shewhart formed the quality management method "control chart." He proposed using a sampling inspection method instead of a 100 percent inspection to reduce inspection, statistical quality control (SQC) (Dahlgaard, Reyes, Chen, & Dahlgaard-Park, 2019). From the early 1950s on, The definition of quality costs was introduced by J.M. Juran. The approach of SPC can't effectively diminish the quality costs, particularly the costs caused by internal failures and external failures. At all phases of product lifetime, quality and all tasks are involved in quality control. The quality definition and concepts of Feigenbaum are close to those of Deming, Juran, and Crosby (Dotchin & Oakland, 2006). In 1970 Deming and Juran introduce the quality concepts and statistical quality methods to the top managers of Japanese industries. Union of Japanese Scientists and Engineers (JUSE) further synthesized the concepts, principles, and approaches of statistical process control and total quality control adopted and named as Japanese; they company-wide quality control (CWQC). But the largest contributor is Kaoru Ishikawa to promote the realization of total quality and continuous improvement. He Developed the Quality Control Circle (QCC) methods and used the seven QC tools and improvement tools to apply the QCC improvement activities (Yang, 2012). CWQC's realization culminated in Japanese industries retaining fundamental competitiveness and moving increasingly to western markets once controlled by Western firms. This situation initiated American and western industries to benchmark Japanese CWQC performance and learned the management of quality control from Japan. It also led Japanese industries to possess core competitiveness, Caused the US and western companies to act quickly towards quality. TQM began in the mid-1980s with benchmarking and the learning of Japanese CWQC. The substance and activities of TQM were initially not on consensuses. However, several gurus such as Deming, Juran, and Ishikawa have been instrumental in developing the TQM, particularly the Deming 14 points and the Juran quality trilogy (Chen, Lee, & Wang, 2020; Dahlgaard et al., 2019; Yang, 2012). This contributed to the introduction and expansion of complete quality management (TQM) among industries worldwide. The industry regarded TQM as an effective weapon to reclaim a competitive Advantage (Yang, 2012). Lean production was first conducted under the leadership of Taiichi Ohno (1912-1990) in Toyota Motor Manufacturing. Lean manufacturing and the Toyota Production Method are currently synonymous with many practitioners (Womack et al., 1990). Lean focuses on eliminating waste by adopting a holistic strategy when interacting with staff, vendors, and consumers. Six Sigma was created by the Motorola Company in the 1980s and is attributes to Bill Smith (1929-1993). Six Sigma focuses on eliminating deviations to reduce defects and other errors (Arnheiter & Maleyeff, 2005). Six Sigma, as recognized today, was developed at Motorola through Bill Smith, a reliability engineer, in the 1980s (Allen & Brady, 2006). The real turning point in Six Sigma's fame came through Jack Welch's work, the then CEO of General Electric, in 1995. Welch had witnessed the success experienced through Bill Smith's approach and intensely championed and led the Six Sigma methodology in GE (K. Black & Revere, 2006; Dahlgaard et al., 2019). The term "Six Sigma" discusses a statistical measure of defect rate within a system. Supported by statistical

techniques, it presents a structured and systematic approach to process improvement, targeting a reduced defect rate of 3.4 defects for every million opportunities, or Six Sigma (Allen & Brady, 2006). In 1986 the George Group of the US was the first to integrate LSS in the manufacturing sector (Raja Sreedharan & Raju, 2016). The convergence of Lean and Six Sigma is the solution to solve the drawbacks of both. The merger of the two is how organizations will boost their potential (Bhuiyan & Baghel, 2005). This is of significant importance as many companies are only applying one of the two methodologies without realizing that great benefits lie in what the other methodology can bring (Smith, 2003). It has also mentioned that the combination of both leads to achieving continuous improvement. The integration of Six Sigma and lean helps companies achieve zero defects and fast delivery at a low cost (Salah, Rahim, & Carretero, 2010). In a nutshell, until 1980 did US managers recognize that quality could be used as a strategy for competitive advantage. They saw the connection between poor quality and loss of pro t, a connection strengthened by increased consumer activism and liability suits for product defects starting in 1970. By the early 1980s, the Japanese advantage in quality had become obvious. The incremental improvement conveyed for Japan Superior skill and processes (Nicholas, 1998). Quality's importance as a competitive instrument is now generally understood, but the problem remains if ensuring that the many principles and prescriptions for quality are adhered to by managers and workers. As a result, much of the prominence on quality has shifted to include the human aspect of quality, and the entire organization is termed Total quality management (TQM). Modern TQM programs focus on assuring that the product design satisfies both customer requirements and manufacturability requirements and that procure raw materials also satisfy these requirements. They also focus on assuring that the production activities necessary to produce a product or service achieve the quality requirements and that the overall quality program is effective in terms of meeting or exceeding customers' expectations (Nicholas, 1998). JIT and TQM are two management philosophies that, though not disputing the need for high technology or capital-intensive efforts, emphasize continuous attention to fundamentals and the crucial role of the workers in the improvement effort. JIT is management that focuses the organization on continuously identifying and removing sources of waste so that processes are continuously improved. JIT is also called lean production. TQM is a management that emphasizes on understanding the expectations and aspirations of consumers and being willing to satisfy their needs and desires (Nicholas, 1998). JIT system and TQM programs have been adopted by organizations everywhere. JIT/TQM programs require long term commitment to implement, and few of them will show positive results in the first several months or even years of effort. Players who have successfully adopted the method of JIT/TQM and who faithfully apply skills to improve their product and processes have gained a substantial competitive advantage over others within the same market who continue to operate by the old rule of mass production and quality control (Nicholas, 1998).

Key Benefits and Factors of TQM

Since the beginning of the 21st Century, TQM has been well recognized by business managers and quality practitioners. The international standard defines the quality system as the organizational structure, procedures, processes, and resources needed to implement quality management. Quality needs to be considered into all elements and functions of the organization and then systematically controlled. A successful TQM necessitates a committed and well-trained workforce that participates fully in quality improvement activities. TQM improves the performance, flexibility, and competitiveness of a business to meet customers' requirements to enhance organizational performance through continuous improvement in the organization's activities (Tesfaye & Kitaw, 2017). Feigenbaum de ned the concept of organization-wide total quality control.

He was the first user of the total quality control concept in the quality literature. It distinguished quality as the overall product and service characteristics of the marketing, engineering, production, and maintenance that satisfy the customer's potential for the product and service in use(Munizu, 2013). Total quality management is an organization's culture dedicated to customer satisfaction through continuous improvement.

Furthermore, to define critical factors of total quality management, several studies have been carried out, and individual researchers established different instruments. Flynn et al. (1994) has established another method to define critical factors of total quality management. The seven-factor they identified are top management support, quality information, process management, product design, workforce management, supplier involvement, and customer involvement. Flynn et al. (1995**)** assessed the effect on quality performance and the competitive advance of total quality management activities (B. B. Flynn & Schroeder, 1995; B. Flynn, Schroederb, & Sakakibara, 1994; Munizu, 2013). Table 1. present the most commonly cited practice of TQM by different researchers.

Table 1. Most widely cited factors of TQM

No	Factors	Authors
1	cleanliness and organization of plant environment	(Beshah B., 2014), (Tesfaye & Kitaw, 2017),
2	Customer involvement or Focus	(Beshah & Berhan, 2017), (Beshah B., 2014), (Tesfaye & Kitaw, 2017), (Flynn et al., 1995), (Sadikoglu & Zehir, 2010), (Baye & Satya, 2016), (J. Nicholas, 2016)
3	Process management or statistical process control	(Tesfaye & Kitaw, 2017), (Flynn et al., 1995), (J. Nicholas, 2016), (Sadikoglu & Zehir, 2010), (Baye & Satya, 2016)
4	Feedback and Communication	(Tesfaye & Kitaw, 2017), (Flynn et al., 1995), (Sadikoglu & Zehir, 2010), (J. Nicholas, 2016)
5	Supplier quality involvement/ supplier relationship	(Tesfaye & Kitaw, 2017), (Flynn et al., 1995), (Sadikoglu & Zehir, 2010), (Baye & Satya, 2016)
6	Cross-functional product design	(Tesfaye & Kitaw, 2017), (Flynn et al., 1995), (Sadikoglu & Zehir, 2010) , (J. Nicholas, 2016)
7	Committed leadership/ management support	(Beshah & Berhan, 2017), (Beshah B., 2014), (Tesfaye & Kitaw, 2017),(Flynn et al., 1995), (Baye & Satya, 2016), (J. Nicholas, 2016),(Ferdousi, Baird, Munir, & Su, 2019)
8	Policy and Strategic planning	(Beshah & Berhan, 2017), (Beshah B., 2014), (Baye & Satya, 2016), (J. Nicholas, 2016)
9	Workforce management/ Employee involvement	(Tesfaye & Kitaw, 2017), (Flynn et al., 1995), (J. Nicholas, 2016), (Sadikoglu & Zehir, 2010), (Baye & Satya, 2016), (Ferdousi et al., 2019)

Key Benefits and Factors of JIT

Just in Time (JIT) production, a manufacturing philosophy removes all forms of waste correlated with time, job, and storage and method diversity in the production system (Muthoni, 2015; Tesfaye & Kitaw, 2017). JIT will contribute to substantial changes in the organization's productivity and build the capacity to adapt to market demand's rapid fluctuations. The waste will happen by surplus supplies and disproportionate lot sizes, leading to excessively long lead times for consumers (Nakamura, Sakakibara, & Schroeder, 1998; Tesfaye & Kitaw, 2017). Other types of wastes are the

inspection of incoming materials, illogical paper trails, excessive handling of work on the shop floor, and excess idle capacity. As discussed by the Toyota Production System, overproduction, waiting, transportation, inefficient processing, inventory, unnecessary movement, and product defects are usually all seven forms of fatal waste in manufacturing. Simplifying production processes (identification and removal of redundant process steps) is a crucial phase in the disposal of such waste. JIT production involves preparing system-wide production schedules based on consumer demand details fed into the last section of the production line. The pull system support procedures, the usage of a kanban card system, and the ability to prepare such demand-driven scheduling is made possible (Nakamura et al., 1998; Tesfaye & Kitaw, 2017). Some of the most commonly cited factors of JIT are presented in Table 2.

Table 2. Most Widely cited factors of JIT

No.	Factors	Authors
1	Setup time reduction	(Flynn et al., 1995; Tesfaye & Kitaw, 2017; Hailu et al., 2018)
2	JIT schedule	(Tesfaye & Kitaw, 2017), (Hailu et al., 2018), (Flynn et al., 1995)
3	JIT layout & Equipment layout	(Tesfaye & Kitaw, 2017), (Hailu et al., 2018), (Flynn et al., 1995)
4	JIT delivery by suppliers	(Tesfaye & Kitaw, 2017), (Hailu et al., 2018), (Flynn et al., 1995)
5	Pull system/Kanban	(Tesfaye & Kitaw, 2017), (Hailu et al., 2018), (Flynn et al., 1995)
6	Committed leadership	(Tesfaye & Kitaw, 2017), (Hailu et al., 2018), (Flynn et al., 1995), (Paranitharan & Babu, 2014)
7	Employee involvement	(Tesfaye & Kitaw, 2017), (Hailu et al., 2018), (Flynn et al., 1995), (Paranitharan & Babu, 2014)
8	Strategic planning	(Tesfaye & Kitaw, 2017), (Hailu et al., 2018), (Flynn et al., 1995), (Paranitharan & Babu, 2014)
9	Information and feedback	(Tesfaye & Kitaw, 2017), (Hailu et al., 2018), (Flynn et al., 1995),
10	Cleanliness and organization of plant environment	(Tesfaye & Kitaw, 2017), (Hailu et al., 2018), (Flynn et al., 1995), (Paranitharan & Babu, 2014)

Key Benefits and Factors of Lean Six sigma

The concept of LSS combines two previously separate areas of operational improvement; Lean management and Six Sigma. Lean management focuses mainly on eliminating waste or non-value-added activities within a business operation. Lean attempts to render the operation as useful as possible by defining waste causes and reducing and removing them so the value-added elements remain. Six Sigma is predominantly a tool for focusing on reducing process variation. It concentrates on reducing the variability of output to reduce variability to below 3.4 defects per million opportunities (DPO)(Antony, Manville, Greatbanks, Krishnasamy, & Parker, 2012; He, Deng, Zhang, Zu, & Antony, 2017; Vinodh et al., 2020). The successful implementation of LSS has several potential benefits. These can include improved cross-functional teamwork across the entire organization; increased employee morale; improved consistent level of service through systematic reduction of variability in processes, and effective management decisions due to reliance on data and facts rather

than assumptions and gut feelings, amongst many others (Antony, 2004; Setijono, Laureani, & Antony, 2012; Vinodh et al., 2020). In Table 3 commonly cited factors of LSS are listed.

Table 3. Most Widely cited factors of LSS

No.	Factors	Authors
1	senior management commitment, support, and enthusiasm	Antony et al., 2012; Muturi, Ho, Douglas, Douglas, & Ochieng, 2015; Antony, Gupta, Gijo, et al., 2018; Rathilall & Singh, 2018; (Raval, Kant, & Shankar, 2018; Muturi et al., 2015; S. M. Saad & Khamkham, 2018
2	linking LSS to business strategy	Antony et al., 2012, 2018; Raval et al., 2018; S. M. Saad & Khamkham, 2018
3	linking LSS to the customer	Antony et al., 2012, 2018; Raval et al., 2018)
4	understanding the tools and techniques	Antony et al., 2012, 2018; Raval et al., 2018; S. M. Saad & Khamkham, 2018
5	Project Management, selection prioritization, and tracking	Antony et al., 2012, 2018; Raval et al., 2018 ; S. M. Saad & Khamkham, 2018
6	Training and education.	Antony et al., 2012, 2018 ; Raval et al., 2018 ; S. M. Saad & Khamkham, 2018
7	Employee engagement	Lertwattanapongchai & Swierczek, 2014; Muturi et al., 2015; Raval et al., 2018; Antony et al., 2018

Comparison of TQM with other CI Methods and its Gap

TQM was a profound, all-inclusive philosophy that presented the vast potential to transform how businesses of all disciplines were managed. However, this is also where the innate weakness of TQM lies in the fact that it is only a “philosophy." TQM was a lightly based philosophy based on ideas (and not unified) of Deming, Juran, Crosby, Feigenbaum, etc., i.e., \One God, many prophets" (Hand, 1992). This philosophy did not provide or sustain the necessary conduit for the people side of quality to be integrated into a scientific approach, thus leaving it impossible to maintain dynamically (Pepper & Spedding, 2010). JIT/Lean and Six Sigma move beyond this view. It has recognized that organizations need direction to achieve improvements, structuring the concepts and philosophical ideas provided by Deming into Techniques and methodology that can be followed to obtain Continuous improvements. Six Sigma has answered the critics of TQM by associating quality improvement with specific business metrics, leading organizations to quantify any improvement made in performance terms.

In conclusion, Six Sigma has thrived in bringing the necessary expertise back into the firms through its strict accreditation process of sequential \belts" (green, black, master black belt, etc.). Moreover, it is expensive to train and implement, has at least brought about the appreciation from practitioners that eluded TQM. As with all roads of process improvement, however, philosophy must be aligned with scientific knowledge. Six Sigma has long been recognized for being a statistically heavy, technical form of process control (Maleyeff, Arnheiter, & Venkateswaran, 2012). The other problem that arises in TQM implementation is managers see the program as seeing TQM as multi-billion dollar solution formula to a particular problem (e.g., JIT to make sure operations lean and less wasteful, TQM to improve quality). However, it is a stepping stone of long-lasting commitment to cultural change and improved competitiveness (Nicholas, 1998). In addition to this lack

of appropriate measures, performance reporting, tracking progress and reward systems contributed to failure (Nicholas, 1998). However, Elimination of waste and quality improvement cannot be achieved solely through e orts in manufacturing. Process improvement and waste reduction require company-wide, integrated e ort that includes all functions- marketing, sales, finance, product engineering, purchasing, customer service, accounting, and manufacturing. This is where TQM and its companywide commitment to come in quality than other continuous improvement methods (Nicholas, 1998).

Methodology

Primarily for the body of knowledge, the systematic literature review methodology is used for an exhaustive search of the past and current published work on a research topic (Hietschold, Reinhardt, & Gurtner, 2014). The review is conducted on selected journals and conference papers from 1994-2019. The significant databases used are Web of Science and Scopus. Secondly, for practical implication, a qualitative method is adopted as an appropriate research methodology. According to Choi (Choi & Behling, 1997), the approach provides an in-depth understanding of the unexplored area of quality management practice.

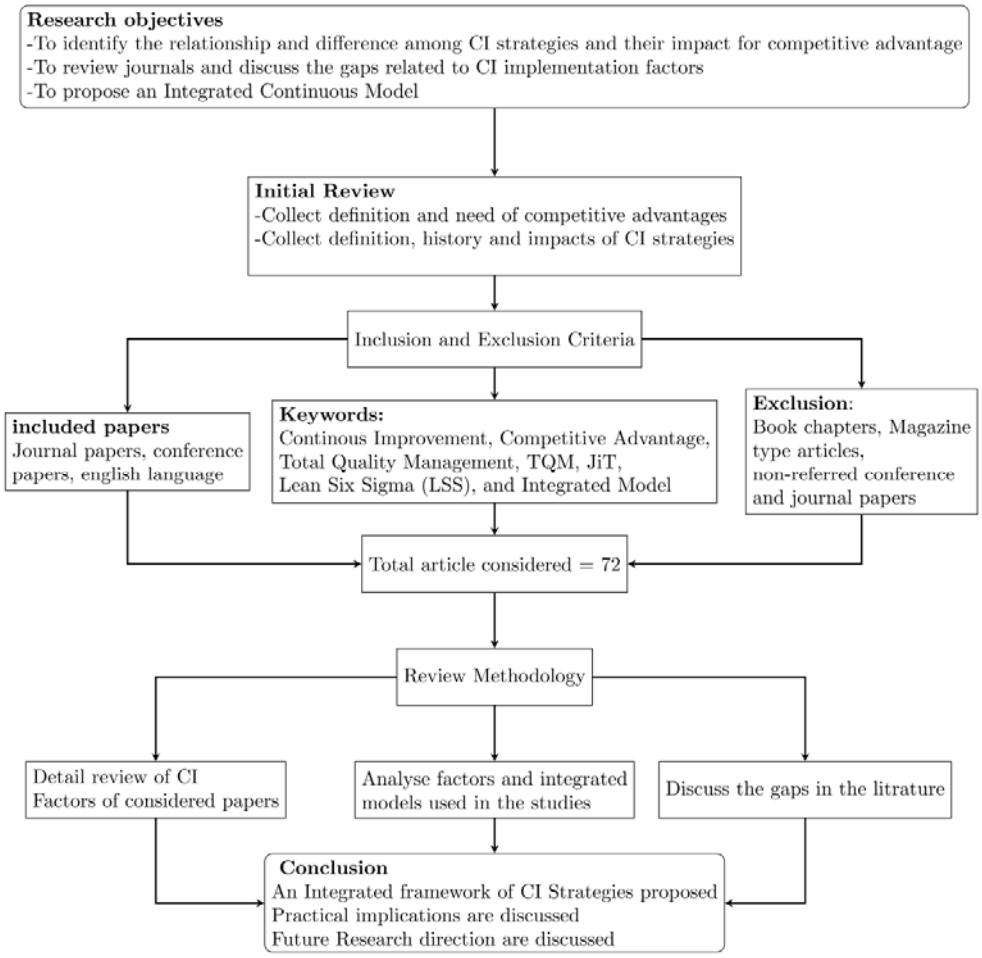

Figure 2. Literature review flow diagram

Quality management practice starts with and in the hands of top management as understanding, perception, and commitment are arrowed towards execution (Godfrey, Dale, Marchington, & Wilkinson, 1997). Data collected with an interview and visual observation is the method of data collection for analysis, in addition to the collection of existing non-classified secondary data such as company performance reports, planning, and objective evaluation results of existing setups. A semi-structured interview is done based on 16 factors/practices of the developed model. According to Lincoln semi-structured interview is useful when researchers are not aware of what they do not know and therefore, rely on the respondents to tell them (Y. Lincoln & Guba, 1985; Y. S. Lincoln, 2007). In addition to interviewing, visual observation is employed to get a reality check and the interview result and gather live data from the existing production situation to alleviate an interview's limitation. Visual observation provides a reality check since what people do may dier from what they say they do (Cohen, 2007; Robson, 2002).

Results and Discussion

Research findings are organized into three parts; the first part is the developed model from the literature body. This section will introduce the developed model and underlying factors of quality management practice. The second part is the case company's background; this section briefly presents the company profile and mainly focuses on its capacity and quality systems (secondary data). The third part analyses the in-depth interview results of company middle managers, supervisors, and researchers' visual observation attempting to explore the integrated Continuous Improvement and Quality management factors.

Integrated Model of CI Methods

The deployment of the integrated model provides advantages and synergies that can be extracted from TQM, JIT, and LSS. As with any other integration management method, there can be obstacles to implementation and possible vulnerabilities. In certain instances, this problem is due to an attempt to incorporate all factors at once. Not all factors can be implemented or regulated at the same time. The Pareto analysis tool can be used to prioritize factors based on the assumption that 20% of the factors are responsible for 80% of the outcome. The suggested model is based on the convergence of the TQM, JIT, and LSS methodology to the generation of a method that is efficient and well structured for continuous improvement. There are several integrated quality management frameworks suggested by previous literature (For the integration of TQM and JiT:-(Cua et al., 2018; Cua, Mckone, & Schroeder, 2001; B. B. Flynn & Schroeder, 1995; Hailu et al., 2018; Phan, Abdallah, & Matsui, 2011; Tesfaye & Kitaw, 2017), while the integration of TQM and LSS proposed by (Saad & Khamkham, 2016, 2018; Salah et al., 2019). Out of many integrated models, only Saad & Khamkham (2018) have tried to show the importance of integrating TQM and LSS in a better way with nine factors (Saad & Khamkham, 2018). However, none of the earlier work suggested the integration of TQM, JiT, and LSS. Second, the new model proposed two new additional factors to the existing TQM, JIT, and LSS, Continuous Performance Management (CFR), and the Organisation Objective and Key Result(OKR) methods. The CFR factor is explicitly explained as communication by Saad & Khamkham (2018). However, CFR is more than just communication; it involves conversation, feedback, and recognition. However, both factors elaborated by Doerr (2018) / communication for the system effectiveness described as part of continuous performance management (CFR) /Conversation, Feedback, and Recognition/ and OKR as a set of Measure that matters, focus and commit priority, Align and communicate teamwork, track accountability, stretch for excellent/. The third uniqueness of the model is easy to visualize the

integrated factors and their interaction. In contrast, most of the models are complex and are step-by-step in the DEMAIC methodology (see Figure 3).

The researchers adopt Motwani's (2001) visualization TQM as constructing a house for an integrated model of TQM, placing top management commitment to TQM as the foundation. Without a solid foundation, the house will never stand. After the groundwork, the training and empowerment of staff, quality measurement and benchmarking, process improvement, and consumer involvement and satisfaction should be provided. These elements can be seen as the four pillars of a building. When the pillars have been built up and enriched, it is time to consider supplier quality management and product design. For producers to achieve better efficiency, sustainable competitive advantages, and global success, this study proposes a new TQM, JIT, and LSS integrated framework (see Figure 3 below). The proposed TQM and JIT integrated model constructed from 15 TQM and JIT factors/practices 15 taken from Table 1, Table 2, and Table 3. Those are cross-functional design team, customer focus, process management, policy and strategic planning, cleanness and organization of plant environment, employee involvement, innovation, supplier quality involvement, set up time reduction, cultural changes, training and education, JIT schedule, JIT layout, pull system, understanding continuous improvement tools and linking continuous improvement with company strategy. Besides, the four modern, practical management tools for achieving organizations objectives and key results by measuring everything that matters most (metrics focus) adopted from industry practitioners Andy Grove and Peter Drucker are adopted (Doerr, 2018). Measure that matters, focus and commit priority, Align and communicate teamwork, track accountability, stretch for amazing and continuous performance management (CFR) (Conversation, Feedback, and Recognition).

A business management philosopher Dov Seidman said in his book, “why how we do anything means everything . . . in business (and life)". Argued how culture guides people’s behaviors or how things happen in an organization. He added the most successful organizations do not merely engage workers; they inspire them. They replace rules with shared principles; a common sense of purpose replaces carrots and sticks. They built around trust, which enables risk-taking, which spurs innovation, which drives performance and productivity. Also, as he acknowledges the importance of focus metrics, He said the metrics that we chose are a window on our beliefs and on what we value. So if we measure anything, we tell people it is essential (Doerr, 2018).

Background of the company

Project 40720, currently named Bishoftu Automotive Industry established in 1984 to overhaul medium repair of armored and automotive parts, communication equipment, maintain radar stations and anti-aircraft guns. From 1991 up to 2008, the project works finalize and the industry started overhauling tanks and Ural military trucks. In 2008 the industry reorganized under Defense Industry Sector named Bishoftu Motorization Engineering Complex, Established in 1999. Later in 2010, it re-established and re-named as Bishoftu Automotive Industry (BAI) while incorporated into the Metals and Engineering Corporation. Located 45 km East of Addis Ababa, in Bishoftu, BAI assembles public transportation buses, inter-city buses, heavy-duty trucks, pick-ups, small vehicles, and multi-purpose military vehicles. In addition to producing and supplying automotive products, it is also working on the expansion of modern automotive technology and related production facilities owned by private enterprises.

Figure 3. TQM and JIT integrated model (by the author)

Current quality practice

Although one company is not entirely representative of continuous improvement in the industry, it is quite helpful to consider the essence of implementation factors as a guideline for other comparable companies and to review the current state of the organization for the future possible improvement area. From the BAI visit, by visual observation and interview of concerned bodies and using company report, the following gaps are identified in terms of TQM, JIT, and LSS integrated model.

Top management commitment: It is difficult to say there is a low commitment of the top management to mobilize the required resources, communicating strategic plans, quality policy, and

objectives. As shown from the company report skill gap in top management on project management skills, leading, tracking, and controlling. Mostly, decisions are not made based on data/facts.

Policy and Strategic Planning: The Company surveyed has strategic plans of its own. It has a firm standing on the implementation of the Quality Management System and Continuous improvement tools.

Customer Focus: The Company's most product categories and quality of products are not based on customer's requirements. It is not focused; it includes all intervention areas of the market gap generally. The product distribution from bicycles to military armored very wide. As shown in Figure 5, Pickup and truck categories are assembled without adequate study of technical and market feasibility. Also, the categories of customers of the company are limited to Public enterprises and government offices.

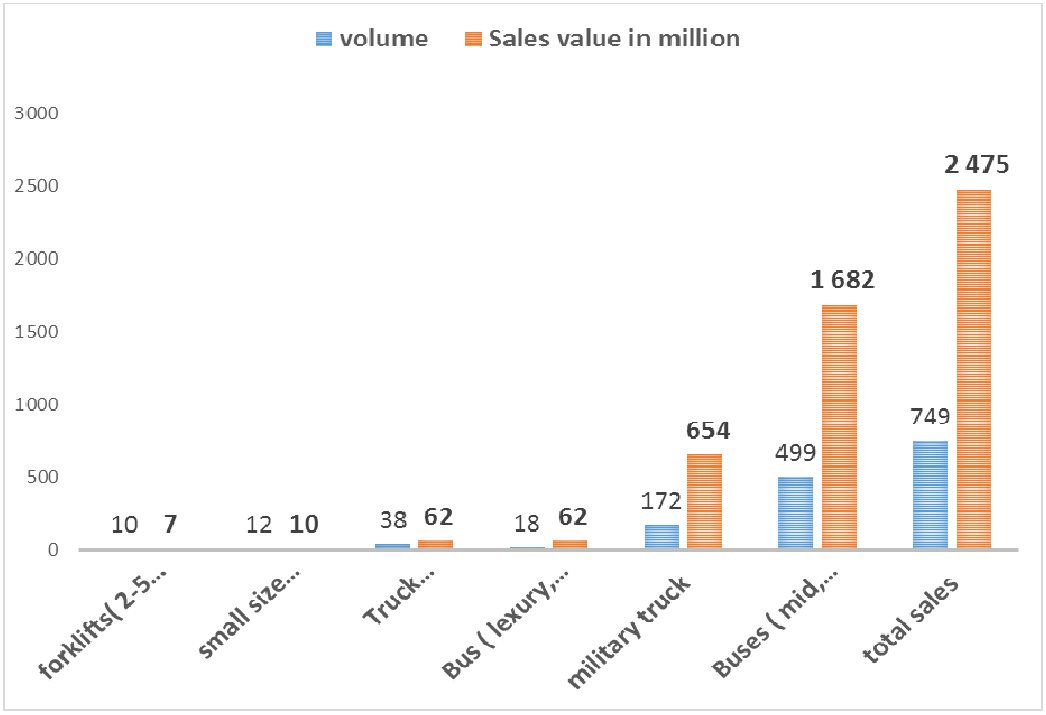

Figure 4. The year 2019/20 BAI sales volume in Millions (compiled by authors)

Figure 5. Pickup and truck stored for more than a year due to little demand from a customer (photo by Authors)

Process management: The lack of emphasis on process measurement and control activities challenged its excellence progress. There is no active type of process management, quality is not built into the process, and there is no continual and extensive training in statistical process control tools.

Cleanness and Organization of plant environment: In this category, the neatness, cleanliness, and orderliness of the workplaces are good, but there are many improvement rooms. Especially industrial safety rules and guidelines must be considered on the working shop floor. As shown in Figure 6, the temporary assembly power lines, temporary stand, and benches are against ergonomic safety rules and regulations.

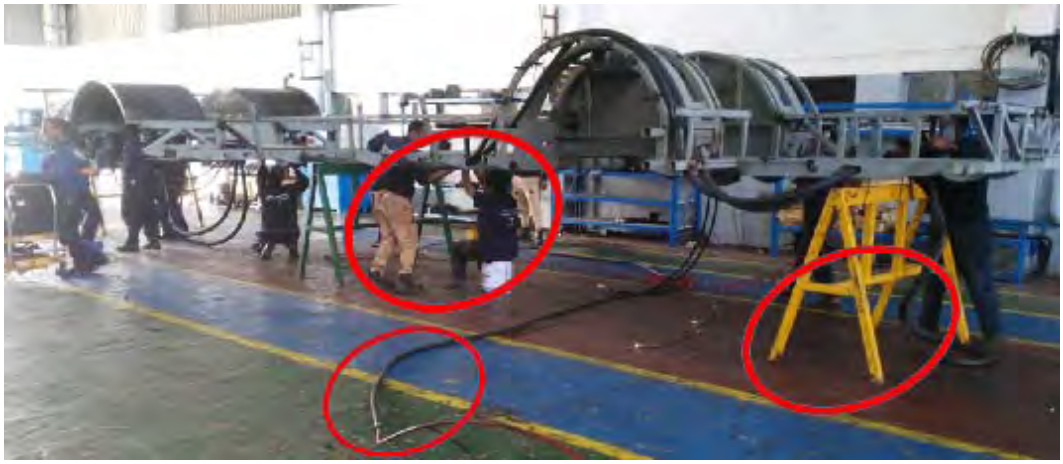

Figure 6. Shop floor workforces are assembling the Chassis standing on temporary benchwork (photo by authors)

Employee Involvement: Employees are not well-motivated and empowered to seek out quality problems, to make continual improvements, to promote innovation, and to meet regularly in teams to evaluate their effectiveness. The top management meets with employees minimal.

Innovation: it is encouraging to have Research and Development works, but it is not focused on company core activities. E.g., mobile Tomatoes and Potato processing technology, mobile cereal mill development project; these research projects have no connection with automotive.

Supplier Quality involvement: The company involves the component suppliers in managing the assembling process. This practice is good for the quality of the final product, but it affects their quality management skills and learning for their journey to the fabrication of components.

Set up time reduction: Due to the company's different product category, have a culture moving workforce from one product to another at every stage of the process. This agility of the workforce and workshop facility gives one competitive edge for the company.

Cultural changes: the goal of a clean and shine workplace and organization environment will come out only cleaning or shining activity unless the company and workforce change the culture that messes and accumulates wastes. The same is true in using bin cards, Kanban cards, check sheets, performance corners, making visible, and continuously updating the culture important for informed decisions and track progress.

Training and Education: the company has done best is in education and training; there is continuous training for the workforce based on the request of departments. It has to be standardized and has a mandatory hour of training per annum for everyone. It should also include top management in learning tools and techniques of Continuous improvement.

JIT Schedule: Due to the absence of JIT scheduling, the companies do not meet the daily production schedule. There is a lack of a performance board, check sheet, bin card, Kanban cards to track accountability and status of progress to avoid delays.

JIT Layout: There is a minimal, streamlined flow of operations, and some operations are fragmented in different shades. There are no mechanisms in place to properly layout machinery. As shown in Figure 7. even if there were differentiated spaces for work, machines and workforce miss alignment disrupt the smooth flow of all workers, components, and work in process.

Figure 7. Current layout of the BAI (photo by authors)

Figure 8. Inventory of Raw material, work in process, and product (photo by authors)

Pull System: It is clear that the companies use extensive inventories of raw materials, WIP, and Products. Without determining their requirements, materials are pushed into downstream processes. As shown in figure 8, a vast amount of raw materials inventory, work in process inventory, and finished product inventory stared more than a year.

Understanding CI tools and Techniques: there is a limited understanding of continuous improvement tools and techniques like project management, statistical process control, and others.

Linking CI with company strategy: the company has linked the QMS ISO 9001:2015 and Kaizen in its strategic planning.

Recommendation

Based on the developed integrated continuous Improvement model and analysis of interview and observation, the researcher has put the following ways forward for Bishoftu Automotive Industry

Top Management Commitment: Since the company is at the initial stage of QMS and Kaizen implementation, Concerning its vital role in implementing TQM and JIT top management commitment is considered as the initiation point in which quality activities stem from it. Top management commitment represents the main driving force behind the TQM, JIT, and LSS; thus, it is responsible for creating an appropriate environment for TQM, JIT and LSS implementation.

Education and Training: Education and training are essential factors in developing companies to improve workforce efficiency and effectiveness. Also, it is mandatory to give continuous training on quality improvement tools and techniques, including top management; for successful implementation, top management knowledge of tools and techniques necessary.

Production leveling (pull system, JIT layout, and JIT schedule) - these factors are the basis of eliminating all types of waste. It starts with studying and learning the exact and actual production capacity of each station, then knowing the demands of customers (time, place, quantity, and condition), and managing the schedule and the progress continuously against the JIT schedule.

Conclusion

The study focused on global competitiveness in line with continuous improvement principles and philosophy. We proposed the new TQM, JIT, and LSS integrated framework to achieve enhanced performance for manufacturing companies. We have constructed the new model by using sixteen different factors of TQM, JIT, and LSS. The factors are cross-functional design team, customer focus, process management, policy and strategic planning, cleanness and organization of plant environment, employee involvement, innovation, supplier quality involvement, set up time reduction, cultural changes, training and education, JIT schedule, JIT layout, pull system, understanding continuous improvement tools and linking continuous improvement with company strategy. We have added four modern, practical management tools to achieve organizational objectives and key results. These tools will indicate the critical factor (metrics focus) adopted from industry practitioners. Besides, it measures, focuses, and commits to priority, Align, and communicates teamwork, tracks accountability, stretches for excellent and continuous performance management(CFR) (Conversation, Feedback, and Recognition). In this study, the case proves the significance of the new model proposed in Manufacturing research. The competitiveness and success of automotive companies rely on their capability of implementing these practices. Companies have to improve in all the dimensions of the integrated TQM and JIT practices proposed in this research to improve their global competitiveness.

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