Network for Research and Development in Africa
International Academic Journal of Management and Marketing
ISSN: 2384-5849. Volume 7, Number 1
Pages 301-332 (April, 2022)
arcnjournals@gmail.com

Continuous Improvement and Operational Performance of Manufacturing Firms: Does Organisational Culture Matter?

[1]Princewill, Sunny Joshua and [2]Professor Godwin Ikpe Umoh
[1,2] Faculty of Management Sciences, University of Port Harcourt, P. O. Box 419, Choba, Nigeria

***Abstract**: The study examined the relationship between continuous improvement and operational performance of manufacturing firms in Rivers State, Nigeria. Continuous improvement was studied as a single construct, while operational performance was bifurcated into quality and cost. The relationship between continuous improvement and operational performance was moderated by organisational culture. The study adopted a cross-sectional survey design while primary data was collected via the administration of a structured questionnaire. Copies of the questionnaire were administered to 72 respondents chosen from a population of 13 manufacturing firms. Three research objectives with corresponding number of research questions and research hypotheses were formulated. Descriptive statistics were analyzed using simple percentages and charts with the aid of the Statistical Package for Social Sciences, while the Partial Least Square-Structural Equation Modeling in Advanced Analysis of Composites (ADANCO 2.3) was deployed to test the hypothesized relationships. The results of the analyses show that continuous improvement significantly and positively correlated with measures of operational performance (quality and cost). This result shows that, continuous improvement amplify the manufacturing firms' operational performance. Thus, it was recommended that managers of manufacturing firms should make continuous improvement of great importance in order to enhance quality and minimize cost. Likewise, Top management of manufacturing firms should establish a culture that supports lean adoption/practices as a means to enhance operational performance.*

***Keywords:** Continuous improvement, cost, operational performance, organisational culture, quality*

1. Introduction

Operational performance is the backbone of organisational performance (Salem, 2003). According to Chavez, Yu, Gimenez, Fynes and Wiengarten (2015), operational performance is the strategic variable that promotes competitive advantage. What is more, it is the foundation of quality practices and the super ordinate performance of organisations (Sharma & Modgil, 2020). Moreover, empirical evidence abound that higher levels of operational performance are known to improve effectiveness of production activities, product, services and processes quality

(Kaynak, 2008; Chavez *et al.*, 2015), customers or clients satisfaction (Lau, Lee & Jung, 2018), revenue and profit (Santos, Lannelongue, Gonzalez-Benito, 2019).

Continuous improvement (known as Kaizen in Japanese) was birthed from a Japanese work method, with the aid of a continuous work method which was adopted from Deming in 1986. Bhuiyan and Baghel (2005) define continuous improvement as a culture of unrelenting improvements. Marin-Garcia, Val and Martin (2008), refer to continuous improvement as a tool for sustaining and enhancing competitiveness. Continuous improvement can be defined as an unceasing effort to enhance products, services or processes (Mudhafar, Mohammed & Konstantinos, 2020). The benefits that continuous improvement can bring to an organisation include: waste reduction (Gallagher, Austin & Chaffyn, 1997), enhanced quality/performance (Goh, 2000), enhanced customer satisfaction (Taylor & Hirst, 2001) and increased employee commitment (Temponi, 2005).

Organisational culture can be defined as a complex mix of shared views, norms and values that affect the organisation's modus operandi and overall performance, making it a possible source of advantage, advancement, and lean practices (Poskien, 2006). According to Alston (2017), organisational culture encompasses all aspects and attributes necessary to undertake and sustain lean process improvement projects. The way things are done in an organisation is shaped by organisational culture, which is one of the most essential aspects of performance (Mann, 2014). Zheng, Yang and McLean (2010) argued that organisational culture is closely related to firm performance.

Despite the large spectrum of empirical research concerning the effect of various dimensions of lean adoption on firms' operational performance (Alkhalidi & Abdallah, 2018), very little is known about the nature of the relationship among these variables in the manufacturing sector of developing countries such as Nigeria. The decision to fill this vacuum is a response to the scholarly cry of previous researchers (Babalola, *et al.*, 2019; Afunwa, *et al.*, 2020) who noted that a majority of works regarding the chosen constructs were conducted in different sectors such as banking, telecommunication, small and medium scale enterprises and large scale enterprises of developed countries rather than developing countries.

In Nigeria, many problems hinder the operational performance of manufacturing firms and as a result the country is progressing very slowly towards economic diversification. From the economic scenario in Nigeria and the role of the manufacturing sector, the main hurdles that mostly and historically affect its development, growth and operational performance are insecurity, market-misrepresentation, political instability, state-owned monopolies, poor infrastructure and lack of finance (Dipak & Ata, 2003) and too much bureaucracy and excessive corruption (Adenikinju, 2003). Moreover, Sylva (2020) argued that quality, cost, responsiveness (on-time delivery and service flexibility), innovation and safety are the challenges of operational performance in the Nigerian work environment.

Based on the above scholarly revelations, this study investigates the nexus between lean adoption and operational performance of manufacturing firms in Rivers State, Nigeria, using organisational culture as a moderating variable.

Conceptual framework of the study

Below is the conceptual framework for this study

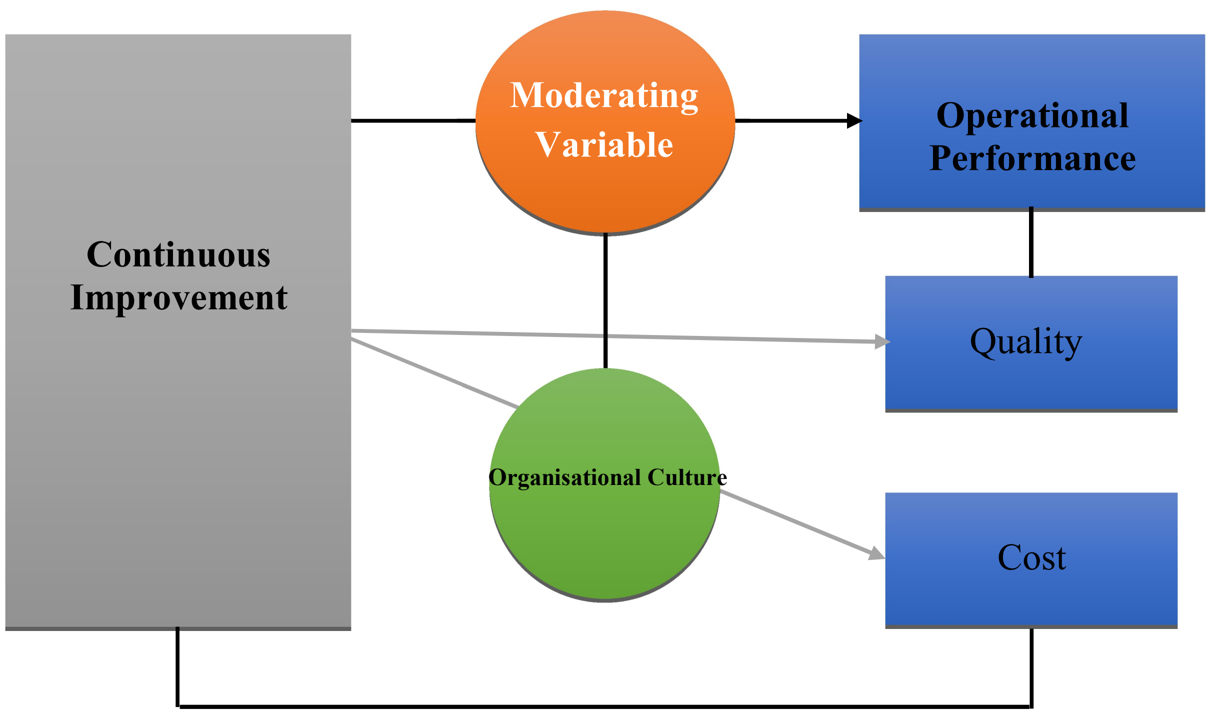

Figure 1: Continuous Improvement - (Aderaw, 2019). Organisational Culture (Wallach, 1983; Iranmanesh, Zailani, Hyun, Ali & Kim, 2019). Operational Performance (Quality and Cost) - (Saleh, 2015; Sylva, 2020).

Figure 1 identifies the key constructs of the study. The independent variable is continuous improvement whereas operational performance was bifurcated into: quality and cost. Finally, it is proposed that the interconnection between continuous improvement and operational performance is subject to the influence of organisational culture.

The following hypotheses are provided for investigation:

H_{O1}: There is no significant relationship between continuous improvement and quality.

H_{O2}: There is no significant relationship between continuous improvement and cost.

H_{O3}: Variation in operational performance as a result of continuous improvement is not significantly a function of organisational culture.

The remaining section of the paper is concerning the literature review; methodology; data analysis, results and discussion; conclusions and recommendations as well as limitations and suggestions for further research directions.

2. Literature review

2.1. Baseline Theories

2.1.1 The Theory of Constraint

The Theory of Constraints (TOC) was introduced by Dr. Eliyahu Goldratt in his ground breaking book "The Goal" in 1984. The concept was conceived when Goldratt and his team were working on a programming software to optimize the production systems, which they called Minimized Production Technology (OPT). According to Goldratt (1991), anything that limits profit making is a constraint. Boyd and Gupta (2004) define TOC as a theory that clearly identifies a “gain orientation” with its three dimensions: mental models, measures and methodology. For Goldratt and Cox and Tsou (2013), TOC is an approach that identifies the constraint and finds solutions to mitigate the constraint. To Watson, Blackstone and Gardiner (2007), the focus of the TOC is to maximize the performance of the systems by exploiting its constraints. Furthermore, Inman, Sale and Green (2009) defined TOC as a management philosophy with a continuous improvement focus which brings about improved organisational performance. TOC is a management philosophy, aimed at removing the weakest point in the operation of the system (Kumar, Siddiqui & Suhail, 2020). The concept of TOC can be summarised as i) there is no organisation without a constraint. If this was not true, then organisations would make infinite profit which is impossible. A constraint is anything that limits a system from achieving higher performance (Goldratt, 1988), and ii) TOC considers constraints to be positive not negative to an organisation because they help the organisation (Sale & Inman, 2003). Due to constraints, there is always opportunity for improvement in the performance of the organisation. Studies have suggested that TOC techniques could result in increased profits (Watson, Blackstone & Gardiner, 2007).

2.1.2 The Resource-Based View

The resource-based view (RBV) was first developed by Barney (1991). The RBV is one of the major theories used to explain the role of superior performance in organisations by scholars (Peteraf & Barney, 2003; Akio, 2005). Scholars (Teece, Pisano & Shuen, 1997; Ahmed & Othman, 2017). This theory is anchored on organisational resources as the key element of performance (Das & Teng, 2000; Powell, 2001; Peteraf & Barney, 2003). These resources enhance performance and work as a basis of competitive advantage (Barney, 1991). RBV has been used to explain sources of better operational performance (Flynn, Picasso & Paiva, 2014) and in the studies of operational performance (Innocent, 2015). For example, Schroeder, Bates and Junttila (2002), used RBV assumptions to argue that proprietary processes and equipment are difficult to imitate when they result from an iterative process and can thus lead to better performance. Likewise, Paiva, Roth and Fensterseifer (2008) found that the integration of different functional areas permitted the creation of product characteristics that are valued by customers and not easily found elsewhere. Coates and McDermott (2002) found that RBV provided a basis for examining methods and skills that support organisations in establishing their competitive priorities.

2.1.3 Competing Value Framework

The Competing Value Framework (CVF) by Cameron and Quinn (1999) is an improvement from the study of Quinn and Rohrbaugh (1983). The CVF is also the theoretical model that serves as the foundation of the Organisational Culture Assessment Instrument (OCAI), and this instrument can be used to diagnose and change an organisation's culture (Cameron & Quinn, 1999). Igo and Skitmore (2006) postulated that the CVF “has been rated as one of the 50 most important models in the history of organisational study and has proven its worth since its conception in the mid-1980s” (p. 125). They also submitted that, it also serves as a beacon and pointer in terms of cultural transformation, employee motivation, and leadership ability.

The CVF model of Cameron and Quinn (1999) is used in this study because of the dynamic business environment encountered by manufacturing firms. Moreover, Yu and Wu (2009) argued that the CVF model was extensively employed and has a wide range of implications in various contexts. For instance, Zhu, Zou and Zhang (2019) examined on the positive link between culture values, innovation and performance.

2.2 Operational Performance

Operational performance (OP) is the backbone of organisational performance (Salem, 2003). Operational performance refers to the ability of an organisation to reduce costs, order-time, lead-time, improve the effectiveness of using raw material and distribution capacity (Heizer, Render & Weiss, 2008; Kaynak, 2008), a vital determinant of competitive advantage (Schroeder, Shah & Xiaosong-Peng, 2011) that leads to improved revenue and returns for organisations (Zhang & Xia, 2013). Operational performance is conceptually defined and explained as competitive priorities (quality, flexibility, cost and dependability) of operations strategy (Wang, Huo, Fujun & Chu, 2010). According to Chavez *et al*. (2015), operational performance is the strategic dimensions in which organisations choose to compete. Furthermore, it is the foundation of quality practices and the general performance of organisations (Sharma & Modgil, 2020). Assemblage of principles and standards that are used by organisations to control cost, enhance quality, time, flexibility, competitive advantage, and customer satisfaction.

In the manufacturing sector, operational performance is a means to enhance production to the barest minimal cost in order to maximize profit. It is also, an avenue to attain the peak of production by doing things differently, promptly, and at lower cost (Russell & Koch, 2009).

Operational performance unites the whole activities of a firm such as after-sales service, manufacturing, and procurement as an end-to-end system (The Economist, 2008; Jaeger, Matyas & Sihn, 2014).

Due to operational performance, measures such as such as safety (Ward, Duray, Leong & Sum, 1995), market share, financial performance and service providers (Tsikriktsis, 2007), sales and stakeholder satisfaction (Chi, Wu, & Lin, 2008), innovation and environmental sustainability (McCardle, Rousseau & Krumwiede, 2019), and quality, cost, responsiveness (on-time delivery and service flexibility), innovation and safety (Sylva, 2020) would not be significant and necessary.

A better operational performance can improve effectiveness of production activities, create high-quality products, services and processes (Kaynak, 2008; Chavez, *et al.*, 2015), satisfy more customers or clients (Ou, Liu, Hung & Yen, 2010; Lau, *et al.*, 2018) and, increase revenue and profit (Markus Bottcher, 2015; Santos, *et al.*, 2019).

2.2.1 Measures of Operational Performance

2.2.1.1 Quality

Quality has been defined as value (Feigenbaum, 1951), adherence to requirements and specifications (Shewhart, 1931, Crosby, 1965, 1979), fitness for use (Juran, 1974), excellence (Tuchman, 1980), product desirable attributes (Leffler, 1982), loss avoidance (Taguchi, 1987), and meeting customer expectations (Ryall & Kruithof, 2001; ISO 9000, 2005). Quality as a major facet of operational performance entails doing the right things according to specification and customers' satisfaction. It is associated with consistency as regard product or service. Quality reduces costs, increase reliability as well as customer loyalty (Montgomery, 2014). According to Sylva (2020), higher quality result in higher loyalty, market share, revenues and user satisfaction.

According to Hasin (2007), the consequences of poor quality are weighty and of several typologies. Some worth mentioning are: Lower productivity, loss of productive time, loss of material, loss of business, and liability. However, most organisations apply some or all of the following methods in order to improve quality namely: statistical quality control, the zero-defects approach, employee involvement teams, Six Sigma, and total quality management (Ghazi & Alam, 2014, Montgomery, 2014).

2.2.1.2 Cost

A common and important measure in evaluating operational performance is cost (Noble, 1997). Cost is the monetary expense associated with running an organisation (Ward, *et al.*, 1998). Cost is the total amount incurred to carry out a specific operation (Bowersox, Closs & Cooper, 2009). Vaidya and Hudnurkar (2012) defined cost as the summation of all administrative and service costs, inbound and outbound freight, third party storage cost, order processing cost, direct labour cost, and warehouse cost. It is “a measure of the naira value (Nigerian currency) of the resources used to produce goods or deliver services; the required payment to manufacture a product or create utility” (Sylva, 2020, p. 302). I define cost as the total amount and expenditures that are incurred by accomplishing every specific activity or operation.

In order to maximize profit, cost must be minimized. As a result, organisations implement cost reduction strategies that underscore reduced inventories, removal of non-value added activities and maximization of resource utilization (Sylva, 2020). Cost helps organisations to reduce the wasteful use of resources, defective output and inventory to minimum level (Saleh, 2015). In order to enhance operational performance, reducing the overall costs entails the following: reducing inventories, maximum utilization of resources, work- in- process inventory turnover, and eliminating non-added value activities.

2.3. Continuous Improvement

Bessant, Caffyn, Gilbert, Harding and Webb (1994) defined continuous improvement as “a company-wide process of focused and continuous incremental innovation” (p. 34). Continuous improvement is an “improvement initiatives that increase successes and reduce failures” (Juergensen, 2000, p. 24). According to Cole (2001), continuous improvement: i) is a tool to muster employees that leads to increased commitment, ii) a game changer and make large changes possible, iii) allows for learning that is based in practice and is more likely to be accepted when it is implemented by the same people who proposed the changes, and iv) allows changes to be implemented that are based on tacit knowledge by the employees. Continuous improvement has been considered a core element in a number of different manufacturing philosophies, including lean adoption, total quality management (TQM), employee involvement programmes, customer service initiatives, and waste reduction campaign (Singh & Singh, 2015).

Furthermore, an avalanche of scholars submitted that the benefits continuous improvement can bring to an organisation include: reduction of waste (Gallagher, Austin & Chaffyn, 1997), provision of a healthy workplace (Woods, 1997), ideas and suggestions coming from the employees who are closer to the actual work done (Goh, 2000; Taylor & Hirst, 2001), improved performance/quality (Chassin, 1997; Goh, 2000), low capital investment (Goh, 2000), improved customer satisfaction (Gallagher, et al., 1997; Taylor & Hirst, 2001), and increased employee commitment (Temponi, 2005). Continuous improvements help organisations progress towards an optimal production process. The intent is to revisit the improved process to ensure the proper implementation of the change, to address any variation, and to look for additional means of improving the process (Deranek, Chopra & Mosher, 2017).

2.4. Organisational Culture

To successfully transform towards continuous improvement, organisations must develop an organisational culture, which is a time-consuming process (Bhasin & Burcher, 2006; Nordin, Deros & Wahab, 2010). According to an assemblage of scholars, diverse characteristics of organisational culture were identified. For example, some definitions described organisational culture with a great leadership commitment (Rentes, Araujo & Rentes, 2009), while it is characterized as superior employee involvement (Höök, 2008; Fricke, 2010). As stated by Schein (2004), organisational culture is referred to as the climate and practices that an organisation creates and implement as a means to control employees. This means organisations have to develop the “right kind of culture”, a “culture of quality” or a “culture of customer service” suggesting that culture has to deal with certain values that organisations want to indoctrinate into their employees. Also, with the “right” kind of culture, there is enhanced performance in the organisation. Organisational culture has been identified as a major factor in the relationship between continuous improvement and its ability to enhance operational performance (e.g., Nahm, Vonderembse & Koufteros, 2004). Furthermore, organisational cultural attributes such as collectivism, future orientation, a humane orientation, and a lower level of assertiveness, positively moderate the relationship between lean and operational performance (Bortolotti, Boscari & Danese, 2015). Previous studies revealed that lack of an organisational culture in an organisation is one of the main causes of poor operational performance (Atkinson, 2010; Saurin, Marodin & Ribeiro, 2011). Zheng *et al.* (2010) argued that organisational culture is closely related to firm performance. The impact of organisational culture on successful firm performance has been demonstrated in various contexts (Kurniawan, Zailani, Iranmanesh & Rajagopal, 2017). For example, Soltero and Waldrip (2002) revealed that a lean culture of continuous improvement in a firm can facilitate the adoption of environmental management practices and principles. Some practitioners and specialists believe that the degree to which the cultural values are shared, determines the impact of a firm’s capabilities and resources on its performance (Saad & Asaad, 2015; Ali, Omar & Bakar, 2016). Similarly, The Aberdeen Group (2018) studied companies that implemented lean adoption and reported that companies that developed lean culture were more effective in comparison to those without lean culture. In his view, Mullins (1999) averred that in attempting to assess lean culture, it is important to examine those issues which can influence and have a direct effect on it. Mullins, submitted that possible factors influencing organisational culture are goals and objectives, history, size, location, management, staffing and organisational environment.

As the organisational culture of manufacturing firms varies (Morris, Williams, Leung, Larrick, Mendoza, Bhatnagar, Li, Kondo, Luo & Hu, 1998; Cullen, Parboteeah & Hoegl, 2004), testing the moderating effect of organisational culture helps to generalize the results and achieve more accurate findings. Thus, it is expected that organisational culture moderates the relationship of continuous improvement on operational performance.

2.5. Empirical Review

Nazar, Ramzani, Anjum and Shahzad (2018) assessed performance: the role of customer focus and continuous improvement in banking sector of Pakistan. The study involved a survey whereby the hypotheses were tested using Partial Least Square-Structural Modelling Equation (PLS-SEM). It was found that customer focus and continuous improvement were positively and significantly associated with operational performance (β = 0.169; t = 1.987; $p < 0.05$), (β = 0.290; t = 2.433; $p < 0.05$), and overall performance (β = 0.187; t = 2.145; $p < 0.05$). Their results revealed that lean adoption is a significant predictor of operational performance.

Rahman, Laosirihongthong and Sohal (2010) examined the extent to which lean practices such as: continuous improvement, waste minimization and continuous flow are implemented by manufacturing organisations in Thailand and their impact on firms' operational performance. From a survey, data were collected from 187 respondents. The multiple regression models were employed to test the effects of three lean constructs on operational performance. The results indicated that all three lean constructs continuous improvement (β = 0.536, t = 3.960, $p < 0.000$), waste minimization (β = 0.037, t = 0.275, $p < 0.785$) and continuous flow (β = 0.268, t = 1.984, $p < 0.054$) are significantly related to operational performance.

Iranmanesh, Zailani, Hyun, Ali, and Kim (2019) examined impact of lean manufacturing practices (continuous improvement) on firms' performance, using lean culture as a moderator of manufacturing firms in Malaysia. Data were gathered through a survey of 187 manufacturing firms and analyzed using the partial least squares technique. It was found that continuous improvement (β = 0.235, $p < 0.01$), product design (β = 0.167, $p < 0.05$), customer focus (β = 0.121, $p < 0.05$), and customer involvement (β = 0.281, $p < 0.001$) have significant effects on performance. Furthermore, it was also revealed that lean culture positively moderated the effect of both variables. These results have important implications for enhancing the performance of manufacturing firms through lean manufacturing practices (lean adoption).

Afunwa, Agbaeze, Ike and Isichei (2020) investigated continuous improvement as a facet of lean adoption and performance of telecommunication firms in Nigeria. The study used a survey design. A sample of 299 was chosen from 6 state offices of selected telecommunication firms. Data were analysed using Partial least square SEM with the aid of SmartPLS 3.9. Findings of the study indicated that continuous improvement have a significant effect on performance of telecommunication firms - continuous improvement (t = 2.164, $p < 0.004$), customer's involvement (t = 1.981, $p <0.003$), and employee's involvement (t = 3.896, $p < 0.000$). The study, therefore, recommends that lean adoption should be enhanced to achieve superior performance.

3. Methodology

3.1. Population and Sampling Method

The population for the survey consist of manufacturing firms in Rivers State. A total of thirty-two (32) manufacturing firms were selected as the population. However, our survey was on those manufacturing firms that have being in business for more than ten years. This resulted in having thirteen (13) manufacturing firms being selected for this research.

3.2. Data collection, Questionnaire Design and Instrumentation

The study involved primary and secondary methods of data collection. The secondary data were obtained from company records, journals and government publication, while primary data were obtained from responses of the structured questionnaire administered to the respondents. Out of the 72 copies of the questionnaire distributed, 38 (which represent 52.8%) were completely filled and returned for analysis. The questionnaire consists of four sections. Section A is concerned with the demographic information of the respondents, which include gender, age, marital status, highest level of educational attainment, position in the organisation and years of experience in the organisation. Section B contains items that captured continuous improvement which was adapted from Aderaw (2019) is depicted by four (4) items - e.g. "Earlier improvements are sustained" and "Staff participate in the improvement of product/service processes". Section C has 10 observable indicators for operational performance, five (5) for both quality and cost respectively. Items for quality include (e.g. "Uses modern technology that maintain the products quality" and "Chooses their suppliers on the basis of high-quality"). Items for cost include (e.g. "The company has laid than plans to reduce defective output" and "The company is working to reduce the inventory to minimum level to the extent that does not hinder the continuation of work") both variables were adapted from Saleh (2015) and Sylva (2020). Section D contains six (6) manifest indicators that captured organisational culture adopted from Wallach (1983) and Iranmanesh, Zailani, Hyun, Ali and Kim (2019) - e.g. "Meaningful incentives that reward lean progress are in place" and "Employees are provided with adequate training on lean practices" Apart from the demographic variables, all other items in the survey instrument were anchored on a five-point Likert scale of 1=Strongly Disagree to 5=Strongly Agree.

3.3. Data analysis Techniques

The sample characteristics and nature of the data were analyzed using means and standard deviation, skewness and kurtosis with the aid of the IBM SPSS Statistics version 22, while the Partial Least Square-Structural Equation Modeling (PLS-SEM) in Advance Analysis of Composites (ADANCO 2.3) was used to analyze the measurement of the constructs as well as the hypothesized relationships (Henseler & Dijkstra, 2015). ADANCO allows for the measurement of multiple relationships simultaneously (Henseler, Hubona & Ray, 2016) and does not discriminate measurement scales and can be used whether the sample size is small or large (Fassott, Henseler & Coelho, 2016).

4. Data Analysis, Results and Discussion

4.1 Demographic Characteristics of Respondents

A total of 72 copies of the survey instrument was administered to managers, heads of department, supervisors and machine operators/floor men those manufacturing firms that have being in business for more than ten years. Thirty-eight (38) copies of the questionnaire were returned which represents 52.8% response rate. These copies of the instrument were properly filled by the respondents and so were used for analysis. Table 4.1 below shows the demographic characteristics of the respondents.

Table 4.1: Demographic Characteristics of Respondents

		Frequency	Percentage	Valid Percent	Cumulative Percentage
Gender	Male	31	81.6	81.6	81.6
	Female	7	18.4	18.4	100.0
Age	20-35	12	31.6	31.6	31.6
	36-50	22	57.9	57.9	89.5
	51-above	4	10.5	10.5	100.0
Marital Status	Single	20	52.6	52.6	52.6
	Married	12	31.6	31.6	84.2
	Separated	4	10.5	10.5	94.7
	Divorced	2	5.3	5.3	100
Educational Qualification	WAEC-OND	12	31.6	31.6	31.6
	HND/B.Sc	22	57.9	57.9	89.5
	Masters above	4	10.5	10.5	100.0
Position in the Organisation	Managers	20	52.6	52.6	52.6
	Heads of Department	12	31.6	31.6	84.2
	Supervisors	4	10.5	10.5	94.7
	Machine Operators/Floor men	2	5.3	5.3	100
Years of experience in the Organisation	0-5	12	31.6	31.6	31.6
	6-10	22	57.9	57.9	89.5
	11-above	4	10.5	10.5	100.0
	Total	**38**	**100**	**100**	

Source: Research Data (SPSS Output), 2022

Table 4.1 indicates the demographic details of the 38 respondents that participated in the study. For gender distribution, result shows that 31 respondents (81.6%) were males while 7 (18.4%) were females. For age distribution, respondents within 51 years and above age brackets were the minority recorded with only 4 respondents (10.5%), while those between 36-50 were the majority respondents with 22 (57.9%). And the age bracket of 20-35 had 12, representing 31.6% of the total number of respondents. For marital status, 12 respondents (31.6%) were married, 20 (52.6%) were single, 4 (10.5%) were separated, while 2 (5.3%) were divorced. On highest level of educational qualification, 22 respondents (57.9%) have Bachelor

Degree and Higher National Diploma, 12 respondents (31.6%) have The West African School Certificate and Ordinary National Diploma while 4 respondents (10.5%) have Master Degree and above. As regards to position in the organisation, there are 20 managers, representing 52.6%, heads of department are 12 representing 31.6% of the total number of respondents, supervisors are 4 respondents (10.5%), while machine operators/floor men are 2 respondents (5.3%) . Finally, for years of experience in the organisations, 12 respondents representing 31.6% have worked in their organisations for 0-5 years, 22 (57.9%) have worked for 6-10 years, while 4 respondents, representing 10.5% have worked in their organisations for 11 years and above.

4.2: Univariate Analysis

Data concerning the four latent variables were analyzed in terms of their means, standard deviations and kurtosis. On a five-point scale, Oxford and Burry-stock (1995), classified mean values (M) are classified between 1.0 - 2.4 as low, 2.5 - 3.4 as medium, while Asawo (2009) classified all responses with mean values between 1.0 - 2.4.0 as low, 2.5 - 3.4 as moderate, 3.5 - 4.4 as high and 4.5 above as very high. Hence, 2.5 is the recommended cut-off mean score for this study.

Furthermore, in testing for normality of the data sets, skeweness ($S_{k)}$ and kurtosis (K_u) of the responses on the items were analysed (Weston & Gore, 2006). In line with Bulmer (1979), a distribution is highly skewed when the skewness value is not more than -1.0 or more than 1.0; moderate if value is between -1.0 and -0.5 or 0.5 and 1.0, and fairly symmetrical if values are between -0.5 and 0.5. Also, as a simple criterion to be applied, the skewness and kurtosis values of each variable was divided by its corresponding Standard Error (S.E) and the result revealed that the outputs did not differ much between -2 and +2, indicating no serious violation of normality (George & Mallery, 2010; Gravetter & Wallnau, 2014). Table 4.2 shows that all the variables have moderate scores above the threshold with continuous improvement having (M = 2.76, SD = 0.81), quality (M = 2.54, SD = 1.49), cost (M = 2.65, SD = 0.10) and organisational culture (M = 2.70, SD = 0.74) respectively.

However, given that the model was tested by applying a Partial Least Square (PLS)-Structural Equation Modeling (SEM) analysis in Advanced Analysis for Composites (ADANCO 2.3), which is vigorous under circumstances of mild non-normality, further alterations to the data are not justified (Henseler & Dijkstra, 2015).

Table 4.2: Descriptive Statistics of Latent Variables

Latent Variable	Indicator	N	Mean	Standard Deviation	Skewness (S_K)		Kurtosis (K_U)	
		Stat.	Stat.	Stat.	Stat.	Std. Error	Stat.	Std. Error
CIM	CIM 1-4	38	2.76	0.81	-0.82	0.44	0.84	1.24
OC	OC 1-6	38	2.54	1.49	0.45	1.03	2.02	1.16
QU	QU 1-5	38	2.65	0.10	0.93	1.07	1.58	0.47
CO	CO 1-5	38	2.70	0.74	0.66	1.09	1.17	0.68
Note: **CIM** = Continuous Improvement; **OC**=Organisational Culture; **QU** = Quality; **CO** = Cost.								

Source: Research Data (IBM-SPSS Output), 2022

4.3: Multivariate (Inferential) Analysis

Owing to the fact that this study is concerned with the relationships and explanation of target variables, the Partial Least Square-Structural Equation Modeling (PLS-SEM) in Advance Analysis of Composites (ADANCO 2.3) is considered suitable (Henseler & Dijkstra, 2015). It allows for the measurement of multiple relationships simultaneously (Henseler, *et al*., 2016) and does not discriminate measurement scales and can be used whether the sample size is small or large (Fassott, *et al.*, 2016).

The PLS-SEM algorithm in ADANCO 2.3 has two models, namely: (i) the model inside which explains the structural connections between the variables, while the model outside shows the connection between the latent variables (LVs) and their corresponding items. The independent variable is continuous improvement, while the dependent variable is operational performance which is disintegrated into quality and cost. Additionally, the moderating effect of organisational culture is measured after assessing the inner direct relationships.

Lohmoller (1989) presented examples where a model with 96 indicators, and 26 constructs was estimated with 100 data cases. In this study, there are 4 constructs and 72 samples, which may be enough to perform PLS-SEM. Moreover, based on regression heuristics, Chin (1998) advocated a sample size that is at least 10 times the block with the largest number of indicators. This study bootstrapped 500 samples from the primary sample. The resulting bootstrap distribution was handled as a sampling distribution approximation. In the bootstrap distribution, the path coefficients were recorded. The emergent t-values were also estimated. This serves as justification for rejecting or accepting the null hypotheses.

The following are the stages of the PLS-SEM algorithmic model evaluation in ADANCO 2.3 (i) Assessment of Measurement Model, (ii) Assessment of Structural Model (main effect), and (iii) Assessment of Moderating or interactive effect.

4.3.1 Assessment of Measurement Model

Figure 2: ADANCO 2.3 output for outer loadings of indicators

Figure 1 shows the ADANCO 2.3 output for outer loadings of the indicators. This result is shown in table 4.2 in order to assess reliability and convergent validity of the model.

Table 4.3: PLS-SEM in ADANCO 2.3 Assessment Results of Measurement Model

Latent Variable	Indicators	Convergent validity			Internal consistency reliability		
		Loadings	Indicator reliability	AVE	Jöreskog ρ_c	Dijkstra-Henseler ρ_A	Cronbach's alpha (CA)
		>0.70	>0.50	>0.50	>0.70	>0.70	0.70 - 0.90
CIM	***CIM_1***	***0.413***	***0.171***	0.533	0.814	0.792	0.781
	CIM_2	0.727	0.529				
	CIM_3	0.724	0.524				
	CIM_4	0.739	0.546				
OC	OC_1	0.736	0.542	0.584	0.798	0.770	0.735
	OC_2	0.754	0.569				
	OC_3	0.743	0.552				
	OC_4	0.756	0.572				
	OC_5	0.808	0.653				
	OC_6	0.783	0.613				
QU	QU_1	0.708	0.501	0.521	0.808	0.790	0.757
	QU_2	0.726	0.527				
	QU_3	0.735	0.540				
	QU_4	0.711	0.506				
	QU_5	0.730	0.533				
CO	CO_1	0.716	0.513	0.574	0.860	0.810	0.781
	CO_2	0.724	0.524				
	CO_3	0.876	0.767				
	CO_4	0.744	0.554				
	CO_5	0.715	0.511				

Note: **CIM** = Continuous Improvement; **OC =** Organisational Culture; **QU** = Quality; **CO** = Cost. **Note: Bold and *italicized* items/scores did not meet recommended threshold.**

Source: ADANCO 2.3 Output on Research Data, 2022

As stated in table 4.3, latent variables reported good Jöreskog ρ_c values which range from 0.798 (organisational culture) to 0.860 (cost). Specifically, it means that the proportion of the total composite variance that serves as an estimation of the true-score variance of each latent variable is above the 0.70 cut-off value (Wang & Stanley, 1970).

Also, both the reliability coefficients of the unobserved (latent) variables and their corresponding Cronbach's alpha values improved; far exceeding the 0.7 threshold (Nunnally & Bernstein, 1994). Consequently, the results verify that the extracted variables are consistent in interpreting the variances that comprises them.

Furthermore, convergent validity of the model was confirmed through the values of the Average Variance Extracted (AVE), which exceeded the recommended 0.50 threshold (Fornell & Larcker criterion, 1981). Next is table 4.3 which shows the output for the test of discriminant (divergent) validity.

Table 4.4: Test of Discriminant Validity - Fornell and Larcker (1981) criterion

	AVE	CIM	OC	QU	CO
CIM	0.533	**0.784** (1)			
OC	0.584	0.252	**0.750** (1)		
QU	0.521	0.456	0.323	**0.874** (1)	
CO	0.574	0.345	0.318	0.332	**0.793** (1)
Note: CIM = Continuous Improvement; **OC** = Organisational Culture; **QU** = Quality; **CO** = Cost. The off-diagonal values are the correlations between latent variables, while **the diagonal values (in bold) denote the square roots of AVEs.**					

Source: ADANCO 2.3 Output on Research Data, 2022

It can be deduced from table 4.4 that the model demonstrates discriminant validity since the square roots of the AVEs (diagonal values in bold) are higher than 0.70, and are far above the correlations between the constructs (the off-diagonal figures). This confirms that each construct is sufficiently distinct from any other one (Fornell & Larcker, 1981).

4.3.2: Assessing the Structural Model (Main Effect)

This stage establishes the assessment of structural model which involves testing the hypotheses, evaluation of predictive accuracy through the coefficient of determination (R^2), assessment of the predictive relevance (Q^2) of the independent variable, and the calculation of effect sizes (Cohen's f^2) of the independent variable. This test uses a blindfolding procedure (Tenenhaus, Esposito Vinzi, Chatelin & Lauro, 2005).

4.3.2.1: Tests of Hypotheses

Table 4.4 shows the results on the tests of hypotheses H_{O1}, H_{O2}, and the moderating effect of organisational culture on the model (H_{O3}a and H_{O3}b) is also demonstrated.

Table 4.5: Results of Hypotheses Testing

Null Hypothesis	Path (Relationship)	Path Coefficient (*β*)	Standard Error	*t*-Statistic	Decision
H_{O1}:	CIM -> QU	0.362	0.142	3.121	Rejected
H_{O2}:	CIM -> CO	0.341	0.098	4.105	Rejected
H_{O3}a:	CIM-> OP	0.397	0.171	3.406	Rejected
H_{O3}b:	OC -> OP	0.276	0.116	2.216	Rejected

Note: **CIM** = Continuous Improvement; **OC** = Organisational Culture; **QU** = Quality; **CO** = Cost; **OP =** Operational Performance.

Source: ADANCO 2.3 Output on Research Data, 2022

This study bootstrapped 500 samples by random replacement method, the path coefficients and the resulting t-values were recorded. This provides the rationale for either confirming or disconfirming the hypotheses. Routinely, path coefficients (*β* values) of 0.10 to 0.29, 0.30 to 0.49 and 0.50 to 1.0 are weak, moderate and strong correlations, respectively (Cohen, 1988). Furthermore, for a two tailed test, *t* values above 1.96 are significant, while *t* values below 1.96 are non-significant (Hair, Hult, Ringle & Sarstedt, 2014).

Table 4.5 shows that there is a positive, strong and significant relationship between continuous improvement and quality (β=0.362, t=3.121); a positive, strong and significant relationship between customer improvement and cost (β=0.341, t=4.105); a positive, strong and significant relationship between customer improvement and operational performance (β=0.397, t=3.406); and a positive, strong and significant relationship between organisational culture and operational performance (β=-0.276, t=2.216).Therefore, H_{O1}, $H_{O2,}$ H_{O3}a and H_{O3}b were supported.

4.3.2.2: Assessment of Predictive Accuracy (R^2) and Predictive Relevance (Q^2)

The R-squared (R^2) statistic displays the cumulative influence of the dimensions of an exogenous variable on a selected endogenous variable. It's a metric for how well the model predicts accuracy (Hair, *et al.*, 2014). The R^2 is not estimated for dependent constructs (Henseler & Dijkstra, 2015). The R^2 values can range from 0 to 1, with 1 representing complete predictive accuracy (Henseler & Dijkstra, 2015). According to Hair *et al.* (2014), an R^2 values with 0.25, 0.50 and 0.75 signifies weak and moderate, substantial levels of predictive accuracy, respectively. However, Chin (1998) submitted that R^2 values of 0.19, 0.33 and 0.67 as weak, moderate and substantial.

Furthermore, it is established that when the dimensions of an independent variable increase, R^2 scores rise-even if the additional dimensions have no statistical significance for the dependent variable. It means that R-squared incorrectly assumes that every dimension of the model's exogenous variable adequately explains the variation in the endogenous variable. To atone for the limitation of R^2, a related statistic known as "R^2-adjusted" is used to calculate the percentage variation elucidated by only the exogenous variables that have an effect on the endogenous variable. Despite the fact that the adjusted R^2 statistic is evaluated in the same way as the traditional R^2, it sometimes records a lower value (rather than a higher) than R^2.

According to Esposito Vinzi *et al.* (2010), predictive relevance (Q^2) can be used in place of goodness-of-fit evaluation that determines whether the observed variables can be re-assessed by the model while maintaining a fit with the parameter estimates. To estimate residual variances, a cross-validated redundancy blindfolding approach was employed with an omission distance of 7 in the data matrix (Tenenhaus, *et al.*, 2005). In general, an independent variable with a Q^2 value greater than zero (>0) or a positive value indicates that the predictor is significant to the model (Hair *et al.*, 2014).

Table 4.6: Outputs for predictive accuracy (R^2) and predictive relevance (Q^2)

Dependent Latent Variable	Correlation Coefficient	Predictive Accuracy (R^2)	Adjusted (R^2)	Predictive Relevance (Q^2)
QU	0.586	0.343	0.341	0.156
CO	0.569	0.324	0.322	0.062
Note: CIM = Continuous Improvement; QU = Quality; CO = Cost; OP = Operational Performance. Reference value: Q^2> 0 = satisfactory predictive relevance (Hair et al., 2014).				

Source: ADANCO 2.3 Output on Research Data, 2022

The figures in table 4.6 indicate positive, moderate and significant correlations (*R*) between the continuous improvement and the measures of operational performance. The combined correlation of the facets of exogenous construct reported *R* values of 58.6% for quality and 56.9% for cost. This means cost attracted the lower correlation score while quality is higher. In addition is the R^2 which demonstrates the accuracy of the models.

The first model, QU = *f* {CIM}, recorded a moderate R^2 of 0.341. Thus, continuous improvement explain 34.1% of the variance of quality, while other unidentified variables are responsible for the remaining 65.9%. This connotes that, the model has a moderate predictive accuracy.

Secondly, CO = *f* {CIM} reported strong R^2 of 0.322. This implies that continuous improvement explain 32.2% of the variance of cost, while other unidentified variables are responsible for the remaining 67.8%. Hence, the model has a moderate predictive accuracy.

Furthermore, outputs for the two dependent latent variables reveals that Q^2 is 0.156 for quality and 0.062 for cost. Since the Q^2 values for the dependent variables are greater than zero, this implies that all paths of the hypothesized models accurately anticipate the observed values. As a result, the continuous improvement is important in predicting operational performance, which is measured in terms of quality and cost.

4.3.3: Assessment of Moderating Effect

As earlier stated in section 4.3.2.1 that hypothesis three (H_{O3}) would be tested in this section. The steps of PLS-SEM require that moderating effects are tested after main effects have been evaluated. Specifically, H_{O3} states that variation in operational performance as a result of continuous improvement is not significantly a function of organisational culture.

The moderating effect of organizational culture was evaluated through the interaction term (cross product of continuous improvement and organizational culture). This process is known as the product indicator method (Hair, *et al.*, 2014). Three components were identified at this stage, viz: the influence of continuous improvement on operational performance, the direct outcome of the moderating variable (i.e., organisational culture) on operational performance, and the resultant interaction values. The Smart PLS 3.2.6 statistical tool offers the interacting term as an automatic option with the product indicators (Ringle, Wende & Becker, 2015). The strengthening effect of organisational culture was proven because the beta (β) from the interaction component to the target variable was significant ($t > 1.96$) disregarding other values (Baron & Kenny, 1986).

Figure 3 shows the ADANCO 2.3 bootstrap output on the straight relationship between continuous improvement and operational performance.

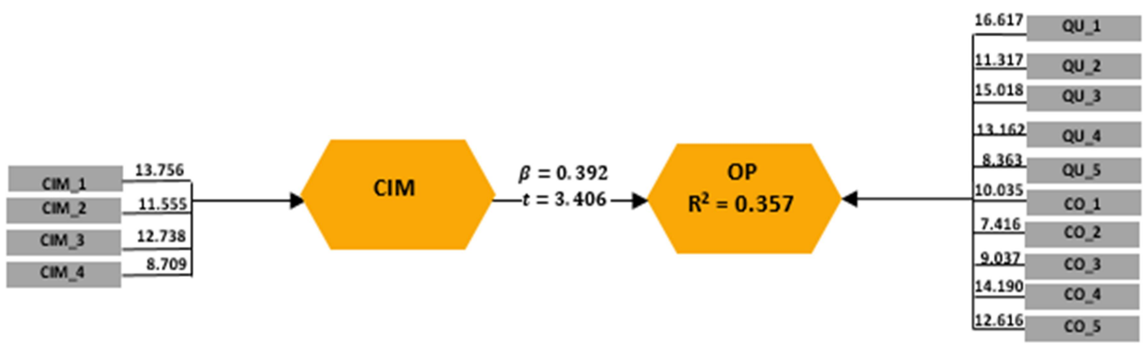

Figure 3: Bootstrapping output on relationship between continuous improvement and operational performance (without moderating variable).

Result from figure 4.2 indicate that, while organisational culture was not present, the path relationship (continuous improvement and operational performance) is significant (β = 0.392, t = 3.406).

As the moderating variable (organisational culture) was included, next was to right click continuous improvement, afterward, organisational culture was stated as the moderator variable, and continuous improvement as the explanatory variable. Thereafter, calculation method was clicked which is stated as 'Product Indicator'. Finally, the "Enter" button was clicked which produced 'CIM*OC' as the interaction term of the model. Figure 3 below, reveals the new bootstrapped structural connection between CIM and OP when OC was introduced.

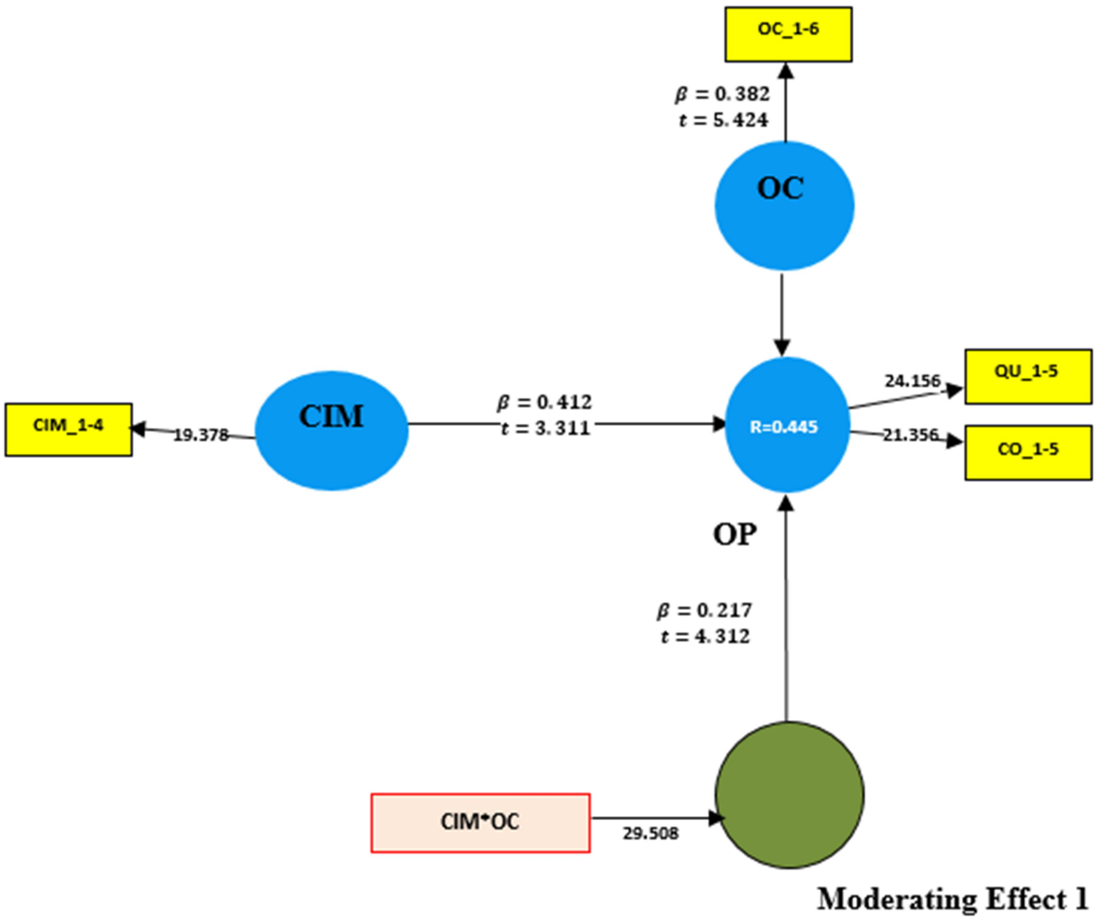

Figure 4: Path relationship between CIM–>OP in the presence of OC.

The result from the structural model in figure 3 is shown in table 4.6.

Table 4.7: Test for moderating effect

	Paths	**Path coefficient (β)**	**t-value**	**Decision**
Hypothesis Testing without moderating variable	CIM -> OP	0.397	3.406	Rejected
Hypothesis Testing with moderating variable	CIM -> OP	0.412	3.311	Rejected
	OC -> OP	0.382	5.424	Rejected
	Moderating Effect 1 –> OP	0.217	4.312	Rejected
Note: CIM = Continuous Improvement; **OP** = Operational Performance. **OC**=Organisational Culture; **Path coefficients (β values)** of .10 to 0.29, .30 to .49 and .50 to 1.0 are weak, moderate and strong correlations, respectively (Cohen, 1988). *t*-statistic greater than 1.96 at 0.05% level of significance.				

Source: ADANCO 2.3 Output on Research Data, 2022

In table 4.7, CIM-> OP recorded significant path relationship (β = 0.397, t = 3.406) when OC was not present. Nevertheless, CIM-> OP recorded a sharp increase in the path coefficient and t-value (β = 0.412, t = 3.311) with the introduction of OC. Moreover, the moderating Effect 1 –> OP (β = 2.17, t = 4.312) is significant. This means, the relationship between CIM and OP is significantly bounded by OC.

4.3.3.1: Determination of Effect Sizes (f^2) of the Moderating Variable

Furthermore, the moderating effect of organisational culture on the relationship between lean adoption and operational performance can be determined through the effect size criterion.

The formula for effect size of the moderator is given as: $\mathbf{f^2} = \frac{R^2_{moderatorpresent} - R^2_{moderatorabsent}}{1 - R^2_{moderatorpresent}}$

Where moderating effects with effect sizes f^2 of 0.02, 0.15, or more than 0.35 can be adjudged low, medium, or high. Less than 0.02 means no effect (Cohen, 1988).
Table 4.8 shows the effect size of organisational culture on the model.

Table 4.8: Effect Sizes of the latent variables

Exogenous Variable	**Endogenous Variable**	***R*-Squared with moderator**	***R*-Squared without moderator**	**f^2-effect size**	**Remark on Effect Size**
CIM	OP	0.445	0.357	0.159	Medium
Note: CIM = Continuous Improvement; **OP** = Operational Performance. **Reference values:** f^2 less than 0.020 = no effect; f^2 , 0.020 = small effect; f^2 , 0.15 = medium effect; f^2, 0.35 = large effect (Cohen,1988)					

Source: ADANCO 2.3 Output on Research Data, 2022

Thus, table 4.8 confirms that organisational culture has a medium, positive moderating effect (f^2= 0.159) on the relationship between continuous improvement and operational performance.

4.4: Discussion

This study investigated the relationship between continuous improvement and operational performance of manufacturing firms in Rivers State, Nigeria. Findings reveal that most of the respondents are predominantly males than females. Also, majority of the respondents are between thirty six and fifty years old, with most of them single. Furthermore, most of the respondents are graduates. Lastly, majority of them have stayed in their respective organisations for over 6 years.

Moreover, although the respondents are preemptive, they have moderate levels of continuous improvement, quality and cost. The study also found that higher level of changes in organisational culture significantly erodes the positive effect of continuous improvement on operational performance. This is in tandem with the work of Nahm *et al.* (2004), that organisational culture is a major determinant of lean adoption and combining it with lean adoption, positively influences manufacturing performance (Challis, Samson & Lawson, 2005).

5. Conclusions and Recommendations

Theoretically, this study draws on the theory of constraint (Goldratt, 1984) and the competing value framework (Cameron & Quinn, 1999), which postulates that lean adoption (customer improvement) and organisational culture schedules of organisations are key elements of competitive advantage that propel firms into higher level of performance. Thus, by implication, these theories are applicable to the Nigerian manufacturing sector.

Furthermore, the study submits that, the findings and conclusions of the study align with the theory of constraint (TOC) (Goldratt, 1984) which maximizes the performance of systems by exploiting its constraints (Watson, *et al.*, 2007). In addition, scholars (Davies, Mabin, & Balderstone, 2005; Watson, *et al.*, 2007) validated that those organisations using TOC techniques have shown increased performance compared to those not using it.

Practically, the study implies that it is imperative for managers of the manufacturing firms to understand how they can stimulate operational performance through the lens of customer improvement, in a well cultured environment. That is, the major confrontation practitioners' face is to identify the essence to develop a conducive environment where business can strive that is aimed at achieving enhanced high quality and minimize cost.

In addition, the conclusion of this study that continuous improvement amplifies cost implies that mangers ought to improve in their activities on a constant basis, engage customers through feedback, and focus on customer inputs the more cost will be minimized.

On organisational culture, the study supports the view that, there is sufficient evidence that continuous improvement in the hypothesized model significantly enhance quality and minimize cost. The study also corroborates with previous empirical findings of Rahman, Laosirihongthong and Sohal (2010) and Alkhalidi and Abdallah (2018) by demonstrating that organisational culture gives rise to a better opportunity for lean practicing firms to attain enhanced performance. Atkinson (2010) and Saurin *et al.* (2011) posits that a well-articulated organisational culture is one of the main causes of superior performance.

The study recommends that:

1. Managers of manufacturing firms should make continuous improvement of great importance in order to enhance quality and minimize cost. They should ensure that staff participate and are integrated in the improvement of service processes and constantly update their product quality as well as minimize cost as a means of sustaining improvement.

2. Top management of manufacturing firms should establish a culture that supports lean adoption/practices as a means to enhance operational performance. Managers should

ensure they provide incentives that reward lean practices and actively get involved in the deployment of the rewards. They should be actively involved in the dynamics of lean practices, while employees should be well trained on lean practices. There should be conducive atmosphere (a non-blaming, performance oriented and process-driven) in order to improve performance.

5.1: Limitations of the Study

This study is affected by some factors which constitute limitations. They include:

Firstly, since the study is domiciled in Rivers State, it is not possible to compare the results with other manufacturing firms in other states or countries. Secondly, the data set contains only manufacturing firms in Rivers State and excluded firms from other sectors such as banks, SMEs and telecommunications. It cannot be guaranteed that the same findings will be reached if the study is conducted in these sectors. This will lead to having a limited response from the participants. Thirdly, the study utilized data from a single source (self-reported data), it may give rise to problems of common method variance.

REFERENCES

Aberdeen Group (2018). *The lean benchmark report-Closing the reality gap.* Available online:http://www.academia.edu/20230515/The_Lean_Benchmark_Report_Closingthe_Reality_Gap (accessed on 12 December 2018).

Adenikinju, A. (2003). *Nigeria's imperative in the new world trade order, workshop report*. African economic research consortium (AERC). Nairobi, Kenya and trade policy research and training (TPRTP). Department of economics, University of Ibadan: Ibadan.

Aderaw, S. (2019). *Effect of total quality management (TQM) dimensions on operational performance of Ethiopian pharmaceutical manufacturing plants.* A Thesis Submitted to Addis Ababa University College of Business and Economics, School of Graduate Studies in Partial Fulfilment of the Requirements for the Master of Business Administration in Management (MBA).

Afunwa, A. P., Agbaeze, E. K., Ike, N. M., & Isichei, E. E. (2020). Lean management and performance of telecommunication firms: The mediating role of workplace structure. *Cogent Business & Management, 7,* 1-20.

Ahmed, A., & Othman, I-B. L. (2017). Relationship between organisational resources and organisational performance: A conceptualize mediation study. *European Online Journal of Natural and Social Sciences, 6*(1), 10-27.

Ali, B. J., Omar, W. A. W., & Bakar, R. (2016). Accounting information system (AIS) and organisational performance: Moderating effect of organisational culture. *International Journal of Economics, Commerce and Management, 4*(4), 138-158.

Alston, F. (2017). *Lean implementation applications and hidden costs.* CRC Press.

Asawo, S. P. (2009). *Spirituality leadership and worker's commitment in manufacturing firms in Nigeria.* PhD Thesis, Rivers State University, Port Harcourt.

Atkinson, P. (2010). Lean is a cultural issue. *Journal of the Institute of Management Services, 54*(2), 35-41.

Babalola, O., Ibem, E. O., & Ezema, I. C. (2019). Lean construction: an approach to achieving sustainable built environment in Nigeria. *Journal of Physics: Conference Series, 1299,* 1-10.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-121.

Baron, R. M., & Kenny, D. A. (1986). Moderator-mediator variables distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Bessant, J., Caffyn, S., Gilbert, J., Harding, R., & Webb, S. (1994). Rediscovering continuous improvement. *Technovation, 14*(1), 17-29.

Bhasin, S., & Burcher, P. (2006). Lean viewed as a philosophy. *Journal of Manufacturing Technology and Management, 17,* 56-72.

Bhuyan, N., & Baghel, A. (2005). An overview of continuous improvement: From the past to the present. *Management Decisions, 43*(5), 761-771.

Bortolotti, T., Boscari, S., & Danese, P. (2015). Successful lean implementation: Organisational culture and soft lean practices. *International Journal of Production and Economics 160,* 182-201.

Bowersox, D. J., Closs, D. J., & Cooper, M. B. (2009). *Supply chain logistics management* (3rd Edition). McGraw-Hill.

Bulmer, M. G. (1979). *Principles of statistics.* Dover.

Cameron, K., & Quinn, R. (1999). *Diagnosing and changing organisational culture. Based on the competing values framework.* Addison-Wesley.

Challis, D., Samson, D., & Lawson, B. (2005). Impact of technological, organisational and human resource investments on employee and manufacturing performance: Australian and New Zealand evidence. *International Journal of Production and Resilience, 43*(1), 81-107.

Chassin, M. (1997). Assessing strategies for quality improvement. *Health Affairs, 16*(3), 151-161.

Chavez, R., Yu, W., Gimenez, C., Fynes, B., & Wiengarten, F. (2015). Customer integration and operational performance: The mediating role of information quality. *Decision Support System, 80,* 83-95.

Chi, N. W., Wu, C. Y., & Lin, C. Y. Y. (2008). Does training facilitate SME's performance? *The International Journal of Human Resource Management, 19*(10), 1962-1975.

Chin, W. W. (1998). The partial least squares approach for structural equation modelling. In G. A. Marcoulides (Ed). *Modern methods for business research.* 295-336. Lawrence Erlbaum Associates.

Coates, T. T., & McDermott, C. M. (2002). An exploratory analysis of new competencies: A resource-based view perspective. *Journal of Operations Management, 20*(5), 435-450.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd Edition). Lawrence Erlbaum Associates.

Cole, R. (2001). From continuous improvement to continuous innovation. *Quality Management Journal, 8*(4), 7-20.

Crosby, P. B. (1965). *Cutting the cost of quality.* Industrial Education Institute.

Crosby, P. B. (1979). *Quality is free: The art of making quality certain.* McGraw Hill.

Cullen, J. B., Parboteeah, K. P., & Hoegl, M. (2004). Cross-national differences in managers' willingness to justify ethically suspect behaviors: A test of institutional anomie theory. *Academy of Management Journal, 47,* 411-421.

Das, T. K., & Teng, B-S. (2000). A resource-based theory of strategic alliances. *Journal of Management, 26*(1), 31-61.

Davies, J., Mabin, V. J., & Balderstone, S. J. (2005). The theory of constraints: a methodology apart. A comparison with selected OR/MS methodologies. *Omega, 33*(6), 506-524.

Deming, W. E. (1986). *Out of the crisis.* MIT Press.

Deranek, K., Chopra, S., & Mosher, G. A. (2017). Lean adoption in a small and medium enterprise: Model validation. *The Journal of Technology, Management, and Applied Engineering, 33*(3), 2-13.

Dipak, M., & Ata, M. (2003).*The African manufacturing firm, an analysis based on firm studies in Sub-Saharan Africa.* Taylor and Francis Ltd.

Fassott, G., Henseler, J., & Coelho, P. S. (2016). Testing moderating effects in PLS path models with composite variables. *Industrial Management & Data Systems, 116*(9), 1887-1900.

Feigenbaum, A. V. (1951). *Quality control: Principles, practice, and administration.* McGraw Hill.

Flynn, B. B., Picasso, F. G., & Paiva, E. L. (2014). *Resources and operational performance: An empirical assessment.* Decision Sciences Institute 43th Annual Meeting Proceedings.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50.

Fricke, C. F. (2010). *Lean management: Awareness, implementation status, and need for implementation support in Virginia's wood industry.* (Master of Science in Wood Science and Forest Products), Virginia Polytechnic Institute and State University, Blacksburg, VA.

Gallagher, M., Austin, S., & Chaffyn, S. (1997). *Continuous improvement in action.* Kogan Page Ltd.

George, D., & Mallery, P. (2010). *SPSS for windows step by step: A simple guide and reference, 17.0 update* (10th Edition). Pearson.

Ghazi, A. T., & Alam, J. M. (2014). Improving quality and productivity in manufacturing process by using quality control chart and statistical process control including sampling and six sigma. *Global Journal of Researches in Engineering: Industrial Engineering, 14*(3), 9-25.

Goh, M. (2000). Quality circles: Journey of an Asian public enterprise. *International Journal of Quality and Reliability Management, 17*(7), 784-799.

Goldratt, E. M. (1984). *It's not luck.* North River Press.

Goldratt, E. M. (1988). Computerized shop floor scheduling. *International Journal of Production Research, 26,* 3, 443-455.

Goldratt, E. M. (1991).*The haystack syndrome: Sifting information in an ocean of data.* Educator.

Goldratt, E. M., & Cox, J. (1984). *The goal: A process of ongoing improvement.* The North River Press.

Gravetter, F., & Wallnau, L. (2014). *Essentials of statistics for the behavioral sciences* (8th Edition). Wadsworth.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2014). *A primer on partial least squares structural equation modeling.* Sage.

Hasin, A. A. (2007). *Quality control and management* (1st Edition). Bangladesh Business Solutions.

Heizer, J. H., Render, B., & Weiss, H. J. (2008). *Principles of operations management.* Pearson-Prentice Hall.

Henseler, J., & Dijkstra, T. K. (2015). *ADANCO 2.3. Composite modelling.* Kleve.

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial management & data systems, 116*(1), 2-20.

Höök, M. (2008). *Lean culture in industrialized housing: A study of timber volume element prefabrication.* (Doctorate in Structural Engineering), Luleå University of Technology, Luleå, Sweden.

Igo, T., & Skitmore, M. (2006). Diagnosing the organisational culture of an Australian engineering consultancy using the competing values framework. *Construction Innovation, 6*(2), 121-139.

Inman, R. A., Sale, M. L., & Green, K. W. Jr (2009). Analysis of the relationships among TOC use, TOC outcomes, and organisational performance. *International Journal of Operations and Production Management, 29*(4), 341-356.

Innocent, O. (2015). *The performance of commercial banks: The role of organisational culture as a mediator and external environment as a moderator*. (Unpublished doctoral dissertation). Universiti Utara Malaysia.

Iranmanesh, M., Zailani, S., Hyun, S. S., Ali, M. H., & Kim, K. (2019). Impact of lean manufacturing practices on firms' sustainable performance: Lean culture as a moderator. *Sustainability, 11*(1112), 1-20.

ISO 9000 (2005). *Quality management systems-Fundamentals and vocabulary.* International Organisation for Standardization, Geneva.

Juergensen, T. (2000). *Continuous improvement: Mindsets, capability, process, tools and results.* The Juergensen Consulting Group, Inc.

Juran, J. M. (1974). *Quality control handbook.* McGraw-Hill.

Kaynak, J. L. H. (2008). A replication and extension of quality management into the supply chain. *Journal of Operations Management, 26*(4), 468-489.

Kumar, N., Siddiqui, M. T., & Suhail, M. (2020). Theory of constraints: A review on its evolution and adoption. *The International Journal of Analytical and Experimental Modal Analysis, 12*(9), 954-969.

Kurniawan, R., Zailani, S. H., Iranmanesh, M., & Rajagopal, P. (2017). The effects of vulnerability mitigation strategies on supply chain effectiveness: Risk culture as moderator. *Supply Chain Management International Journal, 22,* 1-15.

Lau, A. K. W., Lee, S. H., & Jung, S. (2018). The role of the institutional environment in the relationship between CSR and operational performance: An empirical study in Korean manufacturing industries. *Sustainability, 10,* 834.

Leffler, K. B. (1982). Ambiguous changes in product quality. *The American Economic Review, 72(5),* 956.

Lohmoller, J. B. (1989). *Latent variable path modeling with partial least squares.* Physica.

Mann, D. (2014). *Creating a lean culture: Tools to sustain lean conversions*. Productivity Press.

Marin-Garcia, J. A., Val, M. P., & Martin, T. B. (2008). Longitudinal study of the results of continuous improvement in an industrial company. *Team Performance Management, 14*(1/2), 56-69.

Markus Bottcher, K. N. (2015). *Operational performance importance in industrial company.* Bain & Company, Inc.

McCardle, J. G., Rousseau, M. B., & Krumwiede, D. (2019). The effects of strategic alignment and competitive priorities on operational performance: The role of cultural context. *Operations Management Research, 12*(1-2), 4-18.

Montgomery, D. C. (2014). *Introduction to statistical quality control* (3rd Edition). John Wiley & Sons, Inc.

Morris, M. W., Williams, K.., Leung, K., Larrick, R., Mendoza, M. T., Bhatnagar, D., Li, J., Kondo, M., Luo, J. -L., & Hu, J.-C. (1998). Conflict management style: Accounting for cross-national differences. *Journal of International Business Studies, 29,*729-747.

Mudhafar, A., Mohammed, A., & Konstantinos, S. (2020). Lean manufacturing, leadership and employees: The case of UAE SME manufacturing companies. *Production & Manufacturing Research, 8*(1), 222-243.

Mullins, L. J. (1999). *Management and orgnisational behaviour.* Person Education Ltd.

Nahm, A. Y., Vonderembse, M. A., & Koufteros, X. A. (2004). The Impact of organisational culture on time-based manufacturing and performance. *Decision Science Journal, 35*(4), 579-607.

Nazar, N., Ramzani, S. R., Anjum, T., & Shahzad, I. A. (2018). Organisational performance: The role of TQM practices in banking sector of Pakistan. *European Scientific Journal November, 14*(31), 278-302.

Noble, M. A. (1997). Manufacturing competitive priorities and productivity: An empirical study. *International Journal of Operation and Production Management, 17,* 85-99.

Nordin, N., Deros, B. M., & Wahab, D. A. (2010). A survey on lean manufacturing implementation in Malaysian automotive industry. *International Journal Innovation, Management and Technology, 1,* 374.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd Edition). McGraw-Hill.

Ou, C. S., Liu, F. C., Hung, Y. C., & Yen, D. C. (2010). A structural model of supply chain management on firm performance. *International Journal of Operations & Production Management, 30*(5), 526-545.

Oxford, R., & Burry-Stock, J. (1995). Assessing the use of language learning strategies worldwide with the ESL/EFL version of SILL. *System, 23,* 1-23.

Paiva, E. L., Roth, A. V., & Fensterseifer, J. E. (2008). Organisational knowledge and the manufacturing strategy process: A resource-based view analysis. *Journal of Operations Management, 26*(1), 115-132.

Peteraf, M. A., & Barney, J. B. (2003). Unraveling the resource-based tangle. *Managerial and Decision Economics, 24*(4), 309-323.

Poskien, A. (2006). Organisational culture and innovations. *Engineering Economics, 46*(1), 45-50.

Powell, T. (2001). Competitive advantage: logical and philosophical considerations. *Strategic Management Journal, 22*(9), 875-888.

Quinn, R. E., & Rohrbaugh, J. (1983). A spatial model of effectiveness criteria: Towards a competing values approach to organisational analysis. *Management Science, 29*(3), 363-377.

Rahman, S., Laosirihongthong, T., & Sohal, A. S. (2010). Impact of lean strategy on operational performance: A study of Thai manufacturing companies. *Journal of Manufacturing Technology Management, 21*(7), 839-852.

Rentes, A. F., Araujo, C. A. C., & Rentes, V. C. (2009). *Best practice examples in sustaining improvements from lean implementation.* Paper presented at the Proceedings of the 2009 Industrial Engineering Research Conference (IeRC), Marriott Resort, Miami.

Ringle, C. M., Wende, S., & Becker, J. M. (2015). *Smart PLS 3.*Smart PLS.

Russell, R., H., & Koch, J. I. (2009). *Operational excellence. The new lever for profitability and competitive advantage.* Retrieved from http://www.plantservices.com/assets/wp_downloads/pdf/100131_SAP.pdf

Ryall, J., & Kruithof, J. (2001). *The quality systems handbook.* Consensus Books.

Saad, R., & Asaad, M. N. M. (2015). Does organisational culture moderate the relationship between ISO 9000 soft factors and organisational performance? *Journal of Development Areas, 49,* 379-394.

Saleh, H. (2015). *The impact of supply chain integration on operational performance at Jordanian pharmaceutical manufacturing organisations.* Thesis Submitted in Partial Fulfillment of the Requirements for Master Degree in Management, Management Department-Business Faculty Middle East University Amman-Jordan.

Salem, H. (2013). Organisational performance management and measurement. *The Lebanese Experience,* 1-15.

Santos, H., Lannelongue, G., & Gonzalez-Benito, J. (2019). Integrating green practices into operational performance: Evidence from Brazilian manufacturers. *Sustainability, 11,* 2956.

Saurin, T. A., Marodin, G. A., & Ribeiro, J. L. D. (2011). A framework for assessing the use of lean production practices in manufacturing cells. *International Journal Production and Resilience, 49,* 3211-3230.

Schein, E. H. (2004). *Organisational culture and leadership.* John Willey & Sons Inc.

Schroeder, R. G., Bates, K. A., & Junttila, M. A. (2002). A resource-based view of manufacturing strategy and the relationship to manufacturing performance. *Strategic Management Journal, 23*(2), 105-117.

Schroeder, R. G., Shah, R., & Xiaosong-Peng, D. (2011). The cumulative capability 'sand cone' model revisited: a new perspective for manufacturing strategy. *International Journal of Production Research, 49*(16), 4879-4901.

Sharma, S., & Modgil, S. (2020). TQM, SCM and operational performance: An empirical study of Indian pharmaceutical industry. *Business Process Management Journal,* 1-41.

Singh, J., & Singh, H. (2015). Continuous improvement philosophy-literature review and directions. *Benchmarking: An International Journal, 22*(1), 75-119.

Soltero, C., & Waldrip, G. (2002). Using kaizen to reduce waste and prevent pollution. *Environmental Quality Management, 11,* 23-38.

Sylva, W. (2020). Dimensionality and validity of the operational performance construct in the aviation industry: A factor analytic approach. *Research Journal of Business and Management (RJBM), 7*(4), 299-321.

Taguchi, G. (1989). *Introduction to quality engineering: Designing quality into products and process.* Asian productivity organisation.

Taylor, P., & Hirst, J. (2001). Facilitating effective change and continuous improvement: The mortgage express way. *Journal of Change Management, 2*(1), 67-71. https://doi.org/10.1080/ 714042488

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7) 509-533.

Temponi, C. (2005). Continuous improvement framework: Implications for academia. *Quality Assurance in Education, 13*(1), 17-36.

Tenenhaus, M., Esposito Vinzi, V., Chatelin, Y.-M., & Lauro, C. (2005). PLS path modeling. *Computational Statistics & Data Analysis, 48*(1), 159-205.

The Economist (2008). *Operational excellence: Enabling sustained growth. Spotlight on the Americas.* Retrieved from http://www.plantservices.com/assets/wp_downloads/pdf/090804_SAP.pdf

Tsikriktsis, N. (2007). The effect of operational performance and focus on profitability: A longitudinal study of the U.S. Airline Industry. *Journal of Operation Management, 9*(4), 506-517.

Tsou, C. (2013). On the strategy of supply chain collaboration based on dynamic inventory target level management: A theory of constraint perspective. *Applied Mathematical Modelling, 37*(7), 5204-5214.

Tuchman, B. W. (1980). The decline of quality. *Time Magazine, 2,* 38-47.

Vaidya, M., & Hudnurkar, M. (2012). Multi-criteria operational performance evaluation. *International Journal of Productivity and Performance Management, 62*(3), 293- 316.

Wallach, E. J. (1983). Individuals and organizations: The cultural match. *Training & Development Journal,* 37, 29-36.

Wang, M., & Stanley, J. (1970). Differential weighting: A review of methods and empirical studies. *Review of Educational Research, 40*, 663-705.

Wang, Q., Huo, B., Fujun, L. F., & Chu, Z. (2010). Understanding performance drivers of third-party logistics providers in mainland China: A replicated and comparative study. *Industrial Management and Data Systems, 110*(9), 1273-1296.

Ward, P. T., Duray, R., Leong, G. K., & Sum, C. (1995). Business environment, operations strategy, and performance: An empirical study of Singapore manufacturers. *Journal of Operations Management, 13,* 99-115.

Watson, K. J., Blackstone, J. H., & Gardiner, S. C. (2007). The evolution of a management philosophy: The theory of constraints. *Journal of Operations Management, 25*(2), 387-402.

Woods, J. (1997). The six values of a quality culture. *National Productivity Review, 16*(2), 49-54.

Yu, T., & Wu, N. (2009). A review of study on the competing values framework. *International Journal of Business and Management, 4*(7), 37-42.

Zhang, G. P., & Xia, Y. (2013). Does quality still pay? A re-examination of the relationship between effective quality management and firm performance. *Production and Operational Management, 22,* 120-136.

Zheng, W., Yang, B., & McLean, G. N. (2010). Linking organisational culture, structure, strategy, and organisational effectiveness: Mediating role of knowledge management. *Journal of Business Research, 63,* 763-771.

Zhu, Q., Zou, F., & Zhang, P. (2019). The role of innovation for performance improvement through corporate social responsibility practices among small and medium-sized suppliers in China. *Corporate Social Responsibility and Environmental Management, 26*(2), 341-350.