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Factors Affecting Supply Chain Operational Performance in Automotive Companies in the UK

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ABSTRACT

The current highly competitive business climate has given importance to the methods and factors affecting the operational performance in the UK's automotive economy and companies. The advent of globalisation has given birth to issues related to the business community and high request by consumers for production of quality materials across the globe. Emphasising superior quality allows the firms to deal with the changing customers' wants and preferences in a proper manner that consequently brings forth improved competitive dominance in the market. Different approaches have been exponentially vetted to explain the impact it would have in operational performance of automotive companies when applied. This study proposes a few approaches including Just In Time, Total Quality Management, and Green Manufacturing in increasing the quality of service of these companies in order to match the demands of the market and competition. The approaches were carefully selected and proposed with adequate analysis of the characteristics that makes it suitable for automotive companies to adopt. The study adopted a survey research design. A sample size of 50 respondent was used consisting of Employees, line managers and senior executives of automotive companies across the UK. A structured and validated questionnaire was used for data collection. The Cronbach's alpha reliability coefficients of constructs ranged from 0.81 to 0.96. A response rate of 94.9% was recorded. Data were analysed using descriptive and inferential (multiple linear regression) statistics at a 5% significance level.

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KEYWORDS: *Just In Time ; Total Quality Management; Green Manufacturing*

INTRODUCTION

The advent of globalization has given birth to issues related to the business community across the globe. The major issue has been faced by businesses as they must raise their services or products' quality. Today's worldwide business environment has been characterized as hyper dynamic where customers demand superior quality products or services from businesses. This fact demonstrated that only those firms that deliver quality products to their consumers would survive (Lim et al., 2022). According to Ali and Johl (2022), the notion of quality is deemed to be a vital strategic element in the attainment of organizational excellence. Emphasizing superior quality allows the firms to deal with the changing customers' wants and preferences in a proper manner that consequently brings forth improved competitive dominance in the market.

Considering the quality betterment philosophy, total quality management, known as TQM, is the extensively adopted approach. The approach related to total quality management has been extensively pursued by numerous corporations across the globe. It is popular because it facilitates the constant increment in the quality of services or products by modifying business practices or operations. All of these have been done to elevate customer contentment levels and overall business performance (Beard-Gunter et al., 2019). The pursuance of an approach related to total quality management results in superior quality products as this approach has attained worldwide recognition for producing superior quality products as per customers' preferences. A quality culture could be established in corporations by pursuing the TQM approach (Adem & Virdi, 2021).

In the present times, this approach is also being adopted by various manufacturing firms because of its capability of making business operations smoother as well as sustainable to achieve operational excellence. Corporations can attain sustainable merits by adopting the TQM philosophy. These sustainable merits entail superior quality products, contented customers, decreased operational expenses, better financial performance, as well a contented workforce (Yu et al., 2020). It equips the firms with a set of momentous success factors which concentrate on persistent improvement, needs fulfillment of customers, reducing material wastage, raised employee empowerment, ameliorated process management, better alliances with suppliers, etc. All these elements facilitate the constant assessment of outcomes by employing scientific techniques (Haffar et al., 2022). The activities related to TQM assist firms in reducing the production procedures' dispersion and eliminating wastes or redundancies, simultaneously enhancing the quality performance level (Permana et al., 2021).

Moreover, customers can be satisfied only when they get quality products at affordable prices. Thus, the delivery of products must be done as per desired specifications demanded by the customers. Numerous industrial corporations have been ferreting out ways of producing superior quality products by efficiently keeping production costs at a lower rate (Hussein & Zayed, 2021). Just in Time, as known as JIT, is that sort of mechanism that could be implemented in every corporation to ameliorate its performance effectiveness by making drastic elimination of material wastage in every business operation. It initiates from the goods procurement operation, then the production process operation, and finally, the delivery process operation of produced products to the consumers (Palange & Dhatrak, 2021). JIT production techniques produce higher amounts of products with lower human capital efforts, fewer pieces of machinery, and on time by utilizing less space (Schonsleben, 2022).

In recent times, the sustainability challenge has become a critical topic in the sphere of manufacturing sectors globally. One of the foremost SSCM initiatives that are constantly grabbing the attention of strategists, scholars, as well as practitioners is the notion of green manufacturing (Abualfaraa et al., 2020). Green manufacturing entails those practices that do not harm the environment. It encompasses conscious integration of initiatives related to environmental management during the event of the product's life cycle by covering the momentous manufacturing challenges like green products design with reusable capabilities and recyclable content, pollution management, compliance with environmental regulations, waste management, etc. (Leong et al., 2019).

The concept of green manufacturing implanted in it is the notion that manufacturing firms must reduce the generation of hazardous substances in their endeavors of satisfying customer demands (Afum et al., 2020).

Thus, the pursuit of green practices assists in fulfilling greener expectations of the market by implanting activities that facilitate waste reduction, pollution prevention, low level of raw material as well as energy consumption. On the other hand, a learning organization is usually perceived as a fact that assists in preparing organizations for change. Additionally, it plays a critical part in integrating the prevalent knowledge and modifying the active strategies to enhance operational excellence. Hence, the integration of learning organization in the business process could assist in attaining a competitive edge (Tu & Wu, 2021).

Statement of the Problem

Automotive corporations can attain sustainable merits by adopting the TQM philosophy. These sustainable merits entail superior quality products, contented customers, decreased operational expenses, better financial performance, as well as a contented workforce (Abdi & Singh, 2022). Various scholars proclaimed that implementing TQM in corporations can raise the quality standards of products thereby reducing operational costs (Lukin et al., 2022). However, raising production expenditures faced by various automotive corporations is inevitable. JIT is that sort of mechanism that could be implemented in every corporation to ameliorate its performance effectiveness by making drastic elimination in material wastage in every business operation. (Bond et al., 2020; Szasz et al., 2021).

According to da Silva et al. (2021), the pursuit of the JIT approach could assure the production of precisely demanded products at the precise time span in the precise quantity and correct places by eradicating all those activities that do not provide any worthy value. Many successful firms adopt JIT and pursue it in the whole supply chain. It makes possible the delivery of the required material to the production point conveniently. This technique is beneficial in enhancing flexibility with the help of synchronizing delivery time as per the schedule of buyers' production demands. Considering the automotive industry, Toyota Motor is regarded as the pioneer company that adopted the supplier JIT technique for streamlining procurement, making quick production, and depleting the levels of inventory (Kalsaas, 2019).

Unendingly, the UK's automotive sector has been encountering challenges because of rising energy consumption and environmental accountabilities. Failing to deal with environmental duties results in environmental issues and green manufacturing practices could help in resolving these issues (Giampier et al., 2020). It is corroborated by Karuppiah et al. (2020) that the pursuit of green manufacturing practices depletes the unfavorable impact of manufacturing processes. Numerous nations worldwide have implemented and reaped fruitful results of adopting green manufacturing practices because such practices not just help organizations financially but also assure the optimal usage of resources by gaining value from discarded material.

Tu & Wu (2021) postulated that through learning organization, the comprehension, recognition, as well as implementation of business strategies, can easily be done inside the corporation. Thus, the assessment of learning organizations could help in implementing novel business strategies and make them possible for actual execution. The purpose of this study is to make a critical evaluation of the terms like total quality management, just in time, green manufacturing as well as learning organization and determine their empirical impacts on the operation performance of automotive companies in the UK. Considering the lack of study regarding the mediating role between the factors like TQM, JIT, green manufacturing, and operational performance, this study operationalized learning organization as a mediating variable.

Objective of the Study

To examine what factors lead to the enhancement in the operational performance of the UK's automotive companies.

Hypotheses

H_{01}: TQM has a favorable efficacy on the operational performance of the UK's automotive companies.

H_{02}: Green manufacturing has a favorable efficacy on the operational performance of the UK's automotive companies.

H_{03}: IT has a favorable efficacy on the operational performance of the UK's automotive companies.

Significance of the study

In terms of model, this study would register its significant contribution by establishing a model that involves the effect of Just In Time, Total Quality Management and Green Manufacturing on operational performance of selected UK's automotive companies.

The findings derived from this study would assist in the management of automotive companies in the UK to realize the significance of practices related to total quality management for attaining operational excellence. It could also foster the management towards utilizing organizational resources effectively to implement the TQM elements successfully for better organizational outcomes. The empirical evidence would find in this study regarding the relationship between TQM and operational performance would motivate the managers working in automotive companies in the UK companies to make effective endeavors for capitalizing TQM approach.

Moreover, a few critical insights would be provided by this study for the managers working in automotive companies in the UK regarding the implementation of JIT as well as green manufacturing in their business operations.

Literature Review

Theoretical Foundation:

Theory of resource-based view (RBV):

The theory of natural resource-based renders a fundamental elucidation as well as rationale which supports the variables used in this study. It has been contended by this theory that preventing pollution, sustainability, as well as product stewardship, are the 3 critical strategies of a corporation. The theory postulated that the environmental stimulating factors related to each strategy are changeable and derived their underpinning from essential resources, for creating diversified sorts of competitive edge. The role of pollution prevention strategy is to control or deplete production expenditures by reducing wastage and carbon emissions. For instance, eradicating pollutants material from the production procedure will result in better efficiency levels. Consequently, decrease the need for excessive required inputs, simplify processes as well as deplete the costs related to compliance & liability (Agyabeng-Mensah et al., 2021).

This notion of natural resource-dependent theory stimulated various corporations to streamline their production processes by employing successful approaches like just-in-time as well as total quality management. These approaches altogether provide the assurance of the efficient utilization of resources or fuels to lower the level of wastage produced. The directives implanted in the theory of natural resource dependent should be pursued for executing business operations. The reason is hat hazardous business operations can adversely harm the environment and indirectly impact the humans live surrounding that environment. Thus, sustainable strategies are a prerequisite for acknowledging the connection immanent, and corrective actions ought to be taken for ensuring a decrease in environmental unfavorable

efficacies while raising the level of economic merits (Eniola et al., 2019). In this line, this theory supports the empirical connection among TQM, JIT, and business operations.

Green Supply Chain Management Practices (GSCM):

The practices related to GSCM are considered by practitioners and scholars as the expedient solution to ameliorate the environment. These sorts of practices were initiated in the starting period of the 1990s; however, their popularity climbed to a new level around the era of 2000 (Tseng et al., 2019). Zahraee et al. (2018) asserted that in present times, the practices related to GSCM have become very widespread. These practices have now become very momentous for every organization because they assist in lowering those activities that are damaging to the environment and at the same time ameliorate the coordination between the customers & the suppliers. As stressed by Vanalle et al. (2017) that green supply chain management refers to those set of supply-chain practices that are environmentally friendly entailing product design, sourcing, materials procurement, manufacturing procedures, and the provision of the ultimate product to the final consumers. Considering the natural environmental issues and societal development, organizations must follow g GSCM in their operations like manufacturing, distribution, recycling, product dissemination, etc.

It is posited by Zhu et al. (2017) that the rules, as well as guidelines involved in the GSCM methodologies, are considered the expedient solutions for depleting the unfavorable environmental efficacies of operations so that the operational performance could be boosted. The implementation of green SCM practices includes the merits like ecological protection, limited usage of resources, and preventing pollution levels which impel the firms to pursue these sorts of practices. The increasing adoption level of green SCM practices is not witnessed in only giant firms but also in small firms (Tseng et al., 2019). Manufacturing firms across the globe, no matter big or small, are constantly pursuing green SCM practices for controlling waste production, preventing pollution as well as avoiding excessive usage of natural resources. Now consumers become very environmentally conscious, and their environmental consciousness pressurizes manufacturers to avoid those operations that damage the environment for protecting the environment from further deterioration (Chin et al., 2015). This theory supports the variable green manufacturing in this study.

Conceptual Framework

Hypotheses Development:

Total Quality Management & Operational Performance:

The current globalization era has made the business environment very tough for local firms to survive until they sustain good quality of their products or business operations. TQM is the conventional management approach for meeting competitive as well as technological hurdles. However, it is still regarded as one of the best supply chain approaches in modern times across the globe (Lim et al., 2022). Corporations must employ efficacious methods or approaches for enhancing their business performance. The approach related to total quality management (TQM) is perceived as a momentous tool that has extensively been embraced not only by manufacturing firms but also by service firms in their endeavors to improve their overall business performance (Schonsleben, 2022).

TQM concentrates on constant improvement with the help of specific techniques, methods, tools, or values. The eventual grail of the TQM approach is to raise the level of customer satisfaction by making improvements in the product's quality with the lowest possible utilization of available resources. It not only ameliorates quality by synchronizing manufacturing operations but also uplifts competitiveness level, thereby enhancing the competitive edge of the firms (Abbas, 2020). The core value or notion that the

TQM approach involves is the act of improving quality at every operational hierarchical level inside the company. This is to be done to witness the long-term growth of the firms. This approach allows an enduring level of competitiveness by deeply understanding the requirements or preferences of the customers to satisfy them. (Ali & Johl, 2022)

The fact needs to be given due consideration that the fruitful application of the TQM approach demands top management commitment and consequently culminates the lower-level employees that quality and customer satisfaction is the topmost priority (Haffar et al., 2022). The roles of leaders as well as culture, are inevitable while implementing the TQM approach. The initiation process of implementing the TQM approach demands the firm's culture adaptation in this regard (Sharma & Modgil, 2020; Adem & Virdi, 2021). Eniola et al. (2019) advocated that numerous firms (no matter manufacturing firms or service firms) have been embracing the TQM approach to attain a level of enhanced operational performance, thereby raising their competitive edge in the market.

Firms can easily probe as well as minimize the eventual cause of operational issues by adopting the approach related to TQM (Sutrisno, 2019). It is advocated by Sutrisno (2019) that the efficacious employment of TQM practices has a direct connection with customer satisfaction levels. Agyabeng-Mensah et al. (2021) proclaimed that the practices related to TQM assist corporations in attaining competitive merit over their counterparts by making operations sustainable. As stressed by Sahoo & Yadav (2020) that the pursuit of TQM practices helps in depleting the cost of business operations that leads to its enhancement. On the other hand, improving quality, shrinking delivery time as well as enhancing capacity utilization are also witnessed. These are all the beneficial aspects of the TQM practices for ameliorating operational performance.

According to Alkhaldi and Abdallah (2019), TQM practices favorably influence quality performance which ultimately leads to affecting the operational performance in a positive manner. Sahoo (2022) postulated that with the help of the TQM approach, manufacturing businesses can equip consumers with higher-quality products by lowering production expenditure, thereby leading to improved operational performance. Numerous studies found the significant efficacy of TQM practices on the operational performance of firms (Sharma & Modgil, 2020; Adem & Virdi, 2021). Considering the above discussion of the findings derived from the prior studies, it is found that applying TQM practices could elevate the operational performance of the automotive companies operating in the UK. It has been deduced:

H1: TQM has a favorable efficacy on the operational performance of the UK's automotive companies.

Green Manufacturing & Operational Performance:

Green manufacturing entails the provision and processes of the product, which demands minimum consumption of harmful substances. Deploying green manufacturing practices allows businesses to be conscious in terms of their obligations to protect the environment. This is done by revamping the operational mechanisms as well as disposal strategies while adhering to the regulations related to environmental sustainability (Leong et al., 2019). As stressed by Inman and Green (2018) that manufacturing businesses are required to evolve their business operations to be more environmentally friendly by considering the proper system of waste recycling and efficient process of disposing of hazardous products so that a conducive working environment could be achieved.

The concept of green manufacturing specifies the acceptable level of pollution generation in terms of using natural resources while executing business operations (Afum et al., 2020). It is a twofold technique that does not only consider the ecosystem protection strategies but also focuses on improving business operational performance (Abualfaraa et al., 2020). Green manufacturing entails the transformation of raw materials into ultimate products by generating lower levels of environmental hazards with operational efficiency (Kumar et al., 2022). Green manufacturing is the component of green SCM has the vision of creating harmonious circumstances to create business worth by making more products with lesser resources through pursuing green practices. These practices ensure the production of products with less pollution, defects, inventories as well as time, thereby enhancing operational efficiency (Belhadi et al. 2020).

Green manufacturing equips firms as well as the environment with enormous opportunities. It can elevate an organization's operational efficiency, which consequently raises financial motives, prevents environmental deterioration, and expands environmental outcome (Sun et al., 2020). Li et al. (2020) corroborated that green manufacturing is the advanced manufacturing approach that comprehensively concerns environmental efficacies and resource productivity. Those firms that exploit green manufacturing activities would excel in their industries not in terms of engineering aspects but also in terms of business operational aspects. The progress

of green supply chain mechanisms is the immediate requirement for tackling the pressures relevant to energy retrenchment and environmental safeguarding while executing business operations (Yong et al., 2020)

Tripathi et al. (2021) postulated that the efficacious employment of green manufacturing tactics allows businesses to manage their operations considering environmental goals. This practice could ultimately result in increased operational performance. It is advocated by Afum et al. (2020) that corporations could foster their operational abilities by accommodating green manufacturing tactics because green manufacturing involves the redesigning of production mechanisms and implementing inventively eco-friendly technologies. Numerous studies found the significant efficacy of green manufacturing applications on the operational performance of firms (Bhatia, 2021; Thanki & Thakkar, 2020). Considering the above discussion of the findings derived from the prior studies, it is found that applying green manufacturing practices could elevate the operational performance of the automotive companies operating in the UK. It has been deduced:

H2: Green manufacturing has a favorable efficacy on the operational performance of the UK's automotive companies.

Just in Time & Operational Performance:

JIT is a management tactic that makes alignment in orders of raw material from suppliers with the schedules to the production process directly. Companies mostly pursue this tactic to lower the level of wastage created during the production process by receiving material only when the need arises so that inventory costs can be reduced (Voss & Robinson, 2019). Through employing the JIT tactic, the management of supplies as well as components can be done systematically. Its advantages entail the organizational strategy of making quick responses to customer demands while lowering the cost of production. It is the production mechanism that is devised to attain superior quality products at a lower cost on time by reducing the level of wastage in the internal processes to make available the products demanded in the market as per the consumers' preferences (Sulistyowatia et al., 2020).

It is a sort of philosophy initiated by Toyota Company in the era of 1970 for executing manufacturing operations. The primitive grail of this philosophy is to reduce the wastage level of production processes and ensure constant operational improvements (Buer et al., 2021). The mechanism of JIT has the core notion of creating a streamlined, quality procurement as well as efficient production mechanism so that operational performance could be enhanced (Palange & Dhatrak, 2021). The technique of JIT manufacturing has persisted for years by making significant improvements in the organizational working situations, specifically in the sphere of procurement dealings. It has transmuted the level of business operations in the supply chain (Ganiyu et al., 2019). As advocated by Phogat and Gupta (2019) that JIT is presently regarded as an easy-going progressive industrial technology, and its capability to deliver accurate component at a precise time and quantity eventually make better business operations.

Hussein and Zayed (2021) corroborated that the JIT manufacturing mechanism is relied on the thinking of depleting waste, exploiting every worker's total capacity to attain supreme benefits, and reducing the movement of the raw material as well as lower levels of finished goods inventory, which generally assist in detecting deficiencies in business operations. Thus, every production stage has been covered in this technique, encompassing product initiation to the ultimate sale of the finished product (García-Alcaraz et al., 2019). According to Khalfallah and Lakhal (2021), the present century impels businesses to lower operational expenses while producing products and providing those products at competitive prices. Chen et al. (2020) posits that the notion of just in time was first initiated in the nation Japan where Toyota and several other manufacturing corporations implemented it and became successful in depleting the amount of production wastage through employing it.

It is evidenced by Terdpaopong et al. (2021) that the mechanism of JIT could enhance operational performance. Sulistyowatia et al. (2020) advocated that the elimination of wastage as well as optimization of resource utilization could be possible through employing JIT in the supply chain. Thus, the employment of the JIT approach has a favorable association with operational performance. Numerous studies found the significant efficacy of the JIT technique on the operational performance of firms (Opoku et al., 2020; Bond et al., 2020; Sharma & Modgil, 2019). Considering the above discussion of the findings derived from the prior studies, it is found that applying the JIT approach could elevate the operational performance of the automotive companies operating in the UK. It has been deduced:

H3: JIT has a favorable efficacy on the operational performance of the UK's automotive companies.

Methodology

The study in investigation employed positivism research philosophy. This study employed the use of

cross sectional research design for validating the hypotheses. The approach is the deductive for this study and a quantitative technique was used for collecting primary data from employees working in the supply chain department of automotive companies operating in the UK. Through convenience sampling 50 respondents were approached for data collection process. For validating the hypotheses of this study some momentous tests were conducted with the help of SPSS and Smart PLS software.

Population:

The population of this study were employees working in the supply chain department of these automotive companies: Asten Martin, Macleren and Landrover.

Sampling Techniques:

Convenience sampling was followed for recruiting participants because the pursuit of probability sampling requires a plenty quantity of finance, effort, and time which this research study lacks. Hence, convenience sampling is finalized for this study execution as it recruits pertinent respondents with limited resources as per Stratton (2021).

Instrument Design:

A data collection instrument is a tool used to collect the required data systematically. The survey strategy is finalized from alternatives proposed by Saunders et al. (2016) in their research onion model. Survey based studies strengthen the findings of quantitative investigations (Schutt, 2019). Because of its capacity to deliver data at equal-interval intervals, the Likert format was developed (Cerar et al., 2021).

Data Collection:

The data accumulation procedure for this proposed study was accomplished by equipping the study's target respondents with close ended questionnaires via protected online Google forms as this act assured the collected data safety as well as security. There is a facility with a specific link provided by Google Forms so that participants could securely access the questionnaires. Furthermore, the study's participants were also required to fill out the questionnaire in one session and then make submissions via the same website to ensure the responses' reliability and credibility.

Data Analysis*:*

For validating the hypotheses of this study some momentous tests have been conducted. Firstly, a demographics assessment has been done via SPSS software to identify the characteristics of the respondents in terms of gender, age as well as education. Through the software of Smart PLS, version 4 following tests have been conducted. The test named factor loading would be conducted for checking how much the items used for measuring the constructs involved in this study represent those constructs. Then composite as well as Cronbach alpha reliability tests would be performed to identify the level of internal consistency found among the item used for the construct. AVE as well as VIF values would be assessed for fulfilling the criteria of testing the data further. Discriminant validity would be determined to check how much the items of each construct are different from the items of other measures. Path analysis, R square as well as Q square values would be assessed for the model and hypotheses validation.

Response Rate, Data Presentation, Analysis, and Discussion of Findings

Demographics Frequencies:

Table 1: Descriptive Statistics

Descriptive Statistics	Frequency	%
Gender		
Male	38	76.0
Female	12	24.0
Education		
Bachelors	30	60.0
Masters	17	34.0
PhD	3	6.0
Age		
Below 25 years	7	14.0
25 – 30 years	28	56.0
31 – 35 years	11	22.0
Above 35 years	4	8.0
Designation		
Subordinates	31	62.0
Manager	10	20.0
Senior Manager	9	18.0
Experience		
Less than 3 years	34	68.0
3-5 years	5	10.0
6-10 years	7	14.0
Above 10 years	4	8.0

Table 1 discloses the descriptive statistics of this study's respondents. The participation level of respondents with respect to gender manifests that 38 males filled questionnaires of this contradictory to female who filled 12 questionnaires. Moving towards the participation level of respondents with respect to education manifests that 30 out of 50 respondents of this study had bachelor's degree while 17 out of 50 respondents of this study had master's degree where 3 out of 50 respondents of this study had PhD degree.

Moreover, the participation level of respondents with respect to age manifests that the respondents of this study fall below 25 years' age range were 7 while the respondents of this study fall between 25 to 30 years'

age range were 28 whereas the respondents of this study fall between 31 to 35 years' age range were 11. Only 4 respondents of this study belong to above 35 years' age range. With respect to designation, 31 respondents of this study were belonging to subordinate designation whereas 10 respondents of this study were belonging to manager designation. 9 respondents of this study were belonging to senior manager designation.

Additionally, 34 respondents of this study having experience of below 3 years. However, 5 respondents of this study having experience of between 3 to 5 years whereas 7 respondents of this study having experience of between 6 to 10 years. 4 respondents of this study having experience of above 10 years.

Source: Field Survey, 2025

Reliability and Validity of Measurement Model*:*

Table 2: Reliability and Validity

Construct	Items	Factor Loading	CB Alpha	CR	AVE	VIF
Total Quality Management	TQM1	0.723	0.828	0.889	0.670	1.551
	TQM2	0.911				2.264
	TQM4	0.918				2.145
	TQM5	0.696				1.367
Just in Time	JIT1	0.692	0.771	0.820	0.604	1.215
	JIT2	0.828				1.500
	JIT3	0.806				1.369
Green Manufacturing	GM1	0.741	0.881	0.912	0.675	1.981
	GM2	0.801				2.215
	GM3	0.886				1.800
	GM4	0.803				1.399
	GM5	0.868				2.284
Operational Performance	OP1	0.837	0.883	0.914	0.681	2.284
	OP2	0.870				2.645
	OP3	0.896				3.239
	OP4	0.749				1.780
	OP5	0.764				1.945

Discriminant Validity*:*

Discriminant validity is all about assessing the distinction level of a particular construct from another construct in the specific model. It is assumed that the distinction level of a particular construct from another construct in the specific model is done as per empirical standards. As propounded by Fornell & Larcker (1981) criterion that elevated degree of variance need to be shared by construct with its respective items than the variance shared by the same construct with any other construct in the model. The assurance of this criterion is done by comparing the square root of AVE value of a construct with the highest squared correlation of that construct with other constructs in the specific model. It is necessary that the AVE square root value of a particular construct found to be greater than the highest squared correlation of that construct with other constructs in the specific model. Another technique of verifying discriminant validity is to assess the items' cross loadings of a particular construct. It prerequisites that loading of the particular construct's items should be lesser when they load on other constructs as compared to the actual construct itself (Hair et al., 2014).

Table 3: Fornell-Larcker Criterion

	GM	JIT	LO	OP	TQM
GM	0.82145				
JIT	0.44772	0.77745			
OP	0.55369	0.39709	0.86989	0.82538	
TQM	0.40588	0.38896	0.47307	0.59011	0.81846

It can be seen from table of this study that all the constructs of the study's model like TQM, JIT, green manufacturing and operational performance have AVE square root values higher than their inter-construct correlations.

Hypotheses Testing:

Table 4: Path Analysis

Main Effects	Beta	T Value	P Value	Decision
TQM -> OP	0.185	3.761	0.000	Supported
GM -> OP	0.110	2.228	0.026	Supported
JIT -> OP	0.061	1.278	0.202	Not Supported
R Square	0.813			
Q Square	0.532			

Source: Researchers' Findings 2025

Table termed as path analysis in this study showcases the hypotheses results of this study. The first hypothesis of this study states that the pursuance of total quality management technique has favorable efficacy over the operational performance of automotive companies operated in the UK which is validated at the level of 5 percent as p = 0.000. The beta value of this hypothesis is 0.185 demonstrates that if the increment made in implementing total quality management techniques in automotive companies by 1 unit then it raises the level of operational performance in the automotive sector by around 19 percent. Eniola et al. (2019) advocated that numerous firms (no matter manufacturing firms or service firms) have been embracing the TQM approach to attain a level of enhanced operational performance. Agyabeng-Mensah et al. (2021) proclaimed that the practices related to TQM assist corporations in attaining competitive merit over their counterparts by making operations sustainable. According to Alkhaldi and Abdallah (2019), TQM practices favorably influence quality performance which ultimately leads to affecting the operational performance in a positive manner.

Similarly, the second hypothesis of this study states that the pursuance of green manufacturing practices has favorable efficacy over the operational performance of automotive companies operated in the UK which is validated at the level of 5 percent as p = 0.026. The beta value of this hypothesis is 0.11 demonstrates that if the increment made in implementing green manufacturing practices in organizational processes of automotive companies by 1 unit then it raises the level of operational performance in the automotive sector by around 11 percent. Green manufacturing does not only consider the ecosystem protection strategies but also focuses on improving business operational performance (Abualfaraa et al., 2020). Green manufacturing entails the transformation of raw materials into ultimate products by generating lower levels of environmental hazards with operational efficiency (Kumar et al., 2022). Tripathi et al. (2021) postulated that the efficacious employment of green manufacturing could ultimately result in increased operational performance. However, the third hypothesis of this study states that the pursuance of JIT approach has favorable efficacy over the operational performance of automotive companies operated in the UK which is not validated at the level of 5 percent as p value higher than 0.05.

R Square & Predictive Relevance (Q2):

R square depicts the variance present in the dependent variable and it also delineates the explanatory power of the model. R square value is around 0.25 then the explanatory power of model is regarded as weak, whereas R square value is around 0.50 then the explanatory power of model is regarded as moderate while R square value is around 0.75 then the explanatory power of model is regarded as good (Henseler et al., 2009). R square of this study model is around 81 percent which is good. Therefore, it can be interpreted that the independent construct of this study's model like TQM, JIT and green manufacturing predict 81 percent fluctuation in the construct operational performance (dependent variable).

According to Geisser (1974), with the help of Q square value, the model's predictive preciseness can also be evaluated. As stressed by Henseler et al. (2009), dependent variable exhibiting Q2 value higher than zero demonstrates predictive exactness of the structural framework. Q square of this study model is around 53 depicts that the study's model has 53% applicability.

Summary

Emphasizing superior quality allows the firms to deal with the changing customers' wants and preferences in a proper manner that consequently brings forth the improved competitive dominance in the market. Corporations are able to attain sustainable merits by adopting TQM philosophy. It equips the firms with set of momentous success factors which concentrates on the persistent improvement, needs fulfilment of customers, reducing material wastage, raised employee empowerment, ameliorated process management, better alliances with suppliers, etc. Moreover, consumers demand quality products at competitive prices must be delivered to them at the

predetermined timespan as failure of making deliver on time unfavorably influence the consumers' satisfaction level. Just in time as known as JIT techniques produce higher number of products with lower human capital efforts, less machineries, on time by utilizing less space. However, providing quality products on time causes environmental damages that gave birth to one of the foremost SSCM initiatives i.e. green manufacturing. It is the production mechanism that is devised to attain the superior quality products at lower cost on time by reducing the level of wastages in the internal processes.

Discussion and Conclusion

In discussion section, the study's findings have been compared with prior studies' findings. In managerial implications section, the recommendations have been suggested to the management of automotive companies of the UK. Also the study makes recommendation for further studies whilst acknowledging the limitation of the study.

Hypothesis # 1 (Supported): The study first assesses the direct relationship among the variable involved and then indirect relationships among them. The first hypothesis of this study states that the pursuance of total quality management technique has favorable efficacy over the operational performance of automotive companies operated in the UK is found valid which also confirms the findings of previous studies. Pal (2016) asserted found the significant efficacy of TQM practices on the operational performance of firms. Sahoo (2022) postulated that with the help of TQM approach, manufacturing businesses can equip consumers with higher quality products by lowering down the production expenditure thereby leading to improved operational performance.

Hypothesis # 2 (Supported): Similarly, the second hypothesis of this study states that the pursuance of green manufacturing practices has favorable efficacy over the operational performance of automotive companies operated in the UK is found valid which also confirms the findings of previous studies. Eshikumo & Odock (2017) contended that there is a momentous association of green manufacturing with the operational performance. It is advocated by Afum et al. (2020) that corporations could foster their operational abilities by accommodating green manufacturing tactics. Jabbour et al. (2016) found the significant efficacy of green manufacturing practices on the operational performance of the firms. Dubey et al. (2013) postulated that the efficacious employment of green manufacturing tactics allows businesses to manage their operations considering the environmental goals. This practice could ultimately result in increased operational performance.

Hypothesis # 3 (Not Supported): However, the third hypothesis of this study states that the pursuance of JIT approach has favorable efficacy over the operational performance of automotive companies operated in the UK which is not validated at the level of 5 percent as p value higher than 0.05.

Managerial and Policy Implications:

This study's findings could aid supply chain managers of automotive organizations of the UK to grasp the significance of TQM techniques, green manufacturing practices and learning organization abilities for improving operational performance. Considering the significant impact of TQM on operational performance, this study's results would foster supply chain managers to pursue organizational resources that facilitate the efficacious implementation of TQM for superior performance outcomes. The supply chain management of automotive companies should adopt such continuous improvement practices that fulfill production prerequisite, maintain production equipment as per maintenance strategy, assess production process regularly and emphasize over strategies regarding quality-related criteria while manufacturing new products.

The supply chain mangers must also ponder over barriers that hinder the implementation of green manufacturing practices and ought to take appropriate actions to resolve them as soon as possible. They need to increase their endeavors in terms of eco-design and take proper accreditation before taking green initiatives. They should also increase awareness about green products among the masses. This act might widen the market of green products. Moreover, automotive firms must also volunteer themselves in employing green practices because it would help them overpowering the lack of a good green disposal mechanism. The deployment of green manufacturing practices effectively would develop firms' image as an environmentally friendly among people thereby enhancing their credulity in the market.

In sum, the periodic management of all processes of production and the supervision of those processes by prioritizing quality criteria and considering the environmental concern after developing learning culture in the automotive companies would constantly help them in attaining superior operational performance.

Conclusion

The current business environment has been characterized as hyper dynamic where customers

demand from the local businesses to provide them the products like international standards which make the international competition highly severe. This fact demonstrated that the only those firms would service which deliver quality products to their consumers. Corporations can attain sustainable merits by adopting TQM philosophy. TQM approach concentrates on constant improvement with the help of specific techniques. The eventual grail of TQM approach is to raise the level of customer satisfaction by making improvements in the products' quality with lowest possible utilization of available resources. Moreover, just in time is a sort of philosophy that focuses on reducing the wastages level of production processes and assuring the constant improvement. It is the production mechanism that is devised to attain the superior quality products at lower cost on time by reducing the level of wastages in the internal processes.

Furthermore, deploying green manufacturing practices allows businesses to be conscious in terms of their obligations of protecting the environment. This is done by revamping the operational mechanisms as well as disposal strategies while adhering to the regulations related to environmental sustainability.

This research chose a cross-sectional design and deductive approach. The study has implemented a quantitative technique for collecting primary data from respondents through convenience sampling. Smart PLS software was used to conduct tests like demographics assessment, factor loading, composite reliability, Cronbach alpha, AVE, VIF, discriminant validity to check the validity as well as reliability of the collected data. Path analysis, R square as well as Q square values have been assessed for the model and hypotheses validation. Except JIT, direct effects of variables like TQM, green manufacturing on organizational performance are found significant. However, the study also failed to find the significant mediating impact of learning organization between JIT and operational performance.

Limitations & Future Directions:

The small sample size is found to be the first limitation of this study because a larger sample size cannot be used due to the limited time frame. This limitation provides direction for future research as future studies can be done on this study's model by recruiting a larger sample of respondents.

This study collected quantitative primary data and future studies could be performed by accumulating both quantitative and qualitative data.

There is no moderating variable found in this study's model which suggests that future studies could be executed by adding a moderating variable to it.

Future studies could be performed by adding the factor of Covid 19 in the same model.

The technology of artificial intelligence is an evolving sphere, and its impact could also be checked on operational performance. Thus, further studies could be performed by adding the factor of artificial intelligence to this study's model.

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