



DEVELOPMENT OF LEAN ENTERPRISE IMPLEMENTATION METHODOLOGY: AN ISM APPROACH

Muhammad Umer Ahrar

Lecturer, Iqra University
umer.ahrar@gmail.com

Muhammad Ehtesham Khan

Lecturer, Iqra University
enr.ehteshamkhan@gmail.com

Jazib Hassan

Iqra University
enrjazibhassan24@gmail.com

Abstract

In the current competitive environment, most manufacturing companies are looking to improve their competitiveness. They must embrace and apply industry best practices to strengthen their competitive edge. The adoption of new manufacturing best practices typically comes with the expectation of certain advantages in the form of improved organizational performance. The amount of time and attention put into adopting any best practices will result in improvements in many elements of the company. The researcher backed up the previous claim, stating, "The end objective of an organization's management techniques is to raise the level of performance." Lean Management (LM) is regarded as a best practice that consistently changes an organization from its worst to its best condition, which is the desired state for every business.

Keywords:- *Lean Management, Methodology, Manufacturing, Performance*

Introduction

Background

Lean management is a broad term that encompasses a variety of best practices for achieving organizational excellence in all areas. If a company wants to apply lean management methods, it should concentrate on improving its processes first. The importance of economic culture while adopting lean is explored to get better outcomes and long-term performance. According to the Sustainable Lean Iceberg Model (SLIM) by Hines, the significance of leadership, behavior, strategy, and alignment was discovered in Pakistani SMEs (2010). SMEs are often regarded as the engine of development and play an important role in economic progress. SMEs account for more than 90% of all businesses in both developed and emerging countries. Many studies have shown that lean adoption in SMEs is beneficial to the business (Godinho Filho et al., 2016).

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Problem Statement

SMEs account for the majority of job possibilities and contribute significantly to industrial output and exports. Manufacturing SMEs, on the other hand, have several hurdles in competing in the global market. To tackle the aforementioned situation, SMEs are seeking best practices in their business to help them improve and maintain their performance (Vallinayagam Arumugam, Kannabiran & Vinodh, 2020)

Objectives

Following are the key objectives of this research study:

1. To decide the effect of lean specialized practices and lean social practices on authoritative practices.
2. To inspect the connection between lean specialized practices, lean social practices, and authoritative practices outline the Study

This entire chapter is summarized the historical background of the lean supply chain management concept concerning supplier and customer by the influence of three key factors environmental, social and economic performance. Moreover, in this chapter, the discussion about the significance, scope, and limitation of the study had been included. The advancement of the exploration objective and issue articulation assists the scientist with detailing the investigation dependent on the inventive idea of the lean production network that helps the assembling organizations to improve their business cycle.

Definitions

Technical Lean Performance

All the lean activities based on the technical performance to improve the elimination of wastage are known as Technical Lean Performance (Abdallah, Alkhalidi, & Aljuaid, 2021).

Social Lean Performance

All the lean activities based on the social performance to improve the elimination of wastage are known as Social Lean Performance (Arumugam, Kannabiran, & Vinodh, 2020)

Organizational Performance

As demonstrated by Richard, Devinney, Yip, and Johnson (2009), definitive execution suggests the genuine yield or outcomes of a relationship as assessed against its normal yields (or destinations and objectives).

Literature Review

Theoretical Review

Social-Technical System Theory for lean Social Practices

The Socio-Technical System (STS) hypothesis was created by Trist and Bamforth (1951). 'The social framework includes humans and their relationships, whereas the specialized framework includes gear, tools, methods, and measures.' The social and specialized frameworks are distinct, yet they have a cooperative connection in which strengthening one side necessitates developing the other to get the greatest display. The researcher described the socio-technical system theory as a critical integration of technology and human components in the workplace that leads to a good conclusion. Many academics divided lean methods into bundles based on the socio-technical system, emphasizing the significance of the human resource management bundle. Some researchers divided lean practices into lean technical and supporting practices in 2014, and they also proved that lean supportive strategy may alleviate the obstacles to lean technical practices. Previous lean practice models have been examined. They described lean's architecture as a socio-technical framework that allows for the merging of human and technology entities to get better results.



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Hadid et al. (2016) rebranded lean supporting behaviors to lean social practices and experimentally demonstrated their relationship with lean technical practices, as well as their impact on operational and financial performance. Other conceptions of prospective absorbing capacity and actual absorbing capacity have also verified the aforesaid results of lean technical and social practices.

Theory of NRBV

This examination utilizes NRBV as a hypothetical premise to explore how lean cycles improve maintainable execution. As per the RBV, important, uncommon, special, and indispensable assets lead to the upper hand (Barney, 1991). The general idea incorporates authoritative assets, information, abilities, and any remaining resources that increment productivity and effectiveness (for example Petraf, 1993 W Werner Felt, 1984). Hart (1995) extended RBV by consolidating common assets. He created NRBV and recommended that practices like contamination counteraction, item the board and supportable improvement can prompt economical upper hands.

LSCM can be deciphered as explicit assets and abilities created by providers and shoppers (Vengarton et al., 2013). Specifically, LCM addresses the capacity to screen items. Organizations that execute LCM with their inventory network accomplices address the issues of partners in their everyday activities all through the whole item life cycle and consider natural issues. They can acquire social authenticity and foster excellent and refined assets and abilities that can raise the degree of practical execution.

Then again, LSCM addresses the capacity to forestall contamination. Organizations that carry out LSCM with their store network accomplices can consistently improve the cycle, lessen emanations and misfortunes, and wipe out stationary exercises. You can improve manageable execution with less time, lower costs, and less natural effect (Prajugo et al., 2016, Qarnfaliya and Trafdar, 2013).

Empirical Review

AlManei, Salontis, and Xu, (2017) explored the system of lean execution. The execution of lean assembling in an association can bring numerous advantages, like decreasing waste and improving working effectiveness. Notwithstanding, lean execution is certifiably not a clear interaction. Albeit various systems have been introduced, still numerous organizations think that its hard to carry out lean. Besides, the vast majority of these guides are for huge assembling organizations, and not for little and medium undertakings. Lamentably, there isn't a formula that whenever utilized can ensure a fruitful execution. Besides, fruitless execution can enormously affect an association's assets, however significantly more critically, influence representatives and their trust in a lean way of thinking. In the current paper, the most unmistakable lean execution systems will be talked about, under the crystal of the requirements of SMEs. The difficulties for the SMEs in their lean excursion are talked about.

Sahoo, (2019) examined the acts of lean and its exhibition dependent on the specialized and social elements. Current assembling frameworks require devices and methods taken to comprehend the social concerning individuals and relations just as the specialized climate. The reason for this paper is to investigate the connection b/w the social and specialized parts of lean assembling rehearses and their impacts on business execution results. The guessed connections for this investigation are tried with information gathered from 148 Indian assembling firms by utilizing SPSS and AMOS measurable programming. The investigation of the examination was led utilizing primary condition displaying (SEM) strategy, which showed that both "delicate" and "hard" lean practice is emphatically identified with business execution boundaries. The discoveries additionally showed that



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"hard" lean practices completely intervene in the connection b/w "delicate" lean practices and business execution boundaries. There are a few impediments to this examination. Albeit a cross-sectional study has been applied, the examination doesn't allow us to represent the slack between execution and execution. It likewise brings the assessment of a set number of Indian specialists about lean assembling frameworks; thus, the example size could be expanded and the ethnicity of the respondent could be extended for future exploration. The paper would bear some significance with Lean experts, and the consequences of this investigation can be utilized in associations to emphasize friendly social changes while applying lean specialized instruments concerning rehearses just as significant.

Hadid and Mansouri, (2014) investigated the viewpoint of lean and its relationship in the help industry. The surviving writing on lean assistance uncovers an observable absence of hypothetical models setting up the center development of lean help, their interrelation, and its effect on hierarchical execution. The motivation behind this paper is to address this hole by proposing a hypothetical model wherein lean develops are recognized and operationalized to build up their interrelation and effect on hierarchical execution. This paper integrates data drawing on an efficient survey of the writing on lean help, other pertinent scholarly writing to foster a hypothetical model, and a bunch of recommendations. Drawing on the general hypothesis, socio-specialized frameworks hypothesis, and possibility hypothesis (CT), the paper features and explains the expected effect of lean assistance on operational and monetary execution. This investigation recognizes an exhaustive arrangement of lean specialized practices, lean strong practices, inhibitors, and anticipated results of lean help. Expected connections among those builds are set up by fostering a reasonable structure with a few suggestions dependent on the sign writing and the socio-specialized framework hypothesis, the all-inclusive point of view, and the CT, when pertinent. Additionally, six persuasive relevant factors on the lean-execution connection are distinguished dependent on a survey of the administration bookkeeping writing, hierarchical methodology writing, and enhancement writing to beat impediments of past investigations. This paper covers a hole in the writing by recognizing and operationalizing lean assistance development and offering a hypothetical model with a few suggestions that set up connections between lean builds and defeat constraints in past examinations by distinguishing six logical factors that are significant elements in the lean-execution affiliations

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Nath and Agrawal, (2020) explored the predecessors of production network social maintainability in the context of lean and spryness. The examination is one of a kind as it exactly interfaces readiness and lean practices with social supportability direction, social generosity execution, and execution in supply chains. The current examination plans to research whether inventory network nimbleness and lean administration rehearses are precursors of store network social supportability. Information was gathered from 311 store network experts from the Indian assembling area. Corroborative factor examination was utilized to test the legitimacy and unwavering quality of the actions utilized, and an underlying model was broken down to test the speculations of the current investigation. The outcomes demonstrate that deftness and lean practices are critical precursors of social manageability direction just as friendly maintainability execution. The outcomes additionally propose that dexterity has a huge aberrant impact on operational execution utilizing social manageability direction, and essential social supportability rehearses just as nimbleness is by implication influencing social maintainability execution through friendly manageability direction and fundamental social manageability rehearses.

Herrera, Mourgues, and Alarcón, (2018) performed research on the appraisal of lean practices, execution, and interpersonal organizations in Chilean air terminal undertakings. Air terminal undertakings are mind-boggling in nature since they incorporate a few experts from the general population and private area who should briefly cooperate for the satisfaction of recently characterized destinations. The plan of these sorts of public ventures in Chile doesn't matter the Lean way of thinking in a conventional manner or Lean administration instruments; hence, it is important to evaluate the administration practices, execution, and authoritative rationale that are as of now created in these kinds of activities. This is basic to see how experts who are associated with the advancement of air terminal venture configuration collaborate. The target of this paper is to comprehend the working and execution of the impermanent associations that are created in the advancement of the air terminal task plan. To accomplish this objective, it is important to survey Lean administration practices, execution, and connection among the experts of this transitory association. This was done in nine Chilean air terminal undertakings that showed a comprehensive administration of necessities; nonetheless, this does exclude the entirety of the partners, which produces low degrees of association in the association, straightforwardly influencing the presentation of the task because of undeniable degrees of improvement.

Haddach, Ammari, and Laglaoui, (2016) examined the part of lean, ecological, and social practices in expanding an association's general presentation. The organizations face a contest progressively sharp. In this unique circumstance, the appropriation of Lean practices is profoundly requested. It intends to speed up the stream, to lessen non-esteem added, as a feature of a persistent improvement measure. Besides, since the 90s, supportable advancement is a developing interest. Corporate social duty (CSR) is the organization's commitment to maintainable improvement issues. This methodology is for organizations to consider the social and natural effects of their action to receive the most ideal practices and add to the advancement of society and the insurance of the climate. Writing proposes that choosing independent acts of lean, ecological and social decidedly affect firm manageability execution. Our objective in this investigation is to show the effect of different mixes of lean, natural, and social practices on firm monetary, ecological, social, and general execution.

Chavez et al. (2020) examined the connection between inner lean practices and feasible execution: by investigating the intervening job of social execution. This investigation explains the connection between interior lean practices (ILP) and maintainable execution



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utilizing the triple primary concern system (for example social, natural, and operational). A reasonable model grounded in the common asset-based view and asset organization hypothesis is observationally tried utilizing information gathered from assembling organizations in Chile. The overview information is dissected utilizing primary condition displaying. The outcomes uncover that ILP is all together and emphatically connected with ecological execution and social execution. Further, social execution was found to completely intervene in the connection between ILP & operational execution, and incompletely intercede the impact of ILP on ecological execution.

Hypothesis Development

H1: Lean technical practices (LTP) correlated with lean social practices (LSP)

H2: There is a beneficial outcome of lean social practices (LSP) on hierarchical execution

H3: There is a beneficial outcome of lean social practices (LSP) on hierarchical execution

Research Methods

Method of Data Collection

The strategy for gathering information is a huge period of exploration. It is fundamental for the analyst to gather information from the predefined technique. The assortment of information is isolated into two significant classes. These 2 kinds of information assortment strategies are Primary information & Secondary information assortment technique. In this research study, the data is collected through a survey questionnaire for analyzing the data. Moreover, the data is collected from the secondary sources that have been included in the literature review

Sampling Technique

Every researcher must select the right technology to steer research in the right direction. The sample size is an important aspect of any experimental study that involves interpreting the sample population. In most cases, we can only set the minimum sample size to support a single parameter. Probabilistic samples & non-probabilistic samples are two sampling methods. For this research, a potential sample should be selected to collect data from r&om manufacturing companies to achieve the goal (Tongo, 2007).

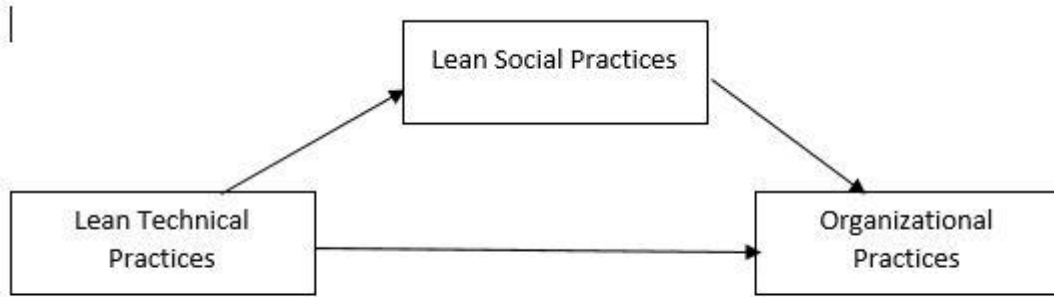
Sample Size

In this study, Haier et al. (2010) approach is used to calculate the sample size. With this approach, we know how much data have to gather for research. For this research, the sample is 130 respondents which would be helpful to convey the examination in the correct way (Hair et al., 2012). The data is collected from r&om manufacturing companies of Pakistan to examine the approach of lean toward sustainable performances.

Data Source & Instrumentation: (Questionnaire design & source of adoption/adaption)

To examine the relationship & impact between the variables, it is necessary to showcase the items used in the research & the source of adaptability.

Research Model Development



Statistical Techniques

The information investigation is another critical way to deal with the exploration study. It is significant for the scientist to exhibit the utilization of the factual method for the information investigation methodology. The PLS-SEM is utilized to analyze the methodology of lean & green toward supportable exhibitions. The test remembers for this exploration study are the discriminatory legitimacy, dependability & legitimacy & intermingling legitimacy. These all will be tried through PLS Algorithm, Bootstrapping, & Blindfolding.

Data Analysis

With the help of data screening, a total of 3 out of range values were found in the data & 4 multivariate outliers were found in the data.

Demographic Profile

Table 1 includes demographic information of the respondents. It consists of gender, age, qualification, frequency of experience, last used & the ambulance service used.

TABLE 1: DEMOGRAPHIC

Age	Count	Percentage %
20-24 years old	84	28
25-27 years old	60	20
28-30 years old	81	27
more than 31 years old	75	25
Gr& Total	300	
Gender	Count	
Female	75	25
Male	225	75
Gr& Total	300	
Education	Count	
Graduated	144	48
Masters	132	44
Others	24	8
Gr& Total	300	
Designation level	Count	
Assistant Managers	69	23
Deputy Managers	9	3

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Managers	48	16
Others	171	57
Senior Managers	3	1
(blank)		0
Gr& Total	300	
Experience	Count	
1 to 5 years	150	50
5 to 10 years	63	21
More than 10 years	60	20
Others	27	9
Gr& Total	300	

Interpretation:

The above table shows that the data is collected from the specified supply chain professionals in which low-level managers participated with the number of 75 which is about 80% of the total participants of this research study. As the specified model is based on the core expertise of the supply chain, therefore the participants of low level & middle level are highly appreciated. Moreover, it can be noticed that most of the participants are master's graduates & having experience of 3 years of experience.

Structural Equation Modeling

Structural Equation Modeling (SEM) is an optimized method for multiple regression analysis. In the multiple regression analysis, the researcher observed that the number of dependent variables was limited to only one, while the number of independent variables in the SEM was not limited. Hence, it can be stated that search engine marketing is more complex & more advanced methodologically rigorous. (Fornell & Bookstein, 1982; Hair et al., 2016).

Outer model measurement**Convergent validity**

The convergent validity relies upon the degree to which two development measures are hypothetically indistinguishable (Ahmed & Najmi, 2018). As per scientists, it depends on the possibility that the hypothetical premise of corresponded estimations that coordinated toward measurable arrangement. Table 2 shows the normal fluctuation separated (AVE) & composite dependability (CR) results as markers for surveying concurrent legitimacy

Table 2:
Convergent Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
LS P	0.882	0.885	0.913	0.679
LT P	0.869	0.872	0.905	0.657
OP	0.861	0.866	0.900	0.644



Table 2 featured the results of merged legitimacy as determined by the specialist Hair et al. (2016). There are 3 strategies to gauge the degrees of merged legitimacy. In the first place, it is affirmed with the worth of CR should be more prominent than 0.7. Furthermore, the following huge section is AVE which should be more noteworthy than 0.5, a perceived edge for united imperativeness (Hair et al. 2016; Fornell and Larcker, 1981). Table 2 shows that the entirety of the above qualities is in reach to affirm the merged legitimacy suspicions. All the CR esteem is above 0.7 and every one of the qualities for the AVE is above 0.5 which shows that our testing model impeccably acknowledges the theory.

Discriminant validity

Discriminatory validity is defined as the degree to which several elements distinguish a variable from other variables in the specified model. In other words, Discriminatory validity assesses the presence of a contrast between the combinations of two discrete functions supported by the theory (Fornell & Larcker, 1981). The discriminatory validity can be analyzed using three criteria. First, all elements of the table must be firmly loaded in their respective variables & the transverse loads must be greater than 0.1 (Gefen & Straub, 2005).

Second, the differential validity approach proposed by Fornell & Larcker (1981) states that the correlation matrix, which shows the square root of the AVE & has diagonal values must be larger than the row & the column. The third criterion for checking the separation is the HTMT heterotrait monotrait testing method. Hensler et al. (2017) suggested that the correlation values in HTMT should not be greater than 1.

Table 3 confirms the validity of the discrimination when the lateral load difference exceeds 0.1. Table 4 shows that the correlation matrix has a series of numbers that represent the square base of the AVE with the supreme worth of its relationships with the design in the segments & lines. The cross-line esteems are bigger than the line & segment esteems, affirming the approval of the separation. Thusly, the examination showed the legitimacy of the oppressive Fornell & Larcker legitimacy st&ard.

Table 5 shows that not all HTMT values are higher than 0.95 & therefore the discriminatory validity of the three measures was determined. This has also provided an inherent foundation for loading in the right factors & developing structures.

Table 3:

Factor Analysis Results

	LSP	LTP	OP
LSP1	0.790	0.588	0.533
LSP2	0.830	0.611	0.584
LSP3	0.858	0.654	0.684
LSP4	0.821	0.589	0.616
LSP5	0.820	0.619	0.703
LTP1	0.633	0.857	0.627
LTP2	0.591	0.786	0.556
LTP3	0.610	0.836	0.618
LTP4	0.584	0.791	0.507
LTP5	0.597	0.781	0.540
OP1	0.702	0.586	0.841
OP2	0.544	0.578	0.797
OP3	0.602	0.582	0.845
OP4	0.485	0.555	0.758
OP5	0.689	0.528	0.767



Table 3b:
Factor Loadings Significant

		Original Sample (O)	Standard (STDEV)	Deviation (O/STDEV)	T (O/STDEV)	Statistics (P Values)
LSP1	<-	0.790	0.037		21.126	0.000
LSP						
LSP2	<-	0.830	0.023		36.504	0.000
LSP						
LSP3	<-	0.858	0.019		46.377	0.000
LSP						
LSP4	<-	0.821	0.034		23.831	0.000
LSP						
LSP5	<-	0.820	0.021		38.261	0.000
LSP						
LTP1	<-	0.857	0.017		49.993	0.000
LTP						
LTP2	<-	0.786	0.024		32.507	0.000
LTP						
LTP3	<-	0.836	0.021		38.964	0.000
LTP						
LTP4	<-	0.791	0.029		27.422	0.000
LTP						
LTP5	<-	0.781	0.033		23.489	0.000
LTP						
OP1 <- OP		0.841	0.020		42.817	0.000
OP2 <- OP		0.797	0.027		29.406	0.000
OP3 <- OP		0.845	0.022		38.431	0.000
OP4 <- OP		0.758	0.036		21.297	0.000
OP5 <- OP		0.767	0.031		24.480	0.000

Table 4:
Fornell & Larcker

	LSP	LTP	OP
LSP	0.824		
LTP	0.744	0.811	
OP	0.761	0.705	0.802

Table 5:
Heterotrait-monotrait ratio (HTMT) results

	LSP	LTP	OP
LSP			
LTP	0.849		
OP	0.860	0.813	

After breaking down & setting up the external model, the following stage is to look at proposed theories by utilizing Smart PLS 3.2.3 (Ringle et al., 2015). To assess the primary model, the half-way least-squares investigation utilizes bootstrapping (Haenlein & Kaplan, 2004). Results have been accounted for in Figure 1 & Table 7, utilizing a bootstrap resampling system of 5,000 subsamples (Hair et al., 2016).

Figure 1:
SEM output (factor loadings & path coefficients)

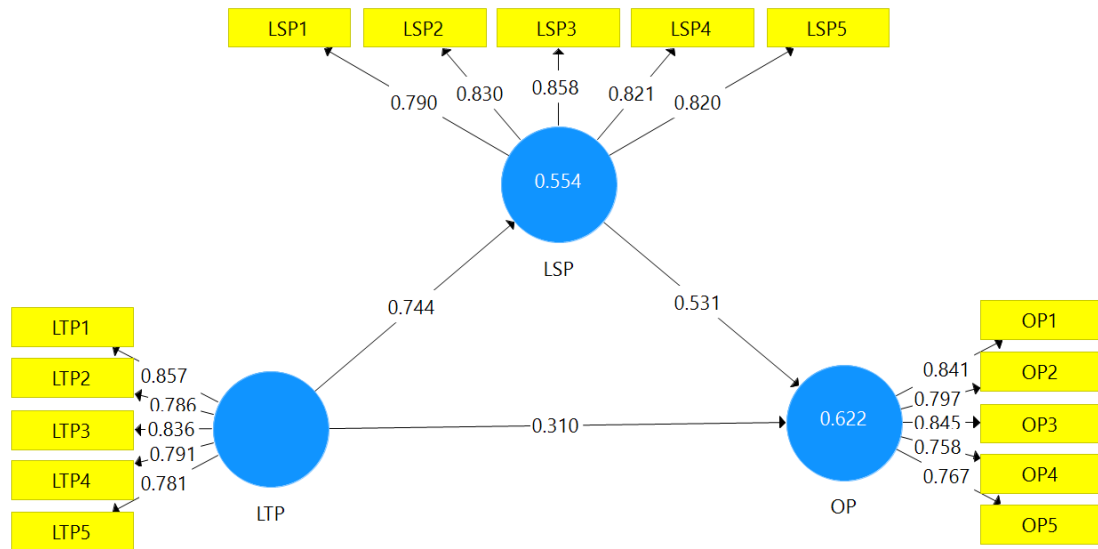


Figure 2:
SEM output (T-statistics)

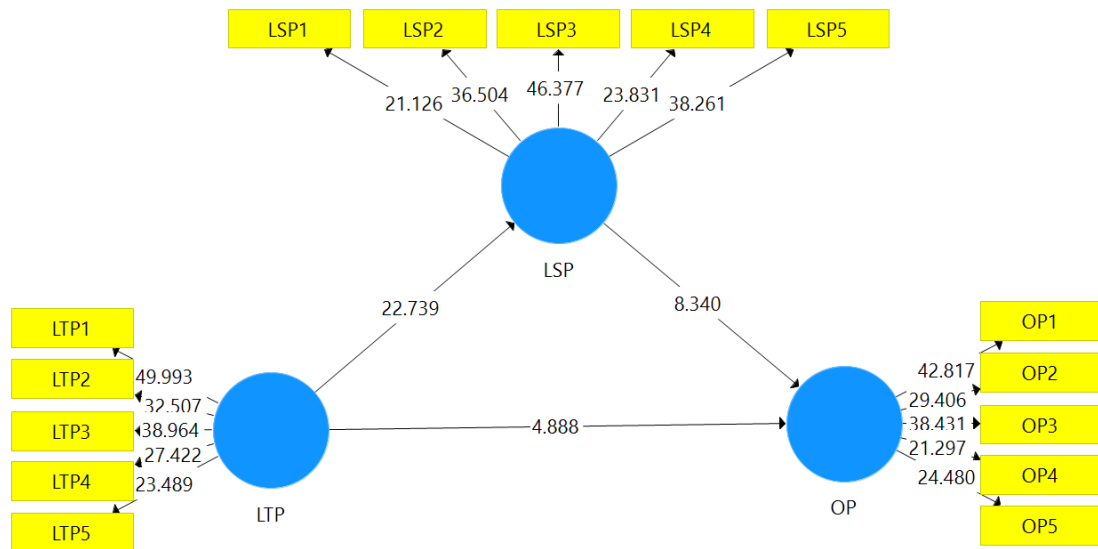


Table 7:
Hypothesis Test Results

	Original Sample (O)	Sample Mean (M)	St&ard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
LSP -> OP	0.531	0.527	0.064	8.340	0.000

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LTP ->	0.744	0.742	0.033	22.739	0.000
LSP					
LTP ->	0.310	0.311	0.063	4.888	0.000
OP					

The above table shows that all the variables are positively associated with the supply chain performance & their respective dependencies. However, the association with supply chain resilience is different from other variables' impact. Cooperation has an insignificant impact on supply chain resilience as it is a risk factor & due to increase in the risk can affect the corporation but not in a greater way. Furthermore, the impact of supply chain resilience on supply chain performance has a negative & insignificant impact as if the risk will increase the performance of the supply chain will be affected therefore, this approach is also considered the valid approach in terms of supply chain performance in the market. The rest of the variable such as commitment, trust, and communication all has a positive & significant impact on their dependent variables.

Table 8:

Predictive Power of the Construct

	Base Square	Q² (=1-SSE/SSO)
LSP	0.554	0.372
OP	0.622	0.393

CONCLUSION**Introduction**

This chapter provides the key findings of the study, recommendations, & areas for future research. Besides, managerial implications would also be discussed in detail.

Discussion

In the present serious climate, little & medium-sized organizations need to rival worldwide makers with excellent items versus low costs. Subsequently, little & medium-sized assembling organizations need to zero in on expanding usefulness to convey their items on schedule & at reasonable costs. For this scenario, small & medium-sized enterprises have used simple practices to improve the various dimensions of organizational work. However, many small & medium-sized businesses were unable to get the results they wanted from quick experimentation because the implementation method focused only on complex technical practices & short-term benefits. In addition, insufficient attention was paid to the human aspects at the time of implementation.

To address the research scenario, this study set out to investigate how Lean's technical and social experiences affect organizational work in SMEs. The findings revealed that both the technical and social experience frameworks boosted organizational effectiveness. Furthermore, the findings revealed that both Lean Social Practices (LSP) and Lean Technical Practices (LTP) have an unavoidable impact on organizational performance. The importance of the relationship between light and technical public practices was discovered, as was the strong link between quiet public practices, safe technological practices, and organizational work.

Recommendation & Future Implications

This study suggested eight research viewpoints, however, it only evaluated five of them; the other three will be studied in future studies. First, various implementation and categorization hurdles for SMEs as technical and social barriers may be addressed in a future study to produce the primary barriers for SMEs. Second, future research could inspect the



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connection between safe practices, improvement measures & the presentation of SMEs. Subsequently, future examination ought to likewise look at changed techniques for lean initiative & their effect on crafted by SMEs.

Future research can be directed to different manufacturing sectors, & research can be done in the service sector to validate research results. Detailed examples & in-depth research in developing countries can be done to confirm the effects of a comfortable living experience. This study considered the four best simple exercise packages in each literature-based social & technical experiment. Future research could therefore examine the remaining packages, which may be related to a particular sector & country. With the help of advanced statistical models, various performance indicators for SMEs can be examined.

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