Chapter

Effect of Lean Practices on Organizational Performance

Lokpriya Mohanrao Gaikwad and Vivek K. Sunnapwar

Abstract

The study focuses on the analysis of the direct effect of Lean Manufacturing (LM) practices on operational performance in manufacturing industry. A model for evaluating the effect of LM is developed taking into consideration as a fundamental variable that affects the causal relationship between LM practices and operational performance. A structural equation model was proposed and investigated across the manufacturing industry in India. A structured survey questionnaire was used to collect empirical data from 400 Indian companies. A total of 203 usable responses were obtained giving a response rate of 53%. The data was analyzed using SPSS-AMOS software. The results revealed that LM practices directly and positively affected operational performance. The results indicated that the structural equation model remained invariant across the Industry. The study provides further evidence to managers and practitioner on the effect of LM practices on operational performance in developing countries like India.

Keywords: Lean Manufacturing, Lean practices, organizational performance

1. Introduction

The present powerful market is described by more limited item life cycles and the expanding individualization of items. Along with expanding worldwide rivalry, this puts pressure both on manufacturing organizations' adaptability and on asset effectiveness to satisfy customer need and stay serious [1]. To address these difficulties, manufacturing organizations are compelled to persistently look for new ways to deal with improve their operational performance. Lean manufacturing has over the most recent twenty years seemingly been the most unmistakable approach for improving the operational performance in manufacturing organizations [2, 3]. Based on the straightforward thought of wiping out waste in all forms by focusing in on the exercises that make an incentive for the client [4], it is a low-tech constant improvement approach that centers on representative strengthening and the smoothing out of manufacturing practices. As of late, the innovation situated Industry 4.0 idea is being marked as the following empowering influence of performance improvement.

Manufacturer work in organization to present new plans of action and advances to improve their manageability execution which coordinates the financial, environmental and social responsibilities. Lean manufacturing is a coordinated arrangement of socio-specialized practices planned to consistently dispose of waste to make value and construct a smoothed out, excellent framework [5]. Attributable to the interrelationship among Lean practices, some Lean groups are framed, e.g., just in

time (JIT), total quality management (TQM), and human resource management (HRM). They form the basis of Lean creation, every one of which contains a bunch of interrelated and inside steady Lean practices [5, 6]. For instance, JIT incorporates arrangement decrease and little part size. For the most part, manageable execution is worried about a firm's capacity to at the same time consider and balance financial, ecological, and social issues in the conveyance of items or administrations in order to augment esteem [7–9]. It ought to be noticed that practical exhibition in this investigation is characterized as far as its financial and ecological execution measurements. The social performance measurement is excluded. Accordingly, we try to look at if our investigation can discover a route for sustainability minded manufacturer to adjust benefit improvement and natural manageability, which has been at the focal point of consideration among policymakers and the scholarly community [10, 11].

2. Literature review

Lean manufacturing targets reducing waste and non-value added exercises [4]. Inside, underway, this is showed through, in addition to other things, smoothed out, stable, and normalized measures; insignificant inventories; the one-piece stream of items; creation dependent on genuine downstream demand; short setup times; and workers being associated with continuous improvement endeavors [12]. Gaikwad and Sunnapawar [13] opined that if Lean, Green, and Six Sigma strategies help the manufacturing firms to compete in global markets through the impact of sustainable strategy for their business.

Every one of these angles can uphold upgrades in various components of operational performance, for example, item quality and manufacturing cost, lead time, adaptability, and dependability [14]. Since Lean manufacturing was advocated and turned into a standard administration approach, there have been various investigations targeting estimating the real impact of Lean manufacturing on operational performance [15]. Krafcik [16] begat the term Lean and introduced one of the primary examinations to contrast Lean manufactures and common large scale manufacturing firms. Mackelprang and Nair [17] did a meta-examination of 25 articles exploring the connection between Lean practices and execution. While the operationalization of Lean manufacturing rehearses and operational execution will in general shift between examines, the agreement is that the appropriation of Lean manufacturing is emphatically connected with operational execution improvement [17]. Aims of Lean production are to recognize and dispense with the production process wastages for quality improvement, cost decrease, on-time delivery, for example to make effective production processes to confront the most noteworthy rivalry level, so Lean is the most recent device to accomplish it and it getting increasingly remarkable to improve operational and competitive performance [18].

3. Methodology

The empirical data used in this study were collected through a survey distributed to Indian manufacturers that already implemented total quality management practices. The underlying example comprised of all the manufacturing organizations which were on the mailing rundown of an information sharing stage for manufacturing logistics. This underlying example comprised of 400 Indian manufacturing organizations, addressing a wide scope of sectors and company sizes. To the most awesome aspect our insight, the underlying example reflects the Indian business. The link to the survey was disseminated through email, and an aggregate

of 212 responses were gathered through an online survey tool. Of these, one of the returned responses needed answers for a few inquiries and was consequently eliminated from the final sample. This examination consequently wound up with a final sample of 203 respondents and a response pace of 53% was noticed.

The study instrument was approved by researching three perspectives: content validity, construct validity, and reliability. To guarantee content validity, a draft survey was pre-tried by two free scholastics with experience in both research project and industry. Also, the survey depended on all around tried and perceived things that have been utilized effectively in different examinations. To evaluate the construct validity, we thought about two viewpoints: convergent validity and discriminant validity [19]. To evaluate convergent validity, we initially examined the unidimensionality of the measures through principal component analysis.

Following the proposals of Carmines and Zeller [20], the things for every one of the constructs were researched independently. For the entirety of the constructs, the Kaiser-Meyer-Olkin measure of sampling adequacy was over the suggested limit of 0.5, and Bartlett's test of sphericity returned p-values beneath 0.001. For all of the autonomous constructs, the items loaded on a single factor, the eigen value surpassed 1.0, the complete difference clarified surpassed half, and all the items' factor loadings were above 0.5, supporting unidimensionality. As added test of convergent validity, the average variance extracted (AVE) and composite reliability (CR) were determined. The recommended thresholds for good convergent validity for these two tests are AVE > 0.5 and CR > 0.7 [21]. For the autonomous factors, the values are over the recommended variables. The dependent variable, operational performance is made out of numerous, unique performance measurements. This implies that the loading factors and thus, AVE and CR will fundamentally be to some degree lower for this construct yet at the same time adequate, as recently proposed by Prajogo and Olhager [22]. To survey discriminant validity, we followed the proposals of Fornell and Larcker [23]. They recommend that to guarantee discriminant validity, the AVE for each construct ought to be more prominent than the square of the construct's bivariate relationships with different constructs. In all cases, this rule was fulfilled. In light of these tests, we expected adequate build legitimacy. To test reliability, the Cronbach's alpha coefficient was determined for every one of the summated scales. All the summated scales have values over the proposed limit of 0.6 Forza [19] and, as needs be, ought to be dependable for additional investigation.

4. Results and discussion

Following **Figure 1** represent the conceptual framework of Lean practices in which Lean practices such as just in time, total productive maintenance, 5S, value stream mapping, single minute exchange of die, etc. plays important role to enhance social, environmental, financial, and operational performance that results overall business excellence in manufacturing industry.

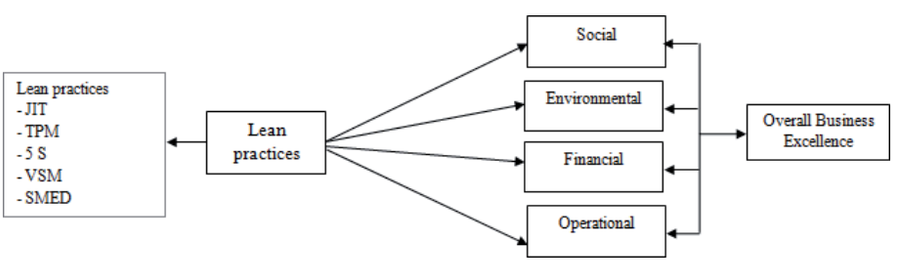

Figure 1.
Conceptual framework of Lean practices.

Structural Equation Model (SEM) for Lean practices and performances:

Figure 2 shows the Structural equation model for Lean practices and its effect on operational, financial, social, and environmental performances.

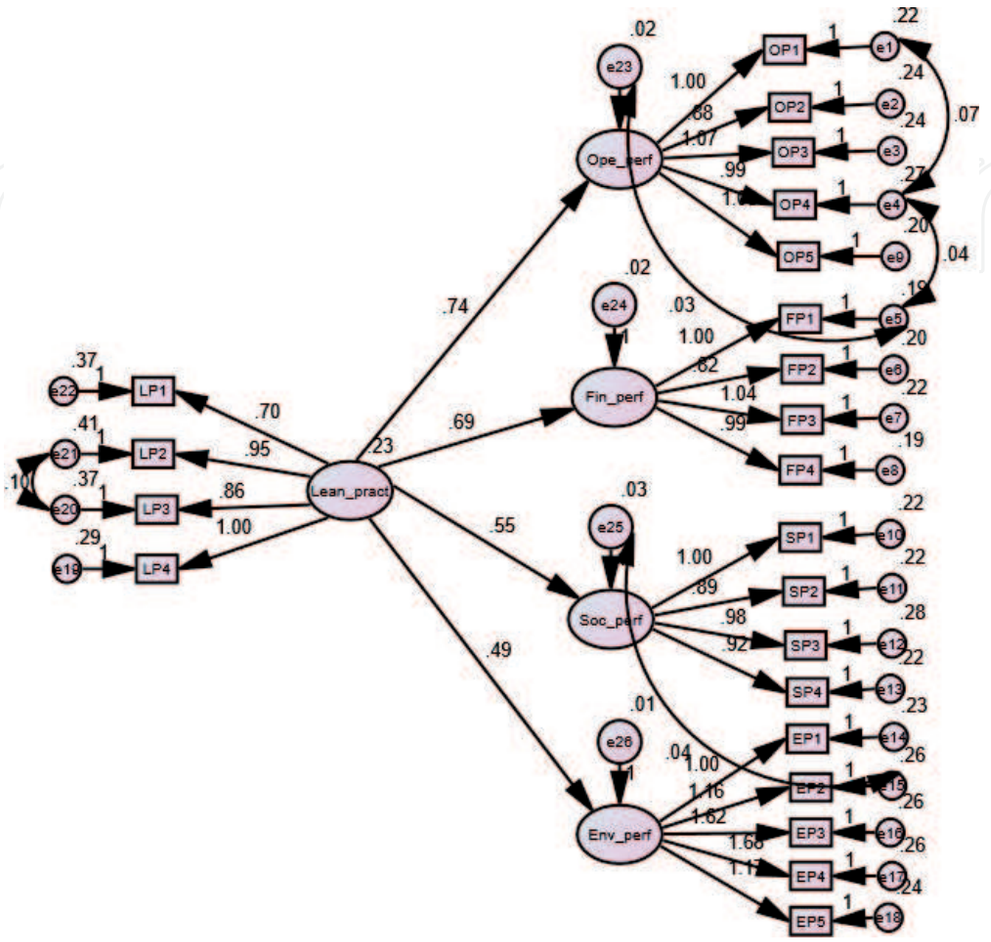

Figure 2.
Structural equation model for Lean practices and performances.

Model Fit Summary
CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	53	239.859	200	.028	1.199
Saturated model	253	.000	0		
Independence model	22	1488.573	231	.000	6.444

CMIN/DF = 1.199, in this case less than 3 is good; less than 5 is sometimes permissible [24].

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.020	.903	.877	.714
Saturated model	.000	1.000		
Independence model	.116	.333	.269	.304

Goodness of fit indices (GFI) is 0.903, should be higher than 0.9 [24].
Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.839	.814	.969	.963	.968
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Comparative fit indices 0.968, (higher than 0.95 great; higher than 0.9 traditional; higher than 0.8 sometimes permissible) [24].
Estimates: Maximum Likelihood Estimates
Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Ope_perf	<---	Lean_pract	.742	.099	7.498	***	
Fin_perf	<---	Lean_pract	.694	.095	7.331	***	
Soc_perf	<---	Lean_pract	.555	.089	6.244	***	
Env_perf	<---	Lean_pract	.493	.086	5.744	***	
OP1	<---	Ope_perf	1.000				
OP2	<---	Ope_perf	.878	.128	6.861	***	
OP3	<---	Ope_perf	1.069	.141	7.599	***	
OP4	<---	Ope_perf	.992	.117	8.460	***	
FP1	<---	Fin_perf	1.000				
FP2	<---	Fin_perf	.821	.126	6.514	***	
FP3	<---	Fin_perf	1.040	.145	7.175	***	
FP4	<---	Fin_perf	.991	.137	7.228	***	
OP5	<---	Ope_perf	1.027	.132	7.769	***	
SP1	<---	Soc_perf	1.000				
SP2	<---	Soc_perf	.893	.162	5.497	***	
SP3	<---	Soc_perf	.976	.179	5.456	***	
SP4	<---	Soc_perf	.919	.164	5.606	***	
EP1	<---	Env_perf	1.000				
EP2	<---	Env_perf	1.160	.225	5.150	***	
EP3	<---	Env_perf	1.619	.279	5.794	***	
EP4	<---	Env_perf	1.676	.286	5.853	***	
EP5	<---	Env_perf	1.175	.224	5.239	***	
LP4	<---	Lean_pract	1.000				
LP3	<---	Lean_pract	.857	.122	7.046	***	
LP2	<---	Lean_pract	.954	.131	7.277	***	
LP1	<---	Lean_pract	.698	.113	6.155	***	

From the above table, it is observed that Lean practices are positively affected on operational, social, environmental, and financial performances ($p \leq 0.05$).

Notes for Model

Computation of degrees of freedom (Default model)

Number of distinct sample moments:	253
Number of distinct parameters to be estimated:	53
Degrees of freedom (253–53):	200

Result

Minimum was achieved

Chi-square = 239.859

Degrees of freedom = 200

Probability level = .028

5. Conclusion

A significant territory to explore is the role Lean manufacturing will play in this new modern period. This examination has reviewed the utilization of various arising advanced innovations just as set up Lean manufacturing practices to explore their relationship with operational performance in manufacturing. It reveals how Lean practices impact sustainable performance. By analyzing data from 203 manufacturing firms, we show that the firm should manage Lean practices in an integrated and coordinated way.

This study adds to explore on manufacturing improvement activities by researching the impact of both Lean manufacturing on operational performance. This examination pointed toward covering the exploration gap with respect to the intelligent impacts of Lean manufacturing on operational execution recently called attention to by Buer, Strandhagen, and Chan [25], just as tending to a portion of the impediments in the prior, comparative investigations. Lean manufacturing has for quite some time been viewed as the 'go-to' answer for improved operational execution and making an improvement culture in the organization. Rinehart, Huxley, and Robertson [26] undoubtedly recommended that Lean manufacturing 'will be the standard production method of the twenty-first century. The operational advantages of utilizing Lean manufacturing have been demonstrated in various past examinations and the aftereffects of the current investigation uphold those discoveries.

The discoveries from the structural equation model confirmed that Lean is as yet an important wellspring of competitive advantage. Albeit large numbers of the thoughts and techniques in Lean manufacturing can be followed far back, the emphasis on making an incentive for the client and decreasing waste are thoughts that will not get old, paying little mind to the mechanical advances that occur.

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