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The Effect of Lean Manufacturing on the Financial Performance: Case of the Manufacturing Companies in South Lebanon

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ARTICLE DETAILS	ABSTRACT
<p>History Revised format: November 2019 Available Online: December 2019</p>	<p>Businesses have been trying to implement new business initiatives such as lean manufacturing to stay alive in the latest competitive market place. Such initiative concentrates on cost reduction by removing the non-value added activities to achieve better financial performance. This study examined the effect of lean manufacturing on financial performance from the perspective of managers in the industrial sector in South Lebanon. The methodology of this study was quantitative in which 152 self-administered questionnaires were distributed randomly among managers. The data was analyzed using SPSS software. Descriptive statistics were identified and proposed hypotheses were tested using Pearson correlation and regression analysis. The results showed that lean manufacturing has a significant and positive effect on financial performance. Future studies are encouraged to expand the research to other regions in Lebanon over a longer time horizon and apply different quality improvement tools.</p>
<p>Keywords Lean Manufacturing, Financial Performance, Investment, South Lebanon.</p>	
<p>JEL Classification: O14, G20, G23</p>	

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1. Introduction

One of the main contributors to the economy is the manufacturing sector as it has the most important role and a significant influence over the economic development of any country at both local and international level (Matar and Eneizan, 2018). Currently and due to the rapid changing era and in the global competition, only those companies can compete and achieve their performance by focusing on costs and quality. Thus, companies today are seeking to compete through quality management for improved efficiency in operational, innovation and financial performance. Such strategies allow manufacturing firms to advance quality, eliminate costs and enhance customers' service.

Lean Manufacturing is the backbone of efficient manufacturing and is significant to the achievement of manufacturing firm by turning the waste into profit. Therefore Manufacturing firms should recognize wastes in every manufacturing operation and proposes accurate solutions for eliminating them and consequently improving the profitability of the firm (Margarossian, 2017; Mwelu, et al., 2014; Moori, et al., 2013).

The present business situation colored by strong competition and alarming rise in the cost of raw materials, has notified many manufacturing companies to follow programs that would reduce waste and diminish manufacturing costs (Marguarossian, 2017).

Since 1975, Lebanon is moving from one conflict to another, the economy is going through hurtful cycle driven by extreme volatility relying on inflows rather on productive sectors, in addition to corruption and fiscal challenges driving un-conducive business environment. The quality of Moving to the Lebanese infrastructure, it is amongst the poorest in the world, ranked 130 out of 137 countries (Kemayel, 2015). The county's obligation burden as well as the lack of official budgets from 2005 to 2016, has resulted in a huge fall in public spending on infrastructure. Moreover, according to Transparency International (2017), it is indicated that Lebanon is one of the most corrupt countries in the world, which intensifies inequalities, but also affects badly the business climate and foreign investment. Businesses are hindered by different networks that monopolize the economy and avoid competitiveness (OECD, 2018).

Overall the manufacturing sector is concentrated around key industries where food and beverages make up 26%, Factories manufacturing construction materials grabbed 12% of the total, while both of the Chemical and Furniture and Wood Products industries grabbed a similar 8% share of the total number of establishments (Hadhri et al., 2016). Consequently, Lebanon's real Gross Domestic Product (GDP) growth fell from an average of 8 percent during the period 2007-2010 to an average of 1.5 percent during the period 2012-2018 (UNHCR, 2019). Throughout the last years, the GDP growth was stagnant and the government deficit became 9.3% of GDP. Furthermore, in 2018, poor growth was accompanied by large and increasing fiscal deficits, estimated at around 10 percent as public finances seriously deteriorated. High and rising fiscal deficits over the years, coupled with poor growth resulted in a debt-to-GDP of 152 percent by the end of 2018, the third highest in the world (UNDP, 2018).

According to Khlaf, et al. (2014), Lebanon is looking forward for implementing lean principles but managers should be trained to the leadership style in lean implementation to learn how to spread a lean culture, organize communication strategy, assess application progress, motivate their employees and solve problems. However, Mazanai (2012) argued that with this growing global economy, cost effective manufacturing has become a necessity to stay competitive, businesses must be competent of manufacturing great quality goods at a low cost, and also deliver a first-class customer service. Lean manufacturing is one of these programs that concentrate on cost reduction by removing the on-value added activities (Abdullah, 2003).

Therefore, the main objective of this study is to identify to which extent the manufacturing companies in South Lebanon are implementing lean tools and to study the effect of lean manufacturing on the financial performance of these companies.

2. Literature Review

2.1 Lean Manufacturing

The word lean refers "to a series of solutions to reduce waste and non-value tasks and enhance the value-added procedure". As the concept, lean is originated from Toyota production system and the main idea of TPS is to create the number of units needed, at the time needed and, in the amounts, needed, in a way, that unnecessary product portfolio can be removed. The main three goals of cost reduction are superior quality control, quality assurance and humanity respect. By this, the origin of TPS is the complete elimination of waste and two important pillar are need to encourage this TPS are JIT and automation- Jidoka (Durakovic et al., 2018). Hence, manufacturing companies are implementing lean methods in order to boost their financial and operational performance.

The core points of lean manufacturing is eliminating waste that occurs in the production process, creating quality into the production process, reducing costs and formulating tools that will increase value to the company's functional performance (Durakovic et al., 2018). In practice, businesses after implementing lean find out that it is not an easy journal with an assured successful end. Unsuccessful lean implementation could have a huge effect on company's resources and on employees and their confidence in lean philosophy. Many frameworks and roadmaps have been established to direct companies to implement and apply lean manufacturing philosophy (AlManei et al., 2017).

In fact, lean tools are used to enhance the manufacturing performance through responding to market demands in numerous dimensions, such as better-quality products, cost reduction and faster delivery. Therefore, shorter lead-

time is attained leading again to a faster respond time. The capability to deliver products quickly is one of the most important differentiators for companies implementing lean manufacturing. This reduction in money can be used in other places for other purposes resulting in lower working capital requirements and better financial performance (Mahmood, 2014).

2.2 Financial Performance

The main goal of investors while investing in a certain business is to improve their own wealth and value. Therefore, performance of companies must offer a clue of how wealthier a shareholder is due to an investment over a certain period. In financial terms, performance is based on how healthy a firm is and to what extent assets are used to generate revenues. Financial measurements are one of the essential keys to success, when implemented and applied correctly can change the organization. Financial measurement is vital for higher performance, success and improvement. Financial performance delivers a competitive advantage for firms using it in order to manage and direct systems, process and strategy with increasing consistency and efficiency. Each system in any company should be emphasized by measurement making it such an important aspect (Sirviö, 2014).

Successful investments involve a careful evaluation of the investment's possible returns and risks of loss. A company's expected return and risk directly affect its share price. In every-day world, the risk of a certain investment would not be perceived independently from other assets. Any new investments should be studied in the light of their effect on returns and risks of the portfolio of assets. The financial analysis of the investment management permits investors to evaluate and measure the return and risk from individual investments (Baran et al., 2016).

The challenge of the industrial sector is to improve and enhance their business performance mainly in cost, productivity and quality in order to compete in the international market. From a research done by Fullerton in 2014, Fullerton indicates that there is a positive relationship between business performance and lean manufacturing where diverse conditions may lead to diverse results triggered by the effect of different factors. Financial measurements consist of return on investments, returns on assets, returns on equity, liquidity, profitability and cash flow (Ataalah et al., 2016).

2.3 Relationship between Lean Manufacturing and Financial Performance

With the increasing industry competitiveness, manufacturing firms are aiming for a better improvement in their industry by focusing on the specific needs of the companies, each company should be capable of applying tactics and strategies for the development of programs and fulfillment of gaps concerning the market specialized needs and the manufacturing abilities of the business. They should be well defined and clear in what they are planning to achieve improvements in the operational performance strategy.

In 2005 Melton identified key techniques and tools in the lean system such as Kanban, Single-Minute Exchange of Dies (SMED), 5S and many more that results in better manufacturing performance. Wilson, Bhuiyan, and Baghel in 2006 indicated that lean production was one of several oldest enhancement methodologies, offering high value to consumers using the greatest practices like Kanban, 5S and mistake proofing. Furthermore, Benson and Ahmad in 1999 identified that Kanban, just in time (JIT), total productive maintenance, SMED, and Poka-Yoke as the most suitable tools for enhancing manufacturing financial performance (Hasan et al., 2017).

Klassen and Corbet in their study about the impact of lean manufacturing on the firm's sustainability showed better financial returns through gaining new customers, eliminating cost through reducing waste and competitive differentiation (Iranmanesh et al., 2019). According to Lenox and King (2001), in their study about lean manufacturing and environmental performance, discussed that lean practices contribute to financial performance by carrying down the managerial cost by lowering pollution, they agree that there is a positive relationship between financial performance and lean manufacturing (King and Lenox, 2001). Also, by using the survey of 711 companies from different industries through 23 countries and gathering data through 2005-2006, Matyusz and Demter established that companies implementing lean techniques and tools have greater inventory turnover and better financial performance from the companies that didn't implement lean in its production (Demeter and Matyusz, 2010).

A similar study was conducted in 2015, Yousef, Abd-Elrahman and Hendy in their study aimed to assess the potential financial and operational improvements of applying lean manufacturing through lean accounting tools. By

using a case study on the cement factory of Misr Cement Co. in Egypt, they establish lean accounting tools such as Value Stream Cost (VSC) and Box Scores to examine the whole potential benefits of lean improvements. The result was a potential development and improvement in the flow of production because of removing waste and the bottle neck, therefore, enhancing the speed of response to the consumers and declining the product lifecycle and deficiencies (Yousef et al., 2015).

A survey done by Vilkas, Koreckaja, Katiliute, and Bagdoniene (2015) on adoption of lean production is made on 41 companies in Lithuanian. The primary data of questionnaire was used to collect the data. The results revealed that the production is planned to support quick introduction of new products and cost-effective mass customization resulting in a better operational and financial reports (Vilkas et al., 2015).

Respectively, the following research framework is developed and the following hypotheses are proposed:

H1: Lean manufacturing is positively and significantly correlated with financial performance of companies in South Lebanon.

H2: Lean manufacturing is significantly and positively affecting the financial performance of companies in South Lebanon.

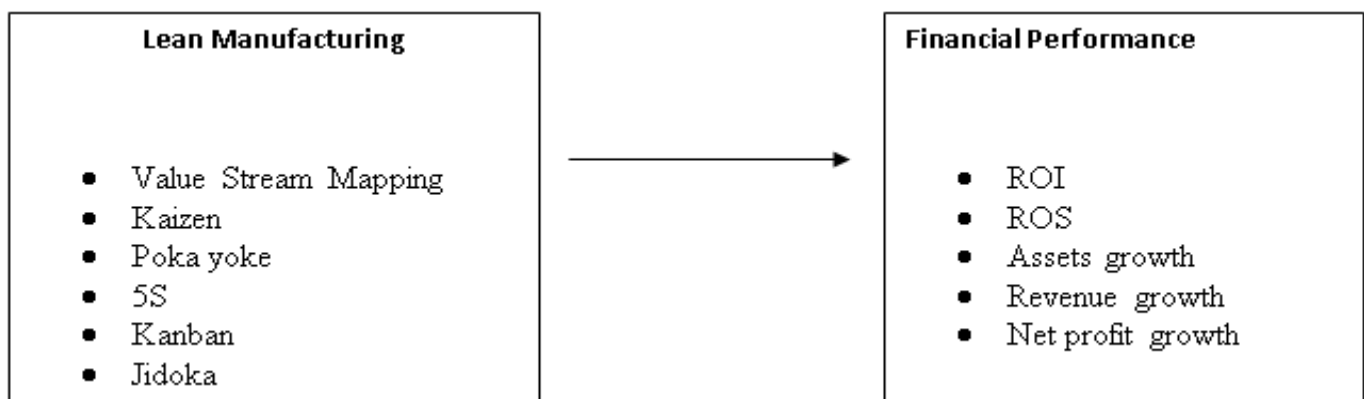


Figure 1: Research Framework

3. Research Methodology

This is a correlational research since it studies the correlation among the variables mainly Lean Manufacturing and Financial Performance. A quantitative methodology was applied in order to reach larger sample of respondents. Moreover, this study adopts the descriptive analysis in order to recognize the description of the demographics of the sample being investigated. For testing the hypothesis and correlation, an explanatory type of research design is applied in order to test correlation and the hypothesis between the variables and consequently to explain the impact of lean manufacturing elements on financial performance.

According to the latest published reports by Ministry of Industry in Lebanon (MOI, 2017), the total number of industrial institutions in Lebanon is 4,703. In absence of detailed statistics about the distribution of these institutions by districts (Mohfaza), the researcher referred to latest statistics of published by MOI (2010). The results showed that total number of industrial institutions was 4033. Particularly, the distribution of industrial establishments by region as shown in Table 1 was 420 establishments.

Table 1: Distribution of industrial establishments by region (MOI, 2010)

Caza	Nb. of establish.	% of total	Workforce	% of total	Area m ²	% of total	Output (000\$)	% of total
Matn	1,101	27.3%	21,136	25.5%	1,497,970	12.9%	1,546,303	22.7%
Zahleh	337	8.4%	8,056	9.7%	1,150,582	9.9%	463,106	6.8%
Aaley	189	4.7%	7,900	9.5%	574,827	5.0%	881,481	13.0%
Kessrwan	173	4.3%	7,092	8.6%	622,907	5.4%	644,138	9.5%
Baabda	340	8.4%	6,504	7.9%	536,820	4.6%	368,623	5.4%
Jbeil	131	3.2%	5,224	6.3%	816,220	7.0%	801,827	11.8%
Beirut	239	5.9%	4,509	5.4%	231,399	2.0%	492,719	7.2%
Baalbeck	334	8.3%	4,069	4.9%	1,218,367	10.5%	163,375	2.4%
Saida	253	6.3%	3,335	4.0%	243,143	2.1%	263,885	3.9%
Chouf	76	1.9%	2,567	3.1%	1,352,733	11.7%	212,024	3.1%
Tripoli	149	3.7%	2,322	2.8%	79,475	0.7%	67,294	1.0%
Batroun	38	0.9%	1,928	2.3%	1,950,174	16.8%	505,006	7.4%
Other Cazas	673	16.7%	8,205	9.9%	1,326,342	10.6%	390,512	5.7%
Total	4,033	100%	82,843	100.0%	11,600,959	100%	6,800,292	100%

As the objective of this research is to focus on manufacturing companies in South Lebanon, clustering sampling is first implemented to identify the target cluster, which is Saida region. Therefore, the target population of this study is 253 industrial institutions in Saida; South Lebanon. By referring to Morgan's sample size table (1970), the best sample size suitable for this population is 152 at 95% confidence interval. Then, the participants of this survey will be selected based on random probability sampling to ensure diversity in respondents.

Structured, self-administered questionnaire were randomly distributed between April and May 2019. The questionnaire contained three main sections; Section "A" is about gaining general information about the participant, involving demographic information. Section "B" measures the attitudes of respondents on different lean implementation practices within the workplace. This part used multiple-choice questions and "five Likert-scale statements, ranging from 1 strongly disagree, to 5 strongly agree". The measurement was based on 10 statements that were adapted from previous valid and reliable literature (Morris, 2011; Hung et al., 2011). As for section "C", it measures the respondents' opinion regarding financial performance of target companies.

4. Data Analysis

4.1 Descriptive Statistics

The software utilized for this study is SPSS. Based on the descriptive statistic results, the lean manufacturing variable has an average mean equal to 3.30 with standard deviation (0.915) Particularly, the mean of lean tools ranged between 2.55 (item 5) and 3.80 (item 10). This means that the minimum implemented tool is visual signs and most implemented tool is the computerization of processes. While financial performance has an average mean equal to 3.23 and standard deviation (1.090). Therefore, majority of respondents have answers ranging between neutral and agree (3-4 scale) about the extent of implementing lean tools and the current financial performance of their companies.

As for the demographic results, the total number of respondents of this study was 77 constituting 51 males and 18 females, which corresponding to 66.2 % and 23.4 % respectively and there is 10.4% missing. This indicates that regarding gender representation, male employees occupied almost greater number of positions than the females in the manufacturing companies. In addition, the age range 20– 30 years old represented 16.9 % of the sample populations, the age ranges 31 – 40 years old represented 31.2 % of the sample population, the age range of 41 – 50

years old represented 32.5 % of the sample population, above 50 years old represents 9.1% and 10.4% missing. The percentages show that the industrial employees were of a wide spectrum age range.

Moreover, 41.6 % of respondents had bachelor's degree; 26% for BT/TS, 13 for High School, 6.5 % for MBA, 2.6% for MPH.

In addition, the results showed that most of the respondents are those with 5 – 10 years of experience in the manufacturing sector represented 45.5 % of the sample population. The second majority of respondents were those with between 11-20 years of experience accumulated 31.2 % of the sample population. In addition, respondents with less than below 5 years of experience were 6.5 %; those above 20 years of experience were 6.5% of the sample population. This indicates that these individuals had adequate knowledge and practice in the industrial sector represented in the study's sample population. Finally, most respondents were Technicians where they represent 49.4 % of the sample, and then administration represents 27.3 % of the sample. Head of production department accounts for 7.8% percent of respondents respectfully, manufacture director accounts 5.2%.

4.2 Reliability and Validity Tests

Reliability test is measured through the Cronbach's alpha which has shown a significant value 0.957 for the 15 items. This value is greater than 0.7, which is the minimum required value of statistical significance. Moreover, validity is measured through exploratory factor analysis (EFA). The "Kaiser-Meyer-Olkin" (KMO) measure of sampling adequacy should be more than 0.5 and the "Bartlett's test of sphericity" should be significant at $p < 0.05$ (Hair et al., 2010; Bartlett et al., 2001). The following table 2 summarizes the results and hence, all KMO values are greater than 0.5 and validity of data is approved.

Table 2: EFA results for Validity test

Constructs	No. of Items	KMO	Bartlett's Test of Sphericity		
			Approx. χ^2	Df	Sig.
Lean Manufacturing	10	0.873	458.101	45	0.000
Financial performance	5	0.898	346.242	10	0.000

4.3 Correlation Tests

Table 3 shows the results of Pearson correlation test. Lean Manufacturing is significantly and positively correlated with financial performance ($r=0.893$; $p=0.00<0.01$). Therefore, H1 is accepted. The positive correlation exists by 89.3 %, between the two variables indicating the relationship between them.

Table 3: Correlation table between Lean Manufacturing and financial performance

		TotalLeanMan	TotalFP
TotalLeanMan	Pearson Correlation	1	0.893**
	Sig. (2-tailed)		0.000
	N	152	152
TotalFP	Pearson Correlation	0.893**	1
	Sig. (2-tailed)	0.000	
	N	152	152

** . Correlation is significant at the 0.01 level (2-tailed).

4.4 Regression Analysis

Regression analysis was conducted to empirically determine whether lean manufacturing was a statistically significant determinant of the financial income. As shown in the model summary table 4, the goodness fit for the regression between lean manufacturing and financial performance was significant. An R squared of 0.798 indicates that holding other factors constant, 79.8% of the variations in lean manufacturing were explained by the variations in financial performance.

Table 4: Model Fit

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	64.474	1	64.474	265.077	.000 ^a
	Residual	16.296	151	.243		
	Total	80.770	152			

a. Predictors: (Constant), TotalLeanMan

b. Dependent Variable: TotalFP

ANOVA statistics in the table 5 below indicated that the overall model was significant. The F statistics is 265.077, which could indicate the significant effect of lean manufacturing on financial performance. Therefore, the regression model is a good fit of the data and there is a statistical significance since the p value 0.000 is less than 0.05.

Table 5: ANOVA Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
		1	(Constant)	-.280			.224		-1.250	.216
	TotalLeanMan	1.065	.065	.893	16.281	.000	.934	1.195	1.000	1.000

a. Dependent Variable: TotalFP

The second hypothesis H2 proposed that there is lean manufacturing significantly affects the financial performance. Based on the table 6 and table 7 below the regression coefficients and the chi-square tests indicate the positive effect of the independent variable, lean manufacturing, on the dependent variable, financial performance. The p value $0.000 < 0.05$, therefore the H2 is accepted.

Table 6: Regression coefficient

Value	df	Asymp. Sig. (2-sided)
438.485 ^a	348	.001
229.894	348	1.000
54.280	1	.000
152		

a. 390 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

Table 7: Chi-Square Tests

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.893 ^a	.798	.795	.493	.798	265.077	1	151	.000	2.219

a. Predictors: (Constant), TotalLeanMan

b. Dependent Variable: TotalFP

5. Conclusion and Recommendations

The main objective of this research was to determine the relationship and effect of Lean Manufacturing and financial performance in the southern Lebanese firms. The concept of this study has been developed upon detecting a gap in the literature regarding the enhancement of the financial performance in the manufacturing firms in south Lebanon. Being integrated in an regular culture of principles, it seems to be difficult for companies to enhance and boost their financial performance and solving the problems and reducing the wastes at workplace, especially when there is lack of applying such tools and principle like Lean. The evidence provides also a strong support that the higher extent of lean practices implementation will bring to the manufacturing companies better financial performance since lean practices leads to better quality, flexibility, lead-time reduction, and cost reduction. In other words, the study findings led to the conclusion that an improvement in lean production practices such as having a constant improvement programs in terms of production, mechanization and use of just-in-time tools in production to remove all non-value added activities in their companies. In addition, having a synchronized production and delivery system throughout the supplier network, applying pull production based on demand, value stream in its system and quality control system on its production system results in a positive and significant improvement in the financial performance of the manufacturing firms in Lebanon.

Further research is needed to empirically validate this study due the importance of lean manufacturing in increasing the financial performance of the Lebanese companies. In addition, the results showed that lean tools related to visual signs are the least implemented tools, thus companies should focus more on training employees how to use these tools and get benefits from the cost reduction and high efficiency of production. All these practices will enhance the financial performance of the Lebanese manufacturing companies. Furthermore, the study recommends that the implementation process of lean practices should be given top priority during the company policy formulation. Adequate time and resources should be assigned in ensuring that the practices are implemented successfully.

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