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An Empirical Studies on Customer' Satisfaction on Lean Management

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Abstract. The concept of lean management emerged in the 1990s, primarily championed by prominent automotive companies such as Ford and Toyota. Lean management focuses on the continuous reduction of waste within production processes to enhance productivity, increase customer satisfaction, and gain a competitive edge in the market. Recognizing the advantages associated with lean management, this research paper aims to explore the direct relationship between the implementation of lean management tools and customer satisfaction within the restaurant industry. The study collected data through a questionnaire distributed among selected Indonesian and German restaurants. The data analysis involved utilizing software such as SPSS and AMOS, and structural equation modeling (SEM) was employed to test the hypotheses of the research model. The findings reveal a significant positive correlation of 74% between lean management practices in restaurants and customer satisfaction. Among the sub-variables, price and value fairness (PVF) exhibited the strongest correlation of 77% with customer satisfaction, surpassing other factors. Furthermore, the layout of the restaurant had a notable impact on lean management implementation, accounting for 68% of the observed effects.

Keywords: lean management, customer satisfaction, restaurant, productivity, market competition

1. Introduction

A concept of lean manufacturing is initially introduced by Japanese company, Toyota, and has been used to improve and reduce cost of manufacturing operation in automotive industry. It focuses on continuous improvement and waste elimination by sorting out value added activity (VA) from non-value added activity (NVA) (Deshmukh *et al*., 2022). In addition, the Lean management model involves the use of many techniques for improvement, such as 5S (Sort, Straighten, Shine, Standardize, and Self-discipline). This was one of the first techniques businesses used to implement lean management. 5S helps eliminate waste from poorly organized work areas (Meintjes & Janse van Rensburg, 2022) and kaizen methodology (Daradkeh *et al*., 2023). Kaizen promotes and engages in continuous improvement through simple, incremental improvements. There may be long-term gains in terms of efficiency if this is implemented. At

the moment, the lean management has been successfully implemented in a wide range of application in many industries to deal with productivity issue, including improving the production lead time (Gebeyehu *et al*., 2022), reducing in cycle-time and production cost (Kholil *et al*., 2022), creating a hygienic workplace, inventory reduction, and productivity and quality improvement (Jayanth *et al*., 2020; Palange & Dhatrak, 2021), developing a data-driven decision-making in controlling the production activity (Ghouat *et al*., 2021; Tripathi *et al*., 2022)., and the integration of lean management and industry 4.0 concept to create what so called smart factory (Jha & Prashar, 2022). As a result the lean concept has been proven for industry to maximize their high product quality with large quantity goods at the lowest possible cost, in which leading to the customer satisfaction (Burinskienė, 2022; Kumar *et al*., 2022).

A strong commitment and innovation is a must for the industry in order to keep or improve the competitive state in the market by performing the most efficient and effective production process (Lopes *et al*., 2022; Özkan & Noyan Tekeli, 2022). Therefore, a continuous improvement is needed to provide high quality products that meet different specifications. It has been perceived by the food and beverage industry, especially the restaurant industry, where providing a good service to satisfy the customer is a major concern. The urgency to make customer satisfied is related highly with the restaurant existence and growth in terms of market share and sales profit (Garg & Kumar, 2017; Lee & Kim, 2022). Many food restaurant faces problem such as food service time, food quality, employee involvement, food storage and waste. In addition, the COVID-19 pandemic, which happened in the early 2020, has worsen the food restaurant in terms of a crisis economic and customer's trust (Gomes *et al*., 2022; Song *et al*., 2022). A hygienic issue which relates to food preparation and serve, which is possibly cause a direct and indirect contact, may pose imminent threats in consumer's mind to come to restaurant or even order the food from restaurant (Siddiqi *et al*., 2022).

A successful story of Lean management concept implemented in the automotive manufacturing, has received widely attention by the food enterprise to deal with the problems exist above. The lean management concept has been studied in previous research projects with regard to the food restaurant shows in table 1.

Table 1. The previous studies about lean management concept

Title	Details	Reference
11 Improving quality by implementing lean manufacturing, SPC, and HACCP in the food industry: A case study	Research Design: The research design was a case study. The researchers conducted a pilot project at a food SME company in Peru. The project lasted for two months. Data Collection Methods: The researchers collected data using a variety of methods, including: Interviews with employees Observations of the production process Review of company records Customer surveys Sample Size: The sample	(Cabrera *et al*., 2020)

Title	Details	Reference
	size for the study was 100 customers. Sampling Techniques: The researchers used a convenience sampling technique to select the customers for the study. Customer Satisfaction: Customer satisfaction was measured using a survey. The survey asked customers to rate their satisfaction with the company's products and services on a scale of 1 to 10. Lean Management Practices: The researchers investigated the following lean management practices: Value stream mapping 5S Statistical process control (SPC) Hazard Analysis and Critical Control Points (HACCP) Statistical Techniques: The researchers used a variety of statistical techniques to analyze the data, including: Descriptive statistics Inferential statistics Hypotheses: The researchers tested the following hypotheses: The implementation of lean management practices will improve customer satisfaction. The implementation of lean management practices will reduce product returns. Implications for Theory and Practice: The findings of the study have implications for both theory and practice. For theory, the findings support the idea that lean management practices can improve customer satisfaction	

Title	Details	Reference
	and reduce product returns. For practice, the findings provide guidance for food companies that are looking to improve their quality and reduce costs. Key Insights and Contributions: The key insights and contributions of the study are as follows: Lean management practices can improve customer satisfaction and reduce product returns. Value stream mapping can be used to identify and eliminate waste in the production process. 5S can be used to improve the organization and cleanliness of the workplace. Statistical process control can be used to identify and control variability in the production process. Hazard Analysis and Critical Control Points (HACCP) can be used to identify and control hazards in the production process.	
Implementation Of Lean Management As A Tool For Decrease Of Energy Consumption And CO2 Emissions In The Fast Food Restaurant	Research Design: The research design was a case study. The researchers conducted a pilot project at a fast food restaurant in Turkey. The project lasted for six months. Data Collection Methods: The researchers collected data using a variety of methods, including: Interviews with employees Observations of the production process Review of company records Customer surveys	(Orynycz *et al*., 2020)

Title	Details	Reference
	Sample Size: The sample size for the study was 100 customers. Sampling Techniques: The researchers used a convenience sampling technique to select the customers for the study. Customer Satisfaction: Customer satisfaction was measured using a survey. The survey asked customers to rate their satisfaction with the company's products and services on a scale of 1 to 10. Lean Management Practices: The researchers investigated the following lean management practices: Value stream mapping 5S Statistical process control (SPC) Kanban Total productive maintenance (TPM) Statistical Techniques: The researchers used a variety of statistical techniques to analyze the data, including: Descriptive statistics Inferential statistics Hypotheses: The researchers tested the following hypotheses: The implementation of lean management practices will improve customer satisfaction. The implementation of lean management practices will reduce energy consumption and CO_2 emissions. Implications for Theory and Practice: The findings of the study have implications for both theory and practice. For theory, the findings support the idea that	

Title	Details	Reference
	lean management practices can improve customer satisfaction and reduce energy consumption and CO2 emissions. For practice, the findings provide guidance for fast food restaurants that are looking to improve their operations and reduce their environmental impact. Key Insights and Contributions: The key insights and contributions of the study are as follows: Lean management practices can improve customer satisfaction and reduce energy consumption and CO2 emissions. Value stream mapping can be used to identify and eliminate waste in the production process. 5S can be used to improve the organization and cleanliness of the workplace. Statistical process control can be used to identify and control variability in the production process. Kanban can be used to improve the flow of goods and services. Total productive maintenance (TPM) can be used to improve the reliability of equipment.	
Lean Restaurants: Improving The Dining Experience	Research Design: The research design was a cross-sectional study. The researchers collected data from a sample of 100 manufacturing companies in the United States. Data Collection Methods: The researchers collected data using a survey. The survey asked questions about the companies' use of lean management	(Keyser *et al*., 2017)

Title	Details	Reference
	practices and their customer satisfaction. Sample Size: The sample size for the study was 100 manufacturing companies. Sampling Techniques: The researchers used a stratified random sampling technique to select the companies for the study. The companies were stratified by industry, size, and location. Customer Satisfaction: Customer satisfaction was measured using a scale of 1 to 10. The scale asked customers to rate their satisfaction with the company's products and services. Lean Management Practices: The researchers investigated the following lean management practices: Value stream mapping 5S Statistical process control (SPC) Kanban Total productive maintenance (TPM) Statistical Techniques: The researchers used a variety of statistical techniques to analyze the data, including: Descriptive statistics Inferential statistics Hypotheses: The researchers tested the following hypotheses: The use of lean management practices will be positively associated with customer satisfaction. The use of lean management practices will be positively	

Title	Details	Reference
	associated with profitability. Implications for Theory and Practice: The findings of the study have implications for both theory and practice. For theory, the findings support the idea that lean management practices can improve customer satisfaction and profitability. For practice, the findings provide guidance for manufacturing companies that are looking to improve their operations. Key Insights and Contributions: The key insights and contributions of the study are as follows: Lean management practices can improve customer satisfaction and profitability. Value stream mapping can be used to identify and eliminate waste in the production process. 5S can be used to improve the organization and cleanliness of the workplace. Statistical process control can be used to identify and control variability in the production process. Kanban can be used to improve the flow of goods and services. Total productive maintenance (TPM) can be used to improve the reliability of equipment.	
Using Lean Manufacturing As Service Quality Benchmark Evaluation Measure	The paper investigates the use of lean manufacturing practices to improve service quality in the fast food industry. The research design was a case study. The researchers collected data from three fast food restaurants in the United Kingdom. The restaurants were	(Abdelhadi, 2016)

Title	Details	Reference
	selected because they had different levels of experience with lean manufacturing. The data collection methods used were interviews, observations, and surveys. The interviews were conducted with employees and managers at the restaurants. The observations were conducted at the restaurants during peak operating hours. The surveys were conducted with customers at the restaurants. The sample size for the study was 30 employees, 15 managers, and 100 customers. The employees and managers were selected using a convenience sampling technique. The customers were selected using a stratified random sampling technique. Customer satisfaction was measured using a survey. The survey asked customers to rate their satisfaction with the restaurant's food, service, and overall experience on a scale of 1 to 10. The lean management practices investigated were: Value stream mapping 5S Statistical process control (SPC) Kanban Total productive maintenance (TPM) The statistical techniques used to analyze the data were descriptive statistics and inferential statistics. The descriptive statistics were used to describe the data. The	

Title	Details	Reference
	inferential statistics were used to test the hypotheses. The hypotheses tested were: The use of lean manufacturing practices will be positively associated with customer satisfaction. The use of lean manufacturing practices will be positively associated with profitability. The findings of the study howed that the use of lean manufacturing practices was positively associated with customer satisfaction. The findings also showed that the use of lean manufacturing practices was not significantly associated with profitability. The implications of the findings for theory and practice are as follows: Lean manufacturing practices can be used to improve customer satisfaction in the fast food industry. Lean manufacturing practices may not be as effective in improving profitability in the fast food industry. The key insights and contributions of the study are as follows: Lean manufacturing practices can be used to improve customer satisfaction in the fast food industry. The use of lean manufacturing practices may not be as effective in improving profitability in the fast food industry. The study provides guidance for fast food restaurants that are looking to improve their	

Title	Details	Reference
	customer satisfaction.	

The previous studies in table 1 have proven that lean management concept can be successfully implemented in restaurant industry. However, a comprehensive of lean management tool implemented in restaurant, including takt time, defects, store layout, people involvement and standardization) towards customer satisfaction involves these indicators such as atmosphere, food and beverage quality, food and beverage variety, service quality, price & value fairness, have not clearly studied in the previous studies and would be performed in this research work. These indicators means including in customer satisfaction models (Mondo et al 2022l; Thi My Hanh Le,). Thus, the main objective is to identify and analyze overall relationship between the lean management tool application in restaurant located in Indonesia and Germany and the possible contribution to the improvement of customer satisfaction. The limitation of this study such as the sample size, as it collects questionnaire data from restaurants in Indonesia and Germany, which is a small sample size that may affect the generalizability of the findings to a larger population of restaurants. The study's results may be specific to the restaurant industry in Indonesia and Germany and may not apply to restaurants in other countries or regions. Cultural, social, and economic factors may influence the implementation and effectiveness of lean management tools in different contexts. Time constraints may limit the ability to capture long-term effects and current trends (in COVID-19) in using lean management tools and customer satisfaction. This research performed using a combined source of data as it collects questionnaire data from a restaurant in Indonesia and another one in Germany. Structural Equation Modelling (SEM) is defined as a statistical technique that attempt to interpret the relationships among observed and unobserved quantitative variables. The data of observed and unobserved variables were primarily analyzed using The Statistical Package for the Social Sciences (SPSS) software, which produced descriptive analysis, and Analysis of a Moment Structures (AMOS). Future research could examine the application of lean management principles and their impact on customer satisfaction in other industries, such as manufacturing, healthcare, or retail. This will help determine the transferability of lean management practices across industries. To capture long-term effects and trends in the application of lean management and its impact on customer satisfaction, longitudinal studies can be conducted. By observing changes over time, researchers can gain insight into the sustainability and effectiveness of lean management practices in improving customer satisfaction. While the current study focused on customer satisfaction, future research could examine other outcome variables such as employee satisfaction, operational performance, or financial indicators. This will help assess the broader impact of lean management practices on different aspects of the organization.

2. Research Methodology

Lean management concept is an improvement tool which focusing on productivity and waste elimination. In this case study, the concept of lean was implemented, that considering takt time, defects, store layout, people involvement and standardization, in the restaurant located in Germany and Indonesia. The focus of the lean concept is to improve customer satisfaction in terms of food and service quality, variety of menu, and comfortable atmosphere of the restaurant. A causal correctional research was performed to identify the degree of causality among variables and it is beneficial to find out the research question of ‘how strong’ and ‘how significant’ variables without controlling or manipulating any of them (Lawler & Suttle, 1972). The data collected was conducted through the distribution of questionnaire for one restaurant in Germany and Indonesia. Afterwards, Structural Equation Modelling (SEM) is defined as a statistical technique that attempt to interpret the relationships among observed and unobserved quantitative variables (McQuitty &

Wolf, 2013). The data of observed and unobserved variables were primarily analyzed using The Statistical Package for the Social Sciences (SPSS) software, which produced descriptive analysis, and Analysis of a Moment Structures (AMOS)

2.1. Data Collection

The data of research was collected through the distribution of questionnaire in two different locations. The questionnaire was developed to identify a customer's preference and satisfaction toward lean management tool implementation. It was distributed in one restaurant selected, which was known as "*Nusantara* Restaurant" located in Berlin and "*Kehidupan Tidak Pernah Berpikir*" restaurant in Bandung. The variables, sub-variables and indicators stated in the questionnaire design distributed as tabulated in Table 2. In the questionnaire involved two variables, which were lean tool management and customer satisfaction, where each variables consist of five sub-variables along with its indicator.

Table 2. Questionnaire and interview design

Variables	Sub Variables	Indicators
Satisfaction	Atmosphere (ATM)	Interior (Q1)
		Temperature (Q2)
	F&B Quality (FBQ)	Taste (Q3)
		Visual (Q4)
	Variety (VAR)	Menu choices (Q5)
		Vegetarian Dish (Q6)
	Service Quality (SQ)	Professionalism (Q7)
		Staff Appearance (Q8)
	Price & Value Fairness (PVF)	Food quality (Q9)
		Service quality (Q10)
Lean	Takt Time (TT)	Speed (Q11)
		Waiting List (Q12)
	Defects (DF)	Rejects (Q13)
		Out of Stock (Q14)
	Store Layout (SL)	Mobility (Q15)
		Convenience (Q16)
	People Involvement (PI)	Problem Solving (Q17)
		Payment (Q18)
	Standardization (STD)	SOP (19)
		Consistency (Q20)

2.2. Sample size of study

In this regard, to provide a greater precision and smaller sample and avoid unrepresentative sample error, stratified sample method is taken as the base of sampling. A simple size calculator used Raosoft software was employed to acquire the recommended sample size of the research study. Using 10% of margin of error, 95% confidence level, and 20.000 population, the result shows 96 data sample is the minimum required size for this research. The number was acquired using Raosoft, one of the sample size calculators available in the Internet. Parallel with the plan, the study will collect 120 data, 60 data from Indonesia and 60 data from Germany.

2.3. Statistical analysis

Statistical Package for the Social Sciences or better known for SPSS is a set of software program developed since 1960, and later bought by IBM in 2009 (Thomes, 2018), was used for data analysis. The data collected were summarized by frequency, which expressed as minimum data was 1 or strongly disagree and maximum data is 5 or strongly agree, as stated in Likert scale in the questionnaire. The mean, standard deviation, skreww and kurtiosis were measured to show the dispersion of data.

2.4. Validity and Reliability Test

Validity testing is conducted as a tool to determine whether the data taken from questionnaire can be accurately measured or not. Measurement of validity can be used by KMO test or communalities in SPSS software. Validity level is below 0.5 or 50% considered as low and above 0.5 or 50% is reflected as good or reliable (McQuitty & Wolf, 2013). Furthermore, reliability test is carried out to make sure that measurement and outcomes of data information are consistent and trusted with a low level of errors in order to convey the actual information contained in the field (Prabowo *et al*., 2018). The Cronbach method, which is found in SPSS, is used to measure the reliability data. The reliability is considered as low if the measured data is below 0.5 or 50% and considered as good or reliable if the measured data is above 0.5 or 50% (Marnburg & Luo, 2014).

2.5. Analysis of a Moment Structures

Analysis of a Moment Structures (AMOS) implements the general approach to data analysis known as analysis of covariance structures or causal modeling. The software is said to be the extension of SPSS software module, also owned by IBM. AMOS is a statistical software that specifically used for Structural Equation Modeling (SEM), Path Analysis, and Confirmatory Factor Analysis.

3. Results

3.1. Descriptive Analysis

Descriptive analysis includes data related to respondents' perceptions of research variables. In this case study, the variables involved are customer satisfaction and lean management. The questionnaire comprised of 20 questions focused on customer satisfaction and lean management tool implementation. The questions made aimed at identifying customer satisfaction that act as an implementation of lean management tool in two different restaurants located in Germany and Indonesia. The respondents had the option to evaluate each question by using the likert scale from 1 to 5 where 1 is “strongly disagree” and 5 is “strongly agree”. Following the receipt and tabulation of the data, using SPSS, as seen in Table 3. Column N represents the number of respondents (120), followed by the minimum value (1) and maximum value (5) which an item can receive (Table 2). The sixth column represents the average responses, where it can be seen that almost all averages range are in 3-4 which means that the respondents tend to agree with the questions. The standard deviation for, which is in seventh column, poses values less than 1 or it is close to the average value meaning that respondents have similar opinions. To determine whether the date set is normally distributed or not is identifying the skewness and kurtosis values calculated. The values for both skewness and kurtosis resulted less than +2 and -2 where this shows that the data collected are distributed normally.

Table 3. Descriptive statistics for variable “customer satisfaction” and “lean management tools”

Variables	N	Range	Min	Max	Mean	Standard deviation	Skewness	Kurtosis
Q1	120	4	1	5	3.23	0.884	-0.311	-0337
Q2	120	4	2	5	3.69	0.828	-0.813	0.584
Q3	120	3	2	5	3.90	0.771	-0.161	-0.573
Q4	120	3	2	5	3.72	0.832	-0.137	-0.549
Q5	120	3	2	5	4.14	0.702	-0.501	0.181
Q6	120	3	2	5	4.12	0.909	-0.780	-0.232
Q7	120	3	2	5	3.65	0.741	-0.216	-0.148
Q8	120	3	2	5	3.73	0.621	0.049	-0.288
Q9	120	4	1	5	3.88	0.875	-0.900	1.100
Q10	120	4	1	5	3.77	0.786	-0.723	0.942
Q11	120	4	1	5	3.77	0.932	-0.970	1.154
Q12	120	3	2	5	4.25	0.689	-0.686	0.553
Q13	120	3	2	5	4.08	0.773	-0.700	0.432
Q14	120	4	1	5	3.21	1.236	-0.026	-1.077
Q15	120	4	1	5	3.58	0.837	-0.198	-0.053
Q16	120	4	1	5	3.53	0.840	-0.237	-0.086
Q17	120	3	2	5	3.60	0.703	0.596	-0.570
Q18	120	3	2	5	4.04	0.715	-0.342	-0.138
Q19	120	3	2	5	3.62	0.735	-0.155	-0.190
Q20	120	3	2	5	3.68	0.778	-0.251	-0.226

3.2. Validity and Reliability Test

The accuracy and consistency of the measured data was conducted through validity and reliability test. The degree of data accuracy was determined through the KMO and Bartlett's Test. Table 4 reveals that the KMO measured has a value of 79.3% which is well above the recommended standard of 50%. Thus, based on the validity test, it is concluded that the data collected is suitable and accurate for applying factor analysis.

Table 4. Kaiser-Meyer-Olkin Measure of sampling Adequacy

Kaiser-Meyer-Olkin Measure of sampling Adequacy		0.793
Bartlett's test of sphericity	Approx. Chi-square	1035.205
	df	190
	Sig.	0.000

In addition, the consistency measurement was carried out using the Cronbach's alpha, as seen in Table 5. The value of Cronbach's alpha calculated accounts for 87% which it is above the recommended value standard of 50%. Therefore the result confirms that the answers are relevant for the variables analyzed.

Table 5. Cronbach's Alpha Values

Cronbach's Alpha	Cronbach's Alpha Based on Standardization items	N of items
0.869	0.877	20

3.3. Structural equation modelling

3.3.1. Measurement model

The measurement model is used to measure the dimensions that make up a factor. The estimation technique used in SEM calculation is called the maximum likelihood. But before forming a full SEM model, factors will be tested first before it makes up each variable. The highlight is shown at the results of the standardized regression weight in the AMOS output seen in Table 6. If there is an indicator that has an estimated value < 0.5, that particular indicator considered insufficient or invalid to describe the construct.

Table 6. Regression weights

			Estimate	S.E.	C.R.	P	Label
F2	<---	F1	,425	,129	3,281	,001	par_9
STD	<---	F1	1,000				
PI	<---	F1	,860	,145	5,942	***	par_1
SL	<---	F1	1,192	,197	6,040	***	par_2
DF	<---	F1	1,008	,187	5,396	***	par_3
TT	<---	F1	,902	,166	5,438	***	par_4
ATM	<---	F2	1,000				
FBQ	<---	F2	1,744	,508	3,434	***	par_5
VAR	<---	F2	1,321	,405	3,263	,001	par_6
SQ	<---	F2	1,480	,429	3,451	***	par_7
PVF	<---	F2	2,318	,639	3,630	***	par_8

The above represents the regression weight of every relationship created with the one-way arrow (Table 6). The function of this table is to show whether each of them created any relationship or not. P value of all nearly sub-variables is ≤ 0.05 which means that the relation among variables are significant, except standardization (STD) and atmosphere (ATM). It is obvious that the two sub variables do not generate any P value, hence an explanation behind this will follow in the managerial implication.

3.3.2 Analysis of structural equation model

After ascertaining that all assumptions in SEM are fulfilled, the research proceed to the structural equation modeling (SEM). In this research, SEM analysis uses the help of AMOS 18. The structural model results can be seen in the following seen in Fig 1.

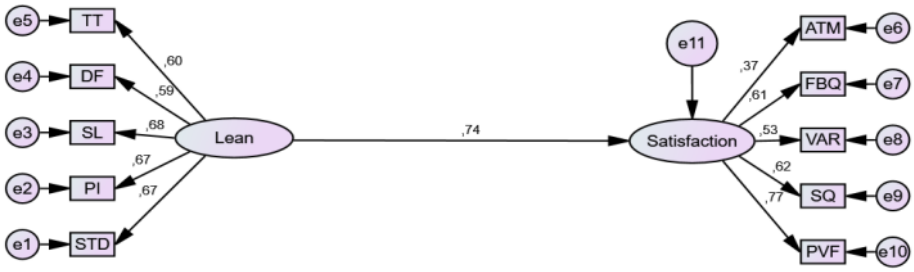

Fig.1: Path diagram

As shown in the path diagram, it can be explained that the relationship between lean and satisfaction is positive with a total influence of 74.4%. Each sub variable depicts its own explanatory power of its respective variable. For example, takt time (TT) has 60% explanatory power upon lean management. It is necessary to remember that the variable atmosphere and standardization have insignificant p value, therefore the explanatory powers shown in this diagram might as well considered unable to be justified.

3.4. Fitness of the structural equation model

Table 7 shows the goodness-of-fit statistics indicates a good fit to the data. Chi-Square Statistic ($\chi 2$) or SEM discrepancy value of 2.687 with probability (p-value) of 0.000. Models with good compatibility require a small chi-square value. With a sample size of 23, the chi-square value of 2.687 can be declared good. The p-value of the research model has also shown a good number, which is < 0.05. This shows that the empirical data obtained is identical to the theory that has been built based on structural equation modeling. Goodness of Fit Index (GFI) of SEM model of 0.859. The GFI size is aligned with the size of the determination coefficient of determination R2 in the regression analysis. This measure implies the diversity of data that can be explained simultaneously by the model built. The diversity of data described reaches 85.9%, which is good and close to 90%. Root Mean Square Error of Approximation (RMSEA) calculated was 0.119. A value of 0.119 greater than 0.10 concluding that the model does not match the data (Hooper et al., 2008). The number 0.119 states that the deviations from the model hypothesized to the empirical model are very large or of about 11.9%.

Table 7. Goodness of fit research model testing

Fit indicator	Recommended value	Model evaluation	Result
Absolute Fit			
Probability	$p > 0.05$	Significant	0.0000
Normed Chi-Square (X^2/df)	< 2	Over Fitting	2.687
	$2 < X^2/df < 5$	Good Fit	
RMSEA	< 0.10	Poor fit	0.119
P-value for test of close fit	< 0.05	Good Fit	0.000
GFI	> 0.90	Marginal Fit	0.859
AGFI	> 0.90	Marginal Fit	0.771
Comparative Fit			
NFI	0.9	Marginal Fit	0.763

NNFI or Tucker Lewis Index (TLI)	0.9	Marginal Fit	0.777
CFI	0.9	Marginal Fit	0.832
RFI	0.9	Marginal Fit	0.687
Parsimonious Fit			
PNFI	0-1	Bigger is better	0.577
PGFI	0-1	Bigger is better	0.531

In addition, Adjusted Goodness of Fit Index (AGFI) makes up of 0.771, which indicates that the model matches the data. The Normed Fit Index (NFI) value states the degree of compatibility of the model with a value of 0.763. A Comparative Fit Index (CFI) of size states the size of the model validation, in which value of CFI accounts for 0.832, where the model has a good level of validation as well as meaning that the level of compatibility of the model is getting better. Parsimony Normed Fit Index (PNFI), aims to see the value of the degrees of freedom used to achieve model match and can also be used for the purpose of comparing two models. In this study the PNFI value obtained was 0.577, which is a modification of GFI by looking at how many latent variables are formed in the model. The greater the PGFI value is be better, but as long as in the range between 0 - 1 (Schermelleh-Engel *et al*., 2003). In this study the PGFI value obtained is 0.531. Based on the suitability of the overall model in this study, generally speaking, the results have shown that the model is considered fit. Therefore, the results can be interpreted and analyzed in a deeper level.

3.5 Hypothesized findings

The standardized regression weight coefficient between lean variable and satisfaction variable is 0.744 with a probability of 0.001 or $p < 0.05$ and has a critical ratio C.R) of 3.281 or greater than 1.96, as can be seen in Table 8. Thus, the hypothesis of H_0 is rejected and the hypothesis (H_1) can be accepted. The coefficient of 0.744 shows that if lean is raised by one unit of value, the value of the satisfaction will increase by 0.744 units and the relationship of two variables is depicted in *Fig 2*.

Table 8. Structural equation model results

Variable			Estimate	C.R	P-value	Description
Lean	→	Satisfaction	0.744	3.281	0.001	Significant

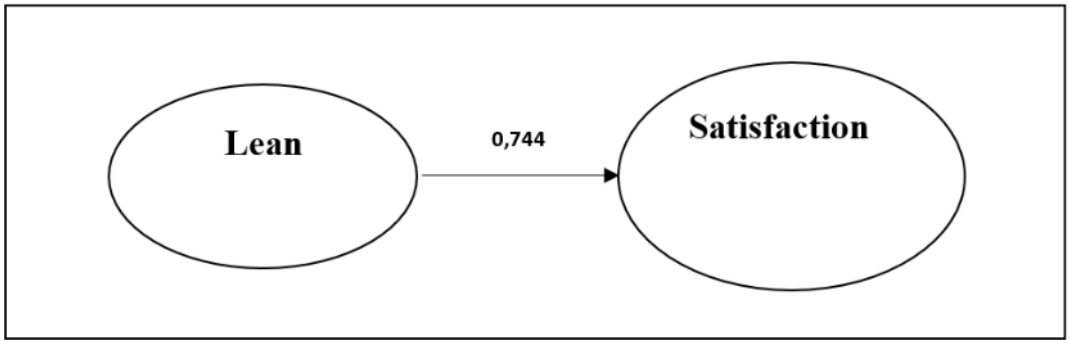

Fig.2: Relationship between two variables; Lean and Satisfaction

4. Discussion

4.1. Customer satisfaction

The study has shown that Price and Value Fairness (PVF) has the biggest correlation of 77% to variable Customer Satisfaction compare to other sub-variables. Theoretically, a change in Price and Value Fairness has the strongest influence towards Customer Satisfaction (Ding & Jiang, 2014; Hanif *et al*., 2010). Excluding insignificant sub-variable Atmosphere, it can be seen that the real comparison is between quality, variety, and fairness. According to a literature study, it is evident that price is more comparable than quality. Therefore, managers should pay attention to the pricing and how customer perceived the value they get from the dining experience. This Price and Value aspect alone has another dimension that has not yet unveiled by this research. It is imperative for managers to know what consisted in the perceived value of their customers and adjust the price in accordance with its expectation. The effect of doing so is the decision to make repurchase and brand loyalty (Bassey, 2014). Hence, it can also be suggested that the pricing strategy and marketing strategy should be in line to ensure desirable customer satisfaction.

As for the variable Lean, sub-variable of store Layout is found to be one with the biggest correlation (68%). According to a study of (Heinävaara, 2010), improvement in store layout has the following goals:

(a) Economic Objective: by choosing the right store layout, restaurant can avoid excessive in paying rent and achieve optimum operation process with the right equipment. Space reduction, renovation, and changing or selling unproductive equipment are some of the strategies to achieve this objective.
(b) Lean Objective: good store layout will improve production flow and flexibility in production process.

Therefore, restaurant is expected to prioritize changes on store layout first over other lean sub-variables. By doing so, it is predicted that the restaurant is more likely to be leaner which in this study proven to then improve customer satisfaction by 74%.

As previously mentioned in the research result, especially in regression weight where it is found that P value for sub-variables STD (standardization) and ATM (atmosphere) are not significant. Comparing to other research result and questionnaire result, possible causes are found. First, the cause for the sub-variable ATM are found using comparison between the result and three other similar papers which are Exploring customer satisfaction with university cafeteria food services (Garg & Kumar, 2017), Restaurant's Atmospheric Elements: What the Customer Wants (Ariffin *et al*., 2012), The Influence of Service Quality and Store Atmosphere on Customer Satisfaction (Miswanto & Angelia, 2017). Among these papers, all of them were successfully proven the significant or correlation between atmosphere towards customer satisfaction. They have one stands out similarity: they took sample from young adult or people who are in between 17-25 years old. On the opposite, this research took sample from people without considering their age. According to observation, people age between 19 – 60 years old were filling out this research's questionnaires. Therefore, it can be said that there is a possibility that older people do not really take into account a restaurant's atmosphere into their satisfaction assessment. Meanwhile, young people think it is quite important to have a good atmosphere throughout their dining experience.

4.2. Implementation of lean in restaurants

Some example for implementation of lean management within restaurant should be discussed and implemented accordingly. First, a restaurant that produce product using takt time help them to produce at the right quantity at the right time. The equation by (Georgiadis *et al*., 2005) might not practical in restaurants where customer order pattern looks simpler than automotive customer but in reality is changing all the time thanks to trend, mood, weather or other external factors. Therefore, it is suggested to use a little bit forecasting before producing. Restauranteur can start calculating how many customers dine in per day and categorized products into the most popular (ordered above 15x per day), popular (ordered between 10-14x per day), average (ordered between 5-9x per day), not popular (ordered between 2-4x per day) and most not popular (ordered between 0-1x per day). It is to be noted that this category is an example only. By

doing simple things like calculating the customers and putting the product into category, chef can start making plans on how much each menu should be prepared to avoid left overs (waste).

Second, restauranteur is highly recommended to reduce defective product. Various ways can be done. Starting from establishing a proper standard to make a purchase order to supplier to avoid unusable ingredients (e.g. have a written tips on choosing fresh vegetables and where to get them), using standard operating procedure in the kitchen and bar so that the good food and beverage quality always consistent (e.g. making a secret recipe book), up to improvement in employees training using written manuals. The more standardized a restaurant is, the less likely they produce defective product.

Third, restaurant layout should be improved to avoid blocking, which leads to higher risk of food falling off when waitress about to deliver them. Examples from Nusantara restaurant: the space between restrooms, Indonesian snacks display, and queue to pay is really small. In this case, when people are in line waiting to pay, they block the way not only to restroom but also to the snack display, bar and backside table area. This queue not only blocking, but increases the risk of food / beverage falling off and also it will give people who is about to enter the restaurants wrong impression. Because of the line, people will assume there is no more place because no one can see that there is more table space in the back of the restaurant.

Fourth, people involvement or employee involvement should be focuses on two aspect; communication and problem solving. Set an example, when a customer accidentally bumps into an employee that brings food in a tray and then the food fell off, how will the employee react? Will he or she apologize first? And after that, how would he or she takes care of the fallen food, will he or she proactively cleans everything up, input a new order to the kitchen, and find the manager to report or not? And how would this employee approach the customers if in the end, it was the customer fault and the customer need to pay for the fallen food? Employee involvement aims to eventually have employees that are independent in solving problems and able to communicate effectively. One of the things that company can do to achieve this is by establishing a good training program.

5. Conclusions

According to the quantitative data collected and analyzes through SPSS and AMOS software, the coefficient correlation results of 0.744 means that lean management in restaurant has a strong positive relationship to customer satisfaction. Restauranteur are highly recommended to start applying lean management in order to enhance customer satisfaction. The sub-variables of lean are sufficiently represented by takt time, defect, store layout, people involvement and standardization. While the sub-variables of customer satisfaction are sufficiently represented by food and beverages quality, variety of food and beverages, service quality and price and value fairness. Generally speaking, all the-sub variables have sufficient explanatory power over their respective variable and deemed fit to represent their variable. The only exception are the sub-variable atmosphere and standardization, which are considered insufficient to represent the construct.

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