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Examine the Relationship between Lean Management and Organizational Performance

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ABSTRACT

Lean is a latest and modern management system in present manufacturing world since it is directly affected to the overall organizational performance. Organization performance can be measured based on five factors. i.e. 'Productivity, Quality, Cost, Delivery and Safety. 5 dimensions of the independent variable (Lean) are 'Train the workforce, Use lean tools and methods, continuous improvement process, Employee behavior, and Management adoption'. The population of this study is consisted of production employees of Camso Loadstar (Pvt) Ltd in Sri Lanka. 140 employees were considered as the sample of the study consists of 120 production employees and 20 management-level employees. Data were collected using questionnaires and conducting the interviews. In addition, secondary data were collected by using budget reports, journals and management-level employees. Multiple Regression methods and SPSS 20 software version used for data analysis. Through correlation analysis and regression analysis, it was found that there is a positive impact (48.2%) of Lean system Implementation on Organization Performance.

Keywords: Organization performance, Lean Manufacturing system, Continuous improvement process, Eliminate waste, Management adoption, Employee behavior.

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1. Introduction

Heightened challenges from global competitors during the past two decades have prompted many US manufacturing firms to adopt new manufacturing approaches (Hall, 1987; Meredith and McTavish, 1992). Particularly salient among these practices is the concept of lean production (Womack and Jones, 1996, Womack, Jones, and Roos, 1990). Lean production is a multi-dimensional approach that encompasses a wide variety of management practices, including just in time, quality systems, work teams, cellular manufacturing, supplier management, etc. in an integrated system (Singh et al., 2011). The core thrust of lean production is that these practices can work synergistically to create a streamlined, high quality system that produces finished products at the pace of customer demand with little or no waste (Holweg, 2007). With the notable exception of White et al. (1999), there is relatively little published empirical evidence about the implementation of lean practices and the factors that may influence implementation.

Although a lot of companies started implementing lean concept, according to Bhasin and Burcher (2006), only 10 percent or less of the companies succeed in implementing lean manufacturing practices. Even though number of lean tools, techniques and technologies available to improve operational performance is growing rapidly, however a few companies put effort to use them failed to produce significant results. (Čiarnienė & Vienažindienė, 2012).

Lean is a systematic approach to enhance the organization performance by eliminating all kind of waste from the manufacturing process. Lean is the quality initiative that is the most effective business improvement techniques that focus on continuous process improvement. These techniques, which are adopted to improve business processes, eliminate defects, reduce cycle times, speed up delivery at a minimal cost and accelerate the process of identifying and solving issues to ensure excellence in operational and business management (Antony et al., 2007; George et al., 2004).

Researcher examine the relationship between contextual factors and extent of implementation of a number of manufacturing practices that are key facets of lean systems. Specifically, focus on five contextual factors, Train the workforce, Use lean tools and methods, Continues improvement process, Employee behavior and Management adoption. Hence, in this study a special attention is paid to analyze the relationship between Lean implementation and organization performance by giving special consideration to Camso Loadstar Company in Sri Lanka.

Research Problem

A majority of article on the topic of lean production system focus on the defining lean production, information technology integration and lean practices and concept of lean production (Kuo et al, 2008). While most of these studies have focused on a single aspect of lean and its performance implications (Hackman and Wageman, 1995; Samson and Terziovski, 1995; McKone et al., 2001), a few studies have explored the implementation and performance relationship with two aspects of lean (Flynn et al., 1995; McKone et al., 2001). Even fewer studies have investigated the simultaneous synergistic effects of multiple aspects of lean implementation and performance implication. However, conceptual research continues to

stress the importance of empirically examining the effect of multiple dimensions of lean production programs simultaneously.

The literature provides evidence that successful implementation of lean production practices creates a streamlined, high-quality system that produces products and services with increased productivity, reduced cost, shortened lead times, and increased volume flexibility, which ultimately enhances organizations' performance (Shah and Ward, 2003). However, some previous studies provide evidence that many of the organizations that implemented lean production have experienced limited success in achieving increased organizational outcomes, such as increased competitiveness. (Doolen and Hacker, 2005).

This study deeply observes the Loadstar production system and how lean system has been affected for its operational performance. The research analyses the way that implementation of Lean Manufacturing Systems in Camso Loadstar pvt Ltd and the way of sustain lean system within the organization. The company started the lean implementation from 2005 with implementing basic 5S concepts (Sort/Set in Order/Shine/Standardize/Sustain). The company continue the lean process implementing new tools and now the concept of Team Leader Base Organization (TLBO) that focus on changing behavior of the working team. During this period, company has achieved their operational objectives at expected level with increasing trend. But there is no any significant evidence to be identified the size of contribution which has shared by lean manufacturing system over the company performance. Therefore, the purpose of this study is to investigate the relationship between Lean implementation, and organizational performance.

2. Literature Review

The most famous simple definition for lean is the systematic method for eliminating waste through continues improvement. The core idea is to maximize customer value while minimizing waste. (Womack and Jones,1996). According to them the five well known principles of lean manufacturing are defining the value from the customer standpoint, identifying the value stream, removing barriers to work flow, enabling customer pull and promoting continuous improvement. Also they identified eight kinds of waste in manufacturing process. viz. Re-work, Over Production, Over Processing, Transportation, Motion, Waiting, Inventory and Intelligence.

Train the work force: Without the assistance and buy-in of all participants in the value chain, organizations will not be able to make the change to lean manufacturing. Womack and Jones (1996) suggest that "It has become conventional wisdom that higher levels of management should learn to listen to the primary work team since they know the most about how to get the job done." The authors indicate, however, that this is not quite enough, that workers must be trained to understand pull techniques and in problem-solving methods.

Use lean tools and methods: Past literature showed most practitioners and researchers had highlighted the lean tools which could reduce inventories, lead times, rapid product development processes. Those are workforce management, Set-up time reduction (SMED), Pull system (Kanban),TPM, Mistake Proofing (Poka

Yoke), 5S, Value Stream Mapping, JIT, Visual Management, One Piece flow (Takt time), Standardised Procedures/work, Kaizen. (Shah & Ward, 2003 and Womack & Jones, 1996).

Continues improvement process: Kaizen is a Japanese word which becomes common in many western companies. The word indicates a process of continuous improvement of the standard way of work (Chen et al, 2000). Continuous Improvement is one of the core strategies for excellence in production, and is considered vital in today's competitive environment (Dean & Robinson, 1991). Williams (2006) highlighted that CI (continuous Improvement) techniques are the recognized way of making significant reduction to production costs. Hyland et al. (2004) highlighted the major potential benefits of CI. i.e. Increased business performance (in terms of reduced waste, setup time, breakdowns, and lead time) and increased 'people performance' in the form of improved development, empowerment, participation, and quality work life of employees; all of which address contemporary societal needs.

Employee Behavior: Lean implementation success hinges upon workers actively participation in problem solving and process improvement efforts for reducing waste, increasing productivity and flexibility, and enhancing quality (Bhasin & Burcher, 2006). Unfortunately, researchers have reported that worker-involvement practices (an important aspect of lean manufacturing) have been implemented in the USA primarily through threats and practices of layoffs (Kwon, 2007). While such harsh tactics may result in improvements in labor productivity and efficiency in the short-term, long-term gains in worker buy-in and dedication to lean is questionable.

Management Adoption: Lack of senior management commitment has been found to be a significant element affecting implementation of a change initiative (Douglas & Judge, 2001). Inability to manage change and resistance to change due to disruption of existing social networks were expensive and time consuming (Alagaraja & Egan 2013). As per Balogun (2006), middle managers have been said to have a 'bilingual role' that requires them to translate the strategic and often abstract language of upper management into the operational language which guides workers towards concrete action.

Organizational Performance: The concept of organizational performance is based upon the idea that an organization is the voluntary association of productive assets, including human, physical, and capital resources, for the purpose of achieving a shared purpose (Alchian & Demsetz, 1972).

According to Bruce and Larco (1999), lean production is both a concept that can be viewed and implemented at a number of levels and also a commitment process of relentless improvement that can significantly impact upon an organizations health wealth and competitiveness. However for most companies, use of recent technologies for lean production system has become critical and is a standard practice for achieving greater performance gains (Emiliani, 2006). Lean is the quality initiative that is the most effective business improvement techniques that focus on continuous process improvement. These techniques, which are adopted to improve business processes, eliminate defects, reduce cycle times, speed up delivery at a minimal cost and accelerate the process of identifying and solving issues to ensure excellence in operational and business management (George et al., 2004). Nakajima (1998)

identified six important parameters to measure the organization performance over lean manufacturing called 'PQCDSM'. i.e. Productivity, Quality, Cost, Delivery, Safety and Morale.

Wickramasinghe & Wickramasinghe (2017) revealed that lean production practices significantly enhance manufacturing performance by conducting a study on Sri Lankan textiles industry. According to Rasi et al. (2016), the four dimensions of operational performance i.e. quality, delivery, cost & flexibility is positively related with the Lean production practice in the manufacturing industry.

3. Methodology

The study was focused on examining the relationship between lean implementation and organizational performance of the manufacturing industry of Sri Lanka. Well recognized manufacturing organization (Loadstar Ltd) was selected for conducting the research. Because of identifying the lean processes, an institute had to be selected which had implemented Lean and maintaining Lean practices. It is very difficult to select same kinds of organizations since different manufacturing organizations have different organization policies, environments, cultures, characteristics and etc. if organizations are varied with above mentioned characteristics, the sample would not be within the same parameters. So, the researcher had to select one manufacturing institute. Data were collected based on primary and secondary sources. 140 questionnaires were distributed among the production level employees and managerial level employees in Loadstar (pvt) Ltd. The study used the systematic stratified sampling technique. The goal of systematic stratified random sampling is to achieve the desired representation from various subgroups in the population (Nthenge, 2016). 20 questionnaires were distributed among the production employees in 4 different departments in the selected organization as a pre-test of the questionnaire. According to the analysis, all the questions were internally consistent since the alpha value is higher than 0.7 in every dimension. The sample (140) was divided among the divisions in production department as subgroups (strata). This sampling technique facilitated the researcher to collect data without facing inconveniences and reducing the bias

Conceptual Framework

The overall aim of the conceptual framework is to make research findings more meaningful, acceptable to the theoretical constructs in the research field and ensures generalizability. (Adom et al., 2018)The conceptual framework depicted in figure 3.1 developed based on the literature survey and the requirement of the study.

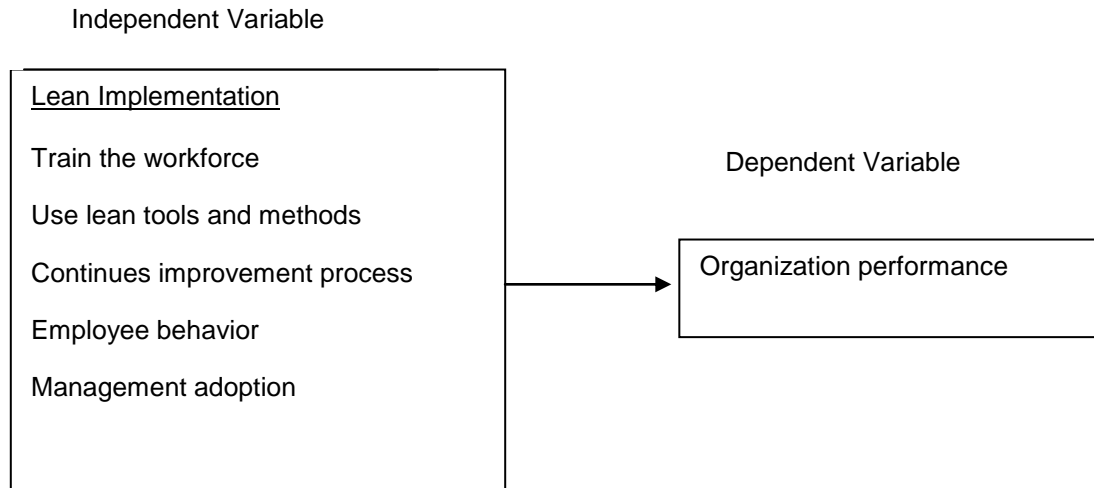


Figure 3.1. Conceptual Framework of the Study

Variable Selection and Hypothesis Development

Key dimensions of Lean implementation were identified through extensive search of previous research articles. After reviewing previous research articles, researcher adjusted the variables with current requirement. Dimensions are, Train the workforce, Use lean tools and methods, Continues improvement process, Employee behavior and Management adoption. Nakajima (1998) identified six important parameters to measure the organization performance over lean manufacturing called 'PQCDSM.

Based on the above, following hypothesis have been formulated for this study.

H1: There is a positive relationship between Lean implementation and organization performance.

H2: There is a positive relationship between Train the workforce and organization performance.

H3: There is a positive relationship between Use lean tools and methods and organization performance.

H4: There is a positive relationship between Continues improvement process and organization performance.

H5: There is a positive relationship between Employee behavior and organization performance.

H6: There is a positive relationship between Management adoption and organization performance.

The process of operationalization makes the variables measurable in a quantitative manner. Quantitative form of data collected by questionnaires and then analyzed to see whether the data support for hypothesis or not. 5 closed ended questions were used to gather the demographic and business details. 40 scaled based questions for the both dependent and independent variables used to see the results of the relationship.

4. Findings

The inter item consistency reliability has been examined with Cronbach's Alpha test. The results of Cronbach's alpha test are given in the Table 4.1, which suggest that the internal reliability of each instrument is satisfactory.

Table 4.1 Cronbach's Alpha Coefficients

| Dimension | Cronbach's Alpha |
|--------------------------------|------------------|
| Train the workforce | 0.788 |
| Use lean tools and methods | 0.780 |
| Continuous Improvement process | 0.801 |
| Employee Behavior | 0.735 |
| Management adoption | 0.775 |
| Organization performance | 0.766 |

Source : Survey data 2018

According to the Cronbach's Alpha test, all the values are greater than 0.70 which surpass the acceptable value. It seems that the questions used in the questionnaire are good measurements of measuring the independent and dependent variables.

Descriptive Statistics Analysis

Descriptive statistics refer to the descriptive coefficients which sum up a given data set of the study variables that can be either a representation of the entire population or a sample of it. In simply, it illustrates the methods to summarize large sets of quantitative/numeric data of the research study. It also considers individual variables and this type of analysis is called as univariate analysis. Under the descriptive statistics analysis, mean and the standard deviation value of each variable in the research are considered.

Demographic Data - Age, Division, and Service period were considered as demographic factors in this study. According to the findings, majority of the sample is represented by the age limit of 30-34 which provides 49.2% of the total sample. Out of 140 respondents 57.5% respondents were represented by the MTD-01 Air Tyre division while 42.5% from MTD-02 Air Tyre division. 44.2% of the sample representing service period more than 10 years.

Table 4.2. Descriptive Statistics

| Scaled based Questions | N | Mean | Median | Mode | Std. Deviation |
|-------------------------------|-----|-------|--------|-------|----------------|
| Train the workforce | 140 | 3.726 | 3.600 | 3.200 | 0.368 |
| Use lean tools and methods | 140 | 3.736 | 3.600 | 3.500 | 0.323 |
| Continues improvement process | 140 | 3.808 | 3.333 | 3.333 | 0.375 |
| Employee behaviour | 140 | 3.849 | 3.467 | 3.467 | 0.339 |
| Management adoption | 140 | 3.675 | 3.700 | 3.900 | 0.392 |
| Performance through lean | 140 | 3.794 | 3.688 | 3.750 | 0.343 |

Source : Survey data 2018

By analyzing the scale based questions, respondents' view on dimensions of Lean Implementation and Organization performance can be identified. Based on the information given by the table 4.2, respondents have held favorable sentiment regarding the all independent variables since all of them are within the level of "agree" (mean 4) and "neutral" (mean 3) level. Mean values of all the independent variables are closer to 4.0, which is "agree". Performance of the Organization is the dependent variable of the study. According to the table 4.2, employees have been agreed with the overall organization performance which suggest by the mean value closer to 4 that is "agree".

Hypothesis Testing

Spearman Rank Correlation Test: This test is a non-parametric test and can be used to test the association between two ranked variables. And also, this test can be used to test the association between two ordinal and continuous variables. Spearman correlation coefficient also varies from -1 to +1. This test was used to test relationship between variables since the dependent variable; "Organization performance" is not normally distributed.

Table 4.3 Correlations between Lean Implementation and Organization performance

| | | Performance through lean | Train the workforce | Use lean tools and methods | CIP | Employee behavior | Management adoption |
|--------------------------|------------------------|--------------------------|---------------------|----------------------------|--------|-------------------|---------------------|
| Performance through lean | CorrelationCoefficient | 1.000 | .580** | .470** | .495** | .818** | .873** |
| | Sig. (2-tailed) | | .000 | .000 | .002 | .000 | .000 |
| Train the workforce | CorrelationCoefficient | .580** | 1.000 | .685** | .345** | .579** | .528** |
| | Sig. (2-tailed) | .000 | | .000 | .000 | .000 | .000 |

| | | | | | | | |
|----------------------------|------------------------|--------|--------|--------|--------|--------|--------|
| Use lean tools and methods | CorrelationCoefficient | .470** | .685** | 1.000 | .457** | .610** | .576** |
| | Sig. (2-tailed) | .000 | .000 | | .000 | .000 | .000 |
| CIP | CorrelationCoefficient | .495** | .345** | .457** | 1.000 | .716** | .626** |
| | Sig. (2-tailed) | .002 | .000 | .000 | | .000 | .035 |
| Employee behavior | CorrelationCoefficient | .818** | .579** | .610** | .716** | 1.000 | .834** |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | | .000 |
| Management adoption | CorrelationCoefficient | .873** | .528** | .576** | .626** | .834** | 1.000 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .035 | .000 | |

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

* . Correlation is significant at the 0.05 level (2-tailed).

Source: Survey Data 2018

According to the results of the Spearman Rank Correlation shown in the table 4.3, there is a positive significant relationship between the each dimension of the Lean implementation and organization performance. Since p-value is lower than 0.05 the desired significance level in every dimension, the null hypothesis should be rejected at 5% level of significance.

Regression Analysis

Table 4.4 Statistics of regression between Lean and OP

| Model | R | R Squar e | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | Sig. F Chang e |
|-------|-------|-----------|-------------------|----------------------------|-------------------|----------|-----|-----|----------------|
| | | | | | R Square Change | F Change | df1 | df2 | |
| 1 | .694a | .482 | .456 | .33427 | .694 | 18.775 | 5 | 101 | .000 |

a. Predictors: (Constant), Management adoption, Continues improvement process, Train the workforce, Employee behavior, Use lean tools and methods

Source: Survey Data 2018

According to the Table 4.4, R value is 0.694 indicates a good level of prediction of the dependent variable: organization performance. R square value is 0.482 and it indicates that the five independent variables explain 48.2 % of the variability on dependent variable. Adjusted R square value is 0.456. It indicates that 45.6 % variation of the Lean implementation effectiveness on organization performance. H1s accepted based on this result. The F value is 18.775, which is significantly at 1% (p = 0.000), which suggest that these all independent have 48.2 % of the variation on employee performance. It shows that there is a impact of Lean implementation on organization performance. The remaining unexplained 51.8 % could be due to other factors determine Organization performance, which are not considered in this study.

Table 4.5 Results of the regression analysis

| | | Coefficients ^a | | | | |
|-------|------------|---------------------------|------------|--------------|-------|------|
| | | Unstandardized | | Standardized | | |
| | | Coefficients | | Coefficients | | |
| Model | | B | Std. Error | Beta | T | Sig. |
| 1 | (Constant) | .013 | .471 | | .027 | .978 |
| | TW | .387 | .096 | .349 | 4.045 | .001 |
| | ULTM | .142 | .078 | .164 | 1.809 | .003 |
| | CIP | .203 | .069 | .263 | 2.955 | .004 |
| | EB | .617 | .090 | .533 | 6.839 | .000 |
| | MA | .518 | .097 | .441 | 5.344 | .000 |

a. Dependent Variable: Performance through lean

Source: Survey Data 2018

According to the Table 4.5, it is evident that all 5 variables' β values are higher than zero (0) and the significance level is also less than 0.05. At the same time, the Beta coefficient has a positive marking, supporting the direction of the hypothesis 2,3,4,5 &6.

Interview based data analysis

Some data were gathered from 20 number of management level employees who are working in the Camso Loadstar Midigama office to further analyze the relationship between lean implementation and organizational performance. There were 6 questions to understand the relationship between the variables. i.e. How do you think about Lean manufacturing system?, Is there any relationship between Lean implementation and Organization performance?, How employees' behaviour would be effected to sustainability of Lean?, How Management adoption would be effected to sustainability of Lean ?, What are the obstacles to implement and sustain Lean ?, What is your role as a manager to have the organization performance through lean and tactics to sustain lean in organization ?.

According to the answers given by 20 managers, they all believe that there is a strong positive relationship between 2 variables. They have a vital responsibility to sustain the Lean in organization. So management adoption is key factor for any organization to have a sustainability of implemented Lean system. Specially Appreciation, follow-up, Go-see, Problem solving are some of strong aspect that management should adoption with the system. knowledge gap, financial gaps, cross functional conflict, management follow up were identified as obstacles to implement lean management system.

4. Discussion

This study confirmed that there is a positive relationship between Lean implementation and organization performance. Under the Lean, the researcher selected 5 dimensions and all of them had a positive relationship with organization performance. This concludes Wickramasinghe & Wickramasinghe (2017) who

revealed that lean production practices significantly enhance manufacturing performance. Womack and Jones (1996) suggested the importance of training the workforce which confirmed by this study. Hyland et al. (2004) highlighted the major potential benefits of Continuous Improvement (CI). i.e. Increased business performance. This study revealed the positive relationship between CI and organization performance. Lean implementation success hinges upon workers actively participation in problem solving and process improvement efforts for reducing waste, increasing productivity and flexibility, and enhancing quality (Bhasin & Burcher, 2006). In here also it has revealed the positive relationship between these 2. Lack of senior management commitment has been found to be a significant element affecting implementation of a change initiative (Douglas & Judge, 2001). This study suggested the positive relationship between management adoption and organizational performance.

5. Conclusions and Implications

Based on the research, the researcher concluded that there is a positive relationship between lean implementation and organization performance in Camso Loadstar Company. According to the statistics analysis it is clear that Lean implementation was a core factor to be improved performance in the organization. Also research has proven that all the independent variables viz. 'Train the workforce, Use Lean tools and methods, continues improvement process, employee behavior and management adoption have positively related to enhance organization performance.

5.1. Recommendations and Implications

Lean has become a most reputed manufacturing system through-out the world to enhance the all form of performance factors in the organization by identifying and eliminating manufacturing wastages. Also it is a customer oriented manufacturing system that company could use to reduce customer waiting time and deliver a value added quality product or service with a competitive price. In the Sri Lanka contest still we can see only limited organizations have been engaging with Lean Manufacturing system. So it is suggested to explore the lean manufacturing system in the each possible organizations in the Sri Lanka. Not only for manufacturing sector, Lean is a powerful customer oriented system that could be used on service sector. There are very limited service entity in the world who has been engaging with Lean system. But implementing lean system in the service sector may be able to provide an efficient and effective service sectors in the world with adding the extra value its customer as same as manufacturing sector.

The findings of this research study shall be important on the theoretical as well as on the practical level. As this research model proves to be an explanatory model of impact of Lean practices on organization performance of manufacturing organizations, the findings of this study are important to improve Lean practices in order to increase organization performance among manufacturing organizations. This research study will help any future researchers who are interested to do a study in regarding with Impact of Lean and organization performance of manufacturing as well as service level organizations. The findings of this research will help to government organizations as well as other organizations to understand the current states of manufacturing industries with regarding new Lean tools and take further action to improve the

present situation. Ultimately the findings of this research will help to various parties those who are interested to the relevant subject and decision makers to get proper decision regarding the manufacturing organizations and also in order to build right strategy for manufacturing organizations to get right understanding about role of Lean practices, its effectiveness and factors affecting the organizational performance.

Limitations

Further investigation in other manufacturing organizations may provide additional insights into the findings of the study. Another important limitation is that this analysis is cross – sectional in nature. Additional research is suggested to be carried out longitudinally in order to evaluate the impact of variables over time. Longitudinal studies using both qualitative and quantitative techniques are required in order to understand the changes in the independent variable over time. Such studies could result in new explanatory variables. If the sample size are increased it would be able to obtain results with a lesser sampling errors.

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