

How Lean Six Sigma, Intellectual Capital and Good University Governance Influenced HEI Performance in Indonesia

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ABSTRACT

Purpose – The purpose of this study is to analyze the influence of Lean Six Sigma and Intellectual Capital mediated by Good University Governance to Higher Education Institutions (HEI) in Indonesia.

Methodology/approach – The methodology using quantitative approach with Structural Equation Model (SEM) of the AMOS analysis. The study having samples of 245 respondents filling the online questionnaires from 26 private universities under Muhammadiyah Aisyiyah organization, spread across all islands in Indonesia.

Findings – Based on the results of the study, it is found that directly and indirectly Lean Six Sigma and Intellectual Capital mediated by Good University Governance deeply positive and significant impacted to the performance of HEI in Indonesia. The practical implications of this study such as Six Sigma and Intellectual Capital variables have positive and significant impact on the performance of 26 Muhammadiyah Aisyiyah private universities in Indonesia. Although there are areas that need improvement, especially in the campus physical arrangement and infrastructure.

Novelty/value – The value of this study such as giving contribution to the theoretical and its regulations implementation of Lean Six Sigma and Good University to support the university performance.

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INTRODUCTION

In the last twenty years, universities around the world agreed to have standards to measure their performance that can be applied in each university around the world. Before the research conducted, universities found their difficulties to have common measurement tools on how to equalize perceptions of performance success among universities. Each country has its own rules for measuring university performance, and each university also has its own procedures to measure their performance.

From results of the studies attended by 17 universities in Australia, China and Singapore by including respondents from campus policy makers and 182 academic staff, it was found that the facts faced by HEI in the international levels are unique, have similarities with each other, even though institutions exist in different regions of the country, among others. There are 5 (five) main points that are the problems of higher education at the international level, as well as being the benchmark for the success of a university, including a) Management of scientific research, b) Institutional outcomes in the

form of graduates absorbed by industry, c) Qualifications of teaching staff, d) Government Role, and e) Involvement and partnership with stakeholders (Gao, 2018).

It is summarized from BAN-PT (Indonesian National Accreditation Board-Higher Education), as of per-September 2022 there are 131 universities and 370 study programs that are not accredited. The main reason is that there are still many universities that have not been able to meet the Institutional Self-Evaluation Component outlined by the BAN-PT (Indonesian National Accreditation Board for Higher Education). The provision of clustering values based on the achievements of higher education performance against the sub-criteria of the assessment component in each main performance, listed 66 criteria assessed at SINTA. Furthermore, each university's performance is normalized with data on the number of lecturers or the number of active study programs at each university in accordance with PDDIKTI data. The following is the clustering table of universities throughout Indonesia for 2023:

Table 1. 2023 HEI Clustering

No.	Clustering	Amount of HEI
1	Mandiri	40
2	Utama	160
3	Madya	238
4	Pratama	442
5	Binaan	1.277

Source: BIMA 2023

What interesting from the BAN-PT measurement, there are 8 (eight) Muhammadiyah Aisyiyah Higher Education Institution (PTMA) accredited Superior. Muhammadiyah Aisyiyah Higher Education Institution (PTMA) is one of Muhammadiyah's Business Charities in the field of education (Fauziana, 2022). According to the Muhammadiyah Data Center -- the largest modern Islamic organization in the world – totally it has 143 universities spread throughout Indonesia.

We can learn how the management team of each Muhammadiyah Aisyiyah Higher Education Institution work and collaborate to achieve superior (*Unggul*) accreditation, so that can be the model for other universities which still struggling to get higher accreditation levels. According to (Aldoseri & Sharadgah, 2021) the accreditation value of private universities can be varied from one another, caused by the number of factors played roles in the assessment and accreditation of educational institutions. Jasti, et al., (2022) focused to study other major internal factors, including curriculum development, lecturer quality, research development strategies as well as academic programs and tools and supported infrastructure. From the phenomenon above, we are interested to study and designing research about *how lean six sigma, intellectual capital and good university governance influenced the performance of Higher Education Institution in Indonesia.*

LITERATURE REVIEW

Lean Six Sigma

Mulyana, Singgih, Partiw, & Hermanto (2023) mentioned that although there has not been much researches related to the application of Lean Six Sigma in universities, they stated that the application of Lean Six Sigma has been implemented in universities in developed countries such as Europe and America. Allaoui & Benmoussa, (2020) argued that the implementation of Lean Six Sigma principles in higher education has yielded significant improvement results, because the main purpose of implementing Lean Six Sigma is to reduce waste in areas that have no added value, and increase

efficiency. Sunder M & Antony (2020) put forward several examples of waste in teaching, research, administration, finance and also human resource management.

Flexibility and autonomy in HEI are challenged when implementing Lean Six Sigma in higher education institutions, and the complexity of institutional management increased because the boundaries of management and division of tasks are still un-clear (Ait-Bennacer, Aaroud, Akodadi, & Cherradi, 2022).

Intellectual Capital

Zhu & Wang, (2022) defined Intellectual Capital as information and knowledge can be implemented to the daily operational activities giving added values to the organization. Uriguen et al., (2023) defined Intellectual Capital as part of skills and experiences owned by all members in the organization combined with information from many sources to improve and enhance individual and organization growth.

Hama & Cavusoglu, (2023) stated that Intellectual Capital has major roles to win the business competition and as the major key of organization profit center. (Uriguen Aguirre & Avolio Alecchi, 2023) defined Intellectual Capital in the universities as the key to create qualified academic environment, innovative and sustainable, by understanding and measuring the qualified academic environment, innovative and sustained. Understanding these variables support HEI to design strategic objectives, continuous improvement and maximize the positive impact to the students and society.

Good University Governance

Al-Zoubi, et al., (2023) summarized that the implementation of Good University Governance have the major roles in improving the quality of higher education. Its implementation contributed significantly to its quality. Based on the practical and theoretical phenomenon mentioned above, the authors of this study would add the Good University Governance as the mediating variables in this research. La Forgia et al., (2023) described the positive influence of Lean Six Sigma on organizational performance mediated by organizational governance. In their research, Simonyte et al., (2022) explained the significant influence between the implementation of Lean Six Sigma on higher education performance mediated by Good University Governance. The results of research by Armaki et al., (2023) describe the influence between organizational performance on the implementation of Lean Six Sigma mediated by Good University Governance.

University Performance

The focus areas of organizational capacity such as economic performance (return of assets and sales development) and organizational innovation for example in the areas of systems, policies, programs, processes, products and services (Javed & Alenezi, 2023). Meanwhile, (Jayabalan, Dorasamy, Raman, Sambasivan, & Harun, 2022) elaborated on the dimensions of Organizational Performance, namely (a) Financial Perspectives, which refers to financial balance, especially institutional income and spending. The second perspective is (b) Internal Stakeholders Perspectives, which refers to the management of human capital, especially in terms of developing skills, technical, social and also managerial and leadership abilities.

The third dimension is (c) Structural Perspectives, which refers to guidelines, procedures, references to operational implementation within the scope of the institution itself. The fourth dimension, namely (d) External Stakeholders Perspectives, refers to how institutions manage good relations with stakeholders, not only in the context of providing education, but also extends to political, social and cultural aspects. And the fifth perspective (e), namely Learning Perspectives, refers to how universities

develop innovation and entrepreneurial spirit in all lines that can support the success and sustainability of higher education.

Craveiro et al., (2023) stated that there is a significant influence between organizational performance and the implementation of Lean Six Sigma mediated by Good University Governance. We can summarize that the variables of Lean Six Sigma, even though rarely being research in education institution industries, having positive impact to the performance of Muhammadiyah Aisyiyah HEI in Indonesia. Good University Governance, also considered giving positive impact to the performance of Muhammadiyah Aisyiyah HEI in Indonesia.

Research Framework

From the detail variables stated above, we can draw the research framework as follows:

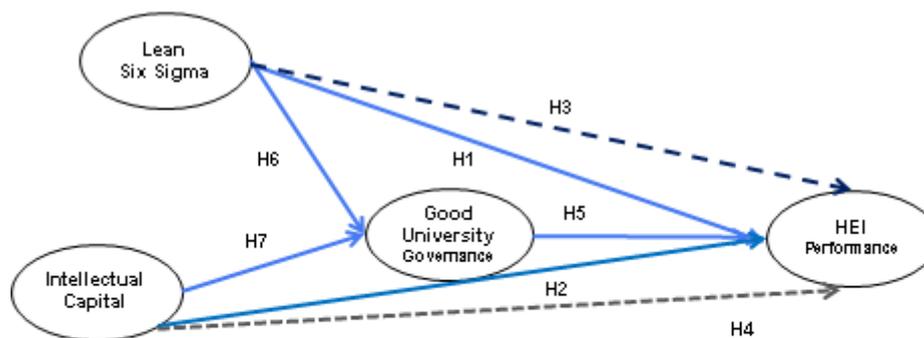


Figure 1. Research Framework

- H1: Lean Six Sigma gives significant and positive influence to the HEI Performance
- H2: Intellectual Capital gives significant and positive influence to the HEI Performance
- H3: Lean Six Sigma gives significant and positive influence to the HEI Performance mediated by Good University Governance
- H4: Intellectual Capital gives positive and significant influence to HEI Performance mediated by Good University Governance
- H5: Good University Governance gives positive and significant impact to HEI Performance
- H6: Lean Six Sigma gives positive and significant influence to HEI Performance
- H7: Intellectual Capital gives positive and significant impact to the Good University Governance

METHOD

The research was conducted at 26 Muhammadiyah Aisyiyah Higher Education Institutions (HEI) spread in all over areas in Indonesia. The research focused on Lean Six Sigma and Intellectual mediated by Good University Governance to the university performance within Muhammadiyah Aisyiyah HEI. The population of this study consisted of 12.470 lecturers within the total 143 Muhammadiyah Aisyiyah

HEI all over Indonesia (Fauziana, 2022). The samples of 245 personnel was selected using purposive random sampling. The sample size was calculated using the Slovin formula. Data collection involved the use of personal questionnaires distributed to respondents. Respondents were asked to choose one of the provided answer alternatives.

The Likert scale was used to quantify responses, with values ranging from 1 to 5, representing different degrees of agreement or disagreement. The variables were operationalized as follows: Exogenous Variable: Lean Six Sigma (X1) and Intellectual Capital (X2). Endogenous Variables: University Performance (Y1), and Mediating Variable: Good University Governance (Z).

Operational definitions and indicators were provided for each variable to clarify the concepts being studied, such as Lean Six Sigma defined the Organizational quality management methodology to improve efficiency, quality, and productivity in different types of organizations. This methodology focuses on process improvement and reducing variability to achieve better results (Sunder M & Antony, 2020), and Good University Governance known for A framework that describes principles, practices, policies, standardization that govern management and decision making in the management of higher education institutions (Nurlatifah et al., 2021). While Organization Performance merging the results of individual and institutional performance as a whole by implementing strategies to achieve the vision and mission and goals of the organization (Heaton & Teece, 2023).

Validity and reliability testing were conducted to ensure the quality of the data collected. Pearson product-moment correlation coefficient (Pearson's r) was used to assess validity statistically. Statements were considered valid if they had a significance level below 5%. Reliability was assessed using Cronbach's Alpha coefficient. An instrument was considered reliable if it had an alpha value greater than 0.50.

The research method aimed to investigate the relationships between Lean Six Sigma mediated by Good University Governance to the performance of Muhammadiyah Aisyiyah HEI. Data collection was conducted through questionnaires, and the validity and reliability of the instruments were assessed to ensure the quality of the data. The analysis using Quantitative of AMOS in Structural Equation Model (SEM). The variable measurement described on the table 2 as follows:

Table 2. Variable Measurement

Variable	Dimensions	Indicators Statements	Sources
<i>Lean Six Sigma</i>	<i>Over Production</i>	Lecturers' teaching schedules have equaled to work load allowed.	(Douglas, Antony, & Douglas, 2015)
		The number of academic functions in our faculties equaled to operational needs.	
		Administration and documentation of each teaching-learning activities have standard compliance to the regulation related.	
	<i>Over Processing</i>	Teaching-Learning activities have been documented by hard copies and soft copies online formatted.	
		The administration of Teaching-Learning activities had been documented in hard copies and soft copies online formatted.	
		Internal approval process for teaching-learning activities arranged properly.	
<i>Excessive Transportation</i>	Class room and academic office located nearby, so lecturers and students easily interacted, especially for administrative and academic purposes.		
	Teaching-learning activities provided in classroom properly and well functioned.		
	Lecturers waiting room are set properly so they can work or rest in between teaching hours.		

	Inventory	Class room areas set properly based on the activities purposes and number of student needs. Laboratorium areas designed and functioned properly.	
	Underutilized Talent	Internal budget allocation support lecturers to do the research activities. Internal budget allocation support lecturers to do the community welfare activities.	
Intellectual Capital	Human Capital	In our study program there is one Professor related to our department In our study program, all permanent lecturers holds LEKTOR as their functional position.	(Hama & Cavusoglu, 2023)
	Structural Capital	In our study program, there is one Open Journal System (OJS) which publish lecturers and students scientific research results, In our study program, all permanent lecturers have minimum one IPR for their research and writings.	
	Relational Capital	In our study program, all lecturers have their own grants from researches or community services In our study program, students satisfaction rate at 80% per-semester	
Good University Governance	Context, Mission and Goals	Faculties visions and missions related to the Institution visions and missions. Study program visions missions related to the faculties visions missions.	(Suharman, Hapsari, Hidayah, & Saraswati, 2023)
	Autonomy	Our study program has been accredited VERY GOOD (Baik Sekali) In our study program, lecturers had the doctoral degree.	

Variables	Dimensions	Indicators Statement	Sources
		In our study program, the ratio numbers of lecturers and students are 1: 20, means one lecturer teach 20 students in a class.	
	Accountability	In our study program, every lecturer has international publication in Scopus or WOS minimum one article per-year. In our study program, every lecturer led the Social Community Welfare (PKM) minimum one activity in each semester.	
University Performance	Financial Perspectives	Campus invested in technology development continuously. Campus invested and allocated fund to lecturers and staff development needed.	(Pedro, Leitão, & Alves, 2019)
	Internal Stakeholders Perspectives	Superior one step above has the capacities to lead the team.	
University Performance	Internal Stakeholders Perspectives	Campus environment support team work and individual positive atmosphere. Internal communication and coordination structured clearly.	(Pedro et al., 2019)
	Structural Perspectives	Every lecturers article online publication got minimum one citation. In our study program, consists of minimum one student with special needs per-year whom study with us.	
Variables	Dimensions	Indicator Statements	Sources

<i>Learning Perspectives</i>	Academic staff joined the trainings minimum one class per-semester. In our university minimum has one profit foundation to support fund and campus operation.
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Summarized by the authors from listed sources

RESULT AND DISCUSSION

Lean Six Sigma

Simonyte et al., (2022) states that Lean Six Sigma is a quality management methodology to improve efficiency, quality, and productivity in various types of organizations. This methodology focuses on process improvement and reducing variability to achieve better results. As for (O'Reilly et al., (2019) argues that Lean Six Sigma is a concept that aims to eliminate waste in business processes. Waste can be time, effort, materials, or other resources that do not add value to the product or service. Lean strives to create a smoother work flow, reduce excess inventory, minimize cycle times, and increase customer satisfaction

Hartanti et al., (2022) summarized that there are three dimensions that determine success in analyzing the success of Lean Six Sigma implementation in universities, including (a) measurement of cultural change that supports and supports continuous improvement activities, (b) measurement of the extent of effectiveness of operational activities on campus, and (c) measurement of the extent of efficient use of all existing resources to provide the best service in each area.

From the total 245 respondents come from 26 Muhammadiyah Aisyiyah HEI (PTMA), we found that exogenous variables (independent variables) in this study consist of lean six sigma variables, and the results of testing the measurement model (confirmatory factor analysis).

The path coefficient obtained from the influence of the Lean Six Sigma variable on Good University Governance is $\rho = 0.338$ with a significance level of $\alpha = 0.05$ with a probability value of 0.000 and t calculated by 5.728 which states that there is a positive and significant influence between Lean Six Sigma on Good University Governance. A value of 0.338 in the parameter coefficient means that the higher the Lean Six Sigma, the higher the Good University Governance. These results support the hypothesis proposed, where there is a positive and significant influence between Lean Six Sigma on the variables of Good University Governance.

Good University Governance

Good University Governance is a framework that describes the principles, practices, and standards that govern management and decision-making in colleges or universities. The main objective of Good University Governance is to ensure that universities operate in an efficient, transparent, fair, accountable, and conforming manner to high ethical values. These principles are designed to create an environment that supports academic success, community development (Marfiah, et al., 2021) and the growth of educational institutions (Nurlatifah et al., 2021). Universities should encourage stakeholder participation and involvement in decision making, including students, lecturers, staff, and alumni. And, good institutional governance encourages universities to uphold ethics, integrity, and moral values in all aspects of their operations (Azka Raga, Suharman, & Sari, 2020).

Good financial management is able to improve the quality of education they offer and support high-quality research (Lestari, Usman, Syofyan, Esya, & Hartini, 2023). To be able to survive and thrive in a competitive era, universities must also be able to comply and adapt to the rules of law and social rules that apply in society, including higher education regulations and data protection law. In addition, universities should collaborate with local communities and forge partnerships with other institutions to promote sustainable growth and development (Diponegoro & Siringoringo, 1992).

The path coefficient obtained from the influence of the Good University Governance variable on PTMA Performance (university performance) is $\rho = 0.654$ with a significance level of $\alpha = 0.05$ with a probability value of 0.000 and t calculated at 5.470 which states that there is a positive and significant influence between Good University Governance on PTMA Performance (university performance). A value of 0.654 in the parameter coefficient means that the higher the Good University Governance, the higher the PTMA (university performance). These results support the hypothesis proposed, where there is a positive and significant influence between Good University Governance on PTMA Performance variables (university performance).

Intellectual Capital

Total score from Intellectual Capital was 5.395 with percentage, which means still in the quite good range. Lowest rank was stated related to the number professor related to the study program. Especially for the universities categorized in the third level of accreditation, still needs extra works to have minimum one professor in their study program.

University Performance

Iqbal et al., (2023) stated that organizational performance, which in this case is university performance, can be measured through three dimensions, including effectiveness, efficiency and adaptation. College effectiveness is measured through percentage and sales growth, efficiency is measured through return on investment (ROI) and profit margin. Adaptation is measured by how much an organization or college can create a new product or service each year. Financial and non-financial performance is also one measure of organizational performance. Financial performance includes earnings growth, sales growth and market share. Non-financial performance is measured by the level of employee satisfaction and retention.

Najmi et al., (2018) uses organizational capacities such as economic performance (return of assets and sales development) as well as organizational innovation for example in the areas of systems, policies, programs, processes, products and services. The dimension of Organizational Performance, namely (a) Financial Perspectives, which refers to financial balance, especially institutional income and expenditure. The second perspective is (b) Internal Stakeholders Perspectives, which refers to the management of human capital, especially in terms of developing skills, technical, social and also managerial and leadership abilities. The third dimension is (c) Structural Perspectives, which refers to guidelines, procedures, references to operational implementation within the scope of the institution itself. The fourth dimension, namely (d) External Stakeholders Perspectives, refers to how institutions manage good relations with stakeholders, not only in the context of providing education, but also extends to political, social and cultural aspects. And the fifth perspective (e), namely Learning Perspectives, refers to how universities develop innovation and entrepreneurial spirit in all lines that can support success and sustainability (Pedro et al., 2019).

To test the significance of Good University Governance as a mediating variable in the model can be checked from the results of the Sobel test with the first detail is to find the calculation value of Lean Six Sigma to Good University Governance and the second to find the calculation of Good University Governance to University Performance. To calculate the mediation test, a sobel test is used using an online sobel test calculator in the following table:

Table 3 Hypothesis Test Results 3

Input:		Test statistic:	p-value:
t_a	5.728	Sobel test:	3.95593942
t_b	5.470	Aroian test:	3.92478042
		Goodman test:	3.98785251
Reset all		Calculate	

Data sourced by Author 2024 from AMOS

Based on the calculation results, the calculated t_{value} for the mediation effect test on this hypothesis is 3.956. If $\alpha = 0.05$ then $t_{\text{table}} = 1.96$. From the calculation above, it can be concluded that t_{count} (3.956) is greater than t_{table} (1.96) with a significance level of $0.000 < 0.05$. These results show that Good University Governance is able to mediate the relationship between Lean Six Sigma and PTMA (University Performance) Performance. These results support the hypothesis proposed, where Lean Six Sigma has a significant effect on PTMA (University Performance) mediated by Good University Governance.

CONCLUSION

Overall, the findings of this study show that several independent variables consisting of Lean Six Sigma, either directly or indirectly through Good University Governance as the mediating variable, have had an influence on the performance of Indonesian Muhammadiyah Higher Education (PTMA) which acts as its dependent variable. The theoretical implications that can be given from this research include that this research has made a meaningful contribution to the development of Strategic Management science, especially in terms of developing the theory of Lean Six Sigma, Intellectual Capital, and University Performance at Muhammadiyah Aisyiyah Higher Education in Indonesia. In this study, the findings produced also have harmony and provide support for previous studies that are used as a basis for reference or reference in the preparation of this study.

The use of Good University Governance variables which are used as mediation variables in this study has produced research findings that can strengthen or weaken the influence of Lean Six Sigma variables on the Performance of Muhammadiyah Aisyiyah Higher Education in Indonesia. Therefore, the findings of this study seem to have made a significant contribution to the increase or decrease in the Performance of Muhammadiyah Aisyiyah Higher Education which was influenced by factors including Lean Six Sigma.

The results of this study are also in line with the results of research (Mulyana et al., 2023) which developed 18 waste models to identify and evaluate the efficiency and effectiveness of operational activities in universities. From the results of his research provide recommendations and input for policy makers in universities regarding the applicable Lean Six Sigma model, which focuses on waste (Hartanti et al., 2022). The managerial implications that can be stated in this study include the findings in this study show that the Lean Six Sigma variable has a positive effect on the performance of Muhammadiyah Aisyiyah Higher Education, although there are areas that need improvement, especially in the arrangement and infrastructure of laboratory space on campus.

Comprehensive novelty in this study is analyzing the role of Lean Six Sigma and Intellectual Capital in improving and enhancing University Performance mediated by Good University Governance in a series of systematic, integrated and comprehensive structured analysis. Analysis of the relationship between these variables is still rarely carried out, including in the areas of higher education sector.



Research limitation on this study suggests for future research such as higher education institutions that are used as units of analysis in this study are limited to Muhammadiyah Aisiyiah Universities in Indonesia which are at least accredited Good or third rank in accreditation level.

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