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Original Research Article

4.0 Educational Adaptation and Faculty Management of Student Performance in Higher Education in Borobudur University

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Abstract

Student enrolment, financial challenges, technology integration, and curriculum diversification have increasingly competition among higher education institutions. The ideal future workforce must possess not only technical expertise but also strong skills in complex problem solving, critical thinking, creativity, human resource management, and teamwork. In addition to analytical and leadership capabilities, these competencies are essential for thriving in a rapidly evolving digital economy. However, limited study has been conducted to assess Indonesia's readiness to engage with this digital transformation. The aim of this study to examine the correlation of 4.0 educational adaptation and school management on student performance in higher education in Borobudur University. This study uses applied research with a cross-sectional design to examine the impact of technological infrastructure and faculty management on student's performance. The population consists of employee at Borobudur University with a sample 40 respondents including leaders, lecturer and education staff. The result found that, the bivariate analysis of technological infrastructure, strategic planning and policy making, operational management, student assessment have significant relationship with performance. p value 0.000. The final model the variable technological structure significant correlation and operational management as confounding factor of student assessment R 0.603, RR 0,364 (36.4%) VIF 2.955.; Strategic planning and policy making was significant with Student performance and technological infrastructure as confounding factor with student performance R 00,609, R2 0,371 (37.1%), VIF 2,277. Student performance, student assessment significant correlation with Student Performance R 0,460, R2 0211 (21,1%), p 0.003, VIF 1.000. Conclusion technological infrastructure and operational management correlation with student assessment; strategic planning and policy and technological infrastructure correlation with student performance; student performance significant correlation with student performance.

Keywords: Operational management, strategic planning And Policy making technological Infrastructure, student assessment and Performance.

1.0 INTRODUCTION

The automation of jobs that is happening all over the world will definitely bring tremendous positive changes to the future of the job market. The rapid progress of both digital technology and the internet, also known as the fourth industrial revolution or Industrial Revolution 4.0 presents a new direction in industrial development. Historically, technological advances have led to disruptions in the job market at least in the short term. Recent technological advances in the fields of artificial intelligence, the Internet of Things, and 3D printing are having a significant impact on the production and consumption of goods and services. Technology integration results in an unprecedented transformation in the way work is planned, organized and managed. Automation has increased efficiency by replacing expensive human labour with machines and computers, which are increasingly becoming cheaper. This phenomenon sparked debate regarding the future of the Job Vacancies market. A study shows that the budget will be allocated to improve the education system. This policy will also complement existing government investment in vocational schools aimed at producing skilled technical personnel. Apart from that, it also aims to complete programs to build digital literacy skills in elementary schools, middle schools and high schools. Investment in

the future workforce depends on the development of ICT and the presence of a technology-literate generation. The ideal workforce in the future is one that has the skills required for complex problem solving, critical thinking, creativity, human resource management, and teamwork. In other words, apart from technical skills, also the future workforce needs to be equipped with strong analytical and leadership skills. Higher education institutions play an important role in shaping these qualities. Very little effort to understand Indonesia's readiness to engage with the digital economy has been made. One rare effort is a survey of 323 businesses, as reflected in the Indonesia Industry 4.0 Readiness Index compiled by the Ministry of Industry. Although more and more people are recognizing this problem, Indonesia still does not have a strong understanding of the capacity and skills of its future workforce. The future in this field is the form of existing students. There is not yet a good understanding of the readiness of higher education institutions, such as universities, institutes and polytechnics, to prepare a workforce that is ready to face the future. (Marzuki & Samsuri, 2022) (McKinsey & Company, 2024) (World Economy Forum, 2023) (Rios *et al.,* 2020)(Mantovani, 2020). The objective of this research intends to find out and explain the correlation of 4.0 educational adaptation and school management on student performance in higher education in Indonesia.

LITERATURE REVIEW

In 2019, there are more than 5.8 million students enrolled in HEIs in Indonesia, with approximately 2.5 million students (43%) studying at public universities.(Prodjomaroeto, 2020) The data shows that girls are more likely to enrolled in higher education institutions (HEIs) than are boys (54% and 46%, respectively), with no significant variation in this regard across all types of HEIs. In 2019, there are 293,775 academic staff members, an increase from 237,837 in 2016, but only 42,497 of these staff members had earned a doctoral degree leading to a low number of staff holding members professorial appointments (there are currently only 4,167 professors in Indonesia) (Prodjomaroeto, 2020) The Government allocates 20% of Indonesia's national budget to the education system to address this problem.

The findings have practical implications for educational institutions in designing and implementing online learning programs during the pandemic and beyond, considering the demographic characteristics of their participants. The study suggests that institutions should consider the effects of gender, position, and year of experience in shaping perceptions and behaviours related to online learning, provide targeted support, foster collaboration and knowledge sharing, conduct ongoing research and evaluation, and adopt a multi-dimensional approach to enhance the effectiveness of online learning initiatives. (Sattayaraksa *et al.,* 2023)

Based on research by (Andika *et al.,* 2021),there are disparity in basic online education infrastructure in Indonesia. This disparity can be seen in from 19 Universities in Indonesia only 4 have developed advanced e-learning system that impacted digital competencies of 1,162 Universities students who scored an aggregate 57,92 out of 100. Meanwhile in US, COVID-19 significantly increased online learning usage and pushed re-evaluation pre-pandemic opinion about online learning among student and faculty member in California Community College (CCC) system.(Hart *et al.,* 2024) Aims of these studies were to explore the impact of infrastructure and digital competencies on the online education effectiveness in Indonesia and the COVID-19 pandemic transformative effects on online learning perceptions in the US.

Online learning revolution foster interoperability conceptual framework development of different stakeholders, whether individual or institutional, to declare, share and maintain the representative collections of information resources related to the particular Education, Learning, Teaching, Training, and Performing (Research, Development, Production, and Service) in European Countries. (Perisic *et al.,* 2023) Meanwhile in Indonesia, Implementation of Electronic Based Government System underscores the critical role of interoperability in achieving an integrated, efficient, and sustainable digital ecosystem. (Kasiwi *et al.,* 2025)This system made due to each Ministry in Indonesia manage their own digital system.

Innovation and strategic planning in education also play an important role in creating an education system in Indonesia. but biggest challenge of its implementation is infrastructure and human resources readiness.(Aini, 2024) Strategic planning has an instrumental role in the success of e-learning in Al-Nisour University College but this research also highlight lecturer who are unable to use electronic education programs due to the lack of training courses and the lack of a clear approach to improving and developing e-learning. (Ahmed, 2023)

According (Webster, 2024), Policymaker should adopt evidence-based strategies when formulate online education policy especially for students from low income household due to increasing academic struggle during COVID-19 Pandemic in US. Meanwhile in Indonesia, government focused in improving lecturer competence and qualification in online education. (Salehudin *et al.,* 2021). These researches aimed to analyse adoption evidence-based strategies to tackle online education problem in low income household in US and Indonesian government program to improve lecturer qualification in online education.

Online education and Digitalization policymaker concern different between rich countries and poor countries due to weak infrastructure and many

areas in developing countries still without internet infrastructure. (Holvikivi, 2024)This situation can hinder student performance especially during online learning. Meanwhile, other researcher proposed machine learning based framework for e-learning platform to helping student and lecturer improve their performances.(Gligorea *et al.,* 2022) This research highlight contrast between weak technological infrastructure in poor countries that hinder development of online learning and development of machine -based learning in developed countries that have strong technological infrastructure.

Strategic planning worked in learner centred teaching method according this research in Philippine. (Manuel *et al.,* 2024)Lecturer teaching learning style also more career oriented than high quality instruction. In Taiwan, operational performance of tertiary institutions in implementing blended learning in the new normal era for students in introduction to business subject has a great responsibility in improving the quality of the blended learning system on an ongoing basis. (Dewi Martha *et al.,* 2023). In South Africa, Strategic and operational managers should also be equipped with stakeholder relations building and management skills to create student workplace opportunities with businesses and industries.(Makole *et al.,* 2023).

RESEARCH METHODOLOGY

This Research investigate correlation between Technological infrastructure, Strategic Planning, and Operational Management as Dependent variable and Student Assessment and performance as independent variable. This research using applied research, cross-sectional, variable dependent student performance, independent variable technological infrastructure consists of interoperability, virtualization, decentralization, real time capability, service orientation and modularity; strategic planning and policy making as: strategic planning and drawing policy; Operational Management: monitoring and evaluation, organizing resources, effective school discipline, controlling activities. Population of this research employee in Borobudur University, Sample 40 respondent (Leaders, Lecturer, Education Staff). This study taken in Borobudur University using goggle form in February 2025. We also using Analysis validity reliability, descriptive, and analytic Pearson correlation, linier regression, and multiple linier regression.

RESULT

3.1 Descriptive analysis

Table 3.1 The Descriptive Analysis of Technological Infrastructure, Strategic Planning and Policy. Operational management, Student assessment performance student.

N	Technological infrastructure	Strategic Planning and policymaking	Operational Management	Student assessment	Performance
Valid	40	40	40	40	40
Missing	0	0	0	0	0
Mean	67	17.3	25.2	8.4	8.7
Std. Error of Mean	1.1384	0.3	0.4	0.1	.2
Median	67	17.	24.	8.	8.
Mode	64	16.	24	8.	8.
Std. Deviation	7.2	1.9	2.9	1.0	0.9
Minimum	48.	14.	19.	6.	7.
Maximum	80.	20.	30.	10.	10

One of result research has standard deviation too big 7,2 in technological infrastructure variable. Other variable Strategic planning has SD 1.9; Operational management has SD 2.9, Student assessment has SD 1.0, and Performance 0.9.

3.2 Pearson Correlation Analysis

We using pearson correlation analysis to analyse linear relationship between variables. Table 3 Explain the mean, median have value quite same in descriptive analysis.

Table 4. The Pearson Correlation

		Technological infrastructure	Strategic Planning And Policy making	Operational management	Student assesment	Performance
Technological Infrastructure	Pearson Correlation	1	.749**	.813**	.552**	.563**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	40	40	40	40	40
	Pearson Correlation	.749**	1	.845**	.375*	.575**

Strategic PLanning Andpolicy Making	Sig. (2-tailed)	.000		.000	.017	.000
	N	40	40	40	40	40
Operational Management	Pearson Correlation	.813**	.845**	1	.307	.547**
	Sig. (2-tailed)	.000	.000		.054	.000
	N	40	40	40	40	40
Student Assesment	Pearson Correlation	.552**	.375*	.307	1	.460**
	Sig. (2-tailed)	.000	.017	.054		.003
	N	40	40	40	40	40
Performance	Pearson Correlation	.563**	.575**	.547**	.460**	1
	Sig. (2-tailed)	.000	.000	.000	.003	
	N	40	40	40	40	40

Base on Table 4 result research all variable significant with Performance student, and student assessment. With p value ≤0,05.

Table 5 The Final Model

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95,0% Confidence Interval for B		VIF
	B	Std. Error	Beta			Lower Bound	Upper Bound	
(Constant)	3.134	1.358		2.309	.027	.381	5.888	
Technological Infrastructure	.123	.033	.852	3.694	.001	.055	.190	3.076
Strategic planning and policy making	.120	.137	.220	.877	.386	-.157	.397	3.633
Operational management	-.198	.099	-.572	-2.004	.053	-.399	.002	4.715

Analysis multiple linier regression variables technological infrastructure, strategic planning and policy making, and operational management were correlated with student assessment, variable strategic planning and policy making has p value 0,386 must be out of the model because p value > 0,05. Furthermore, variables technological infrastructure and operational management both could be analysis again.

DISCUSSION

Result of this research Technological Infrastructure, Strategic planning and Policy Drawing, Operational Management, were correlated with Student assessment and performance. Meanwhile in other research, he introductory and related work analysis shows documents, studies, standards, procedures, and scientific articles that dominantly address particular aspects of current and future Education, Teaching, Training, Learning, and Performing ecosystems in EU. (Perisic *et al.,* 2023) Strategic planning worked in learner centred teaching method according this research in Philippine. (Manuel *et al.,* 2024)Lecturer teaching learning style also more career oriented than high quality instruction. In Taiwan, operational performance of tertiary institutions in implementing blended learning in the new normal era for students in introduction to business subject has a great responsibility in improving the quality of the blended learning system on an ongoing basis. (Dewi Martha *et al.,* 2023)In South Africa, Strategic and operational managers should also be equipped with stakeholder relations building and management skills to create student workplace opportunities with businesses and industries.(Makole *et al.,* 2023) Meanwhile in Research by (Sidin, 2020) advised to university to conducted short courses related to technology in their fields of expertise, increasing opportunities to participate in industry linkage programs, encouraging self-directed learning, improving and adding infrastructure in line with the development of IR 4.0 technology to strengthen the knowledge and teaching and learning skills of lecturers. Other Research inform that strategic planning has become the comprehensive view of all education problems, it is the primary tool and means of development, and it has a role in the growth of the economy and social life, as well as its role in the growth of culture and civilization in general (Tahseen Aziz, 2022) In Indonesia, Islamic education madrasas should have great potential for 4.0 education development because they have the social power they have.(Hadi, 1970)

CONCLUSION

Technological Infrastructure, Strategic planning and Policy Drawing, Operational Management, were correlated with Student performance in this pilot study. This research highlight investment to be done to technological investment in online education. Weak technological infrastructure in poor countries that hinder development of online learning and development of machine -based learning in developed countries that have strong technological infrastructure.

Conflict of Interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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