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COMPARATIVE STUDY OF TECHNOLOGY UTILIZATION IN NATIONAL EXAMINATIONS IN MALAYSIA AND INDONESIA

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Abstract. This study compares the usage of technology and its consequences while analyzing its function in the national examination systems of Malaysia and Indonesia. Comparative analysis based on secondary data from many trustworthy sources is used in the study methodology. Six factors were used to examine the data: acceptance rates for computer-based technologies, online tests, exam implementation effectiveness, infrastructure availability, software usage, and technical preparedness. The findings revealed notable variations in the two nations' national exam rates for technology adoption and use. With computer-based and online tests, Malaysia has embraced technology more than Indonesia, which is currently working to develop the required infrastructure. While Indonesia's inadequate infrastructure is a challenge, Malaysia has seen improvements in efficiency and accuracy from the use of technology in its national exams. According to the study's findings, technology can raise the caliber and effectiveness of national tests. However, in order for both nations to equally benefit from technology, infrastructure and technical obstacles must be removed.

Keywords**:** Computer, Technology Utilization, National Examinations

I. INTRODUCTION

In many nations, the national exam system is a crucial component of the educational system. The national test serves as a tool for assessing curricular efficacy, general educational quality, and student success. Malaysia and Indonesia are two Southeast Asian nations with comparable national examination systems. These two nations' national test systems are managed differently and provide unique issues.

The "Secondary Assessment Test" (UPSR) for elementary schools and the "Secondary Achievement Examination" (PMR) for junior high schools comprise Malaysia's national examination system. The "Secondary School Achievement Test" (SPM), which is given by each school under the direction of the Malaysian Ministry of Education, has taken the position of the national high school level exam since it was eliminated in 2014 (Chin et al., 2019).

Conversely, Indonesia utilizes a national examination system called the "National Examination" (UN). The elementary, junior, and senior high school levels are where UN is applied. According to Saukah and Cahyono (2015) and Sutari (2017), this test is regarded as a crucial yardstick for assessing student graduation and a determining factor for students to pursue further education.

There exist notable distinctions in the national test format between Indonesia and Malaysia. The UPSR and PMR for elementary and junior secondary education, and the SPM for upper secondary education, comprise Malaysia's national exam system (Magaswari, 2017; Ministry of Education Malaysia, 2013). In the meanwhile, elementary through high school students in Indonesia take a single national test (Saukah & Cahyono, 2015).

Apart from that, another difference lies in the material and emphasis of the exam. In Malaysia, national exams usually emphasize understanding concepts and critical thinking skills, focusing on a comprehensive curriculum (Hashim et al., 2017; Singh et al., 2019). In Indonesia, national exams

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tend to be more oriented toward mastery of material and academic skills that are more specific following the national curriculum (Nambiar et al., 2019; Suryadarma & Jones, 2013).

In addition to differences in structure and emphasis, implementation aspects also affect the comparison of national examination systems in the two countries. In Malaysia, the government has implemented computer-based technology in several stages of the national exam, such as SPM. On the other hand, in Indonesia, national exams still rely heavily on conventional written exam methods (Hamied et al., 2015; UNICEF, 2021b).

The advancement of information and communication technology has impacted many facets of society, including education. There are several advantages to using technology for national examinations, including improved efficiency, more accurate evaluations, and flexibility in terms of when and where students may take the test (Bourdeaux, 2017; Drasgow, 2016).

Technology integration into Malaysia's national test system has improved evaluation process accuracy and efficiency. Exam results may be obtained more rapidly and comprehensively on student performance when computer-based tests are used (Boevé et al., 2015; Cameron, 1983; Ceka & O'Geen, 2019).

Sophisticated test software lowers the possibility of grading errors and gives teachers the chance to provide pupils immediate feedback (Cambridge Learner Attributes, 2013; Hossain, 2015; Lyster & Ranta, 1997). But there are drawbacks to using technology for national tests, particularly in terms of data security and cybercheating. (Sari et al., 2020). The Malaysian government must keep creating and enforcing stringent security measures in addition to encouraging morality and integrity in the country's examination system in order to solve this.

However, due to a number of logistical and technological issues, the use of technology in national exams is still restricted in Indonesia. (Ministry of Finance, Republic of Indonesia., 2020; Ministry of Health of the Republic of Indonesia, 2021; UNICEF, 2021a). Limited computer access and internet connections evenly distributed throughout the country are the main obstacles to adopting a computer-based exam (H. Retnawati et al., 2017). However, technology's gradual and selective application can be considered a strategic step to increase exam efficiency and accountability.

The purpose of this study is to examine how technology is used in Malaysia's and Indonesia's national examination systems and how that affects their respective educational systems. Governments and other stakeholders in both nations should take proactive measures to enhance the effectiveness and quality of educational evaluation by recognizing the distinctions and similarities in the ways that technology is used in national exams.

This research holds significant urgency in educational development in Malaysia and Indonesia. By analyzing the role of technology in the national examination systems of both countries, this study provides deep insights into how technology can impact the efficiency, accuracy, and quality of educational assessment. Moreover, the research addresses each country's challenges and obstacles in adopting technology in national exams, including data security, technology access equity, and infrastructure development. The novelty of this research lies in its comparative approach between two countries with distinct social, cultural, and educational contexts. Thus, this study offers a valuable contribution to formulating appropriate policies and strategies for implementing technology in the national examination systems, with the ultimate goal of enhancing the quality and relevance of education in Malaysia and Indonesia following the demands of an increasingly digital era.

II. METHODS

This study investigates the influence of technology in Malaysia's and Indonesia's national exam systems using a comparative analysis technique. The comparative analysis method was chosen because it makes it possible to compare and evaluate the differences and similarities between the two national examination systems in a broader context.

The secondary data utilized in this study were gathered from a number of trustworthy sources, including academic journals, governmental reports, government policies, and relevant news stories. This secondary data encompasses information about the indicators in the following Table 1.

TABLE I
RESEARCH INDICATORS

Indicators	Description
1. Adoption of Computer-Based Technology	The use of computer-based technology in exam administration is a focal point for enhancing efficiency and accuracy in evaluation.
2. Online Exam Adoption Rates	The rate of adopting online exams is an assessment of how technology has been employed in conducting remote examinations.
3. Exam Administration Efficiency	Exam efficiency is a benchmark for measuring the extent of technology utilization in streamlining exam management.
4. Availability of Technology Infrastructure	The availability of technological infrastructure gauges the application of technology in the national exam system.
5. Usage of Examination Software	Utilization of advanced exam software streamlines question preparation, online exam administration, and automated scoring.
6. Technical Readiness	Technical readiness is primarily focused on integrating technology into the national exam system.

The gathering of secondary data through literature reviews and document analysis is the first step in the research process. Subsequently, an extensive analysis is conducted on the data to pinpoint the distinctions and overlaps between the national examination systems of Malaysia and Indonesia, specifically concerning their technological utilization. Subsequently, a comparison study

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was conducted to assess the function of technology in every national examination system. To determine the benefits and drawbacks of each strategy, the data collected from the two nations were first examined independently and then in comparison. The analysis's findings are utilized to create a compilation of study findings that outline the degree of technological acceptance and use in Malaysia's and Indonesia's national test systems, as well as the consequences for education.

III. Result and Discussion

The comparison of technology adoption levels in computer-based examination systems serves as a pivotal point of analysis to evaluate the integration of technology in the national examination systems of Malaysia and Indonesia. The utilization of computer-based technology in conducting exams has emerged as a central focus to enhance the efficiency and accuracy of educational assessment processes. In this section, we comprehensively examine technology adoption across various aspects, including the levels of adoption, online examination practices, efficiency of examination implementation, infrastructure availability, and utilization of examination software. Through this comparative exploration, we aim to shed light on the distinct progress, challenges, and potential benefits of technology integration within the national examination systems of both countries, contributing to an enriched understanding of their educational landscape. In general, the findings of this research can be observed in the table provided in Table 2 below. Subsequently, each indicator will be elaborated on in detail.

TABLE 2
Comparison of Technology Utilization in National Examinations in Malaysia and Indonesia

Indicators	Malaysia	Indonesia
1. Adoption of Computer-Based Technology	High adoption rate with significant progress	Limited adoption due to technical and infrastructure constraints
2. Online Exam Adoption Rates	Implemented online exams for specific tests	Online exams trialled, facing infrastructure challenges
3. Exam Administration Efficiency	Considerable efficiency improvement with technology	Potential efficiency increase varies across regions
4. Availability of Technology Infrastructure	High availability due to government initiatives	Challenges in remote areas, government efforts underway
5. Usage of Examination Software	Practical usage with advanced software	Implementation with challenges in remote areas
6. Technical Readiness	Teachers trained, technical support available	Challenges in technical readiness and training

A. Comparison of Adoption of Computer-Based Technology

The degree to which technology has been incorporated into the national test system in Malaysia and Indonesia may be determined by looking at the adoption rate of computer-based technologies. Exam administration using computer-based technology has drawn attention as a means of improving the effectiveness and precision of educational assessment.

The use of computer-based tests has advanced significantly in Malaysia. For instance, since 2014, the Secondary School Achievement Test (SPM) has been administered via a computer system. The Malaysian Ministry of Education, which has worked very hard to provide technology infrastructure in schools, supports this. As high as 98% of schools have computer facilities for giving tests, according to the study on implementing Malaysian education in 2015 (Umar & Hassan, 2015). Additionally, the number of pupils taking computer-based tests has been rising each.

However, due to a number of infrastructure and technological issues, computer-based technology is still only partially used in Indonesia's national test system. Limited internet connectivity and uniformly dispersed computer infrastructure remain obstacles to the widespread implementation of computer-based exams across the nation. To get around this challenge, the Indonesian government has introduced computer-based exam trials at a few of schools. The Indonesian national test will be held in 2021–2022, and computer-based exams will be used exclusively in accordance with the standards (Alka, 2023; Setiyowati et al., 2022).

The national test system may benefit from a higher percentage of computer-based technology use. Question papers may be printed, distributed, and assembled more quickly when examinations are administered using computers. Sophisticated test software also simplifies the question collection process. Additionally, exam results may be accessed online more quicker, giving instructors and students instant access to evaluation outcomes. This lowers the possibility of error in the human scoring process by enabling a quicker and more precise automatic scoring system.

Numerous indicators, including the number of schools or other institutions using computer-based exams, the number of students taking computer-based exams, and the degree of infrastructure and technical readiness of schools in adopting this technology, can be used to gauge the level of adoption of computer-based technology in the national exam system. The degree of computer-based technology adoption in the two nations may be used to compare opportunities and obstacles for integrating technology into the national test system (Crossley & McNamara, 2016; Mardjuki & Lubis, 2020).

B. Comparison of Online Exam Adoption Rates

An important metric for assessing how much technology has been embraced by Malaysia and Indonesia to administer tests online is the adoption rate of online exams. In order to

administer national tests with greater flexibility and efficiency, online exams have become necessary (Tan et al., 2021).

A few Malaysian schools have begun using online assessments as a way to incorporate technology into the classroom. The Primary School Achievement Test (UPSR) will be offered online starting in 2021, providing a concrete illustration of the widespread use of online assessments. Students may take tests at any time and from any location with the freedom that comes with taking them online. According to the study on the implementation of education in Malaysia, "UPSR online benefits students and parents with a more flexible time and place" (Basar et al., 2021; Manan et al., 2022). Additionally, because online exams do not require the distribution and collecting of question sheets, they also aid in lowering the logistical load and test implementation costs.

In the meanwhile, Indonesia has begun testing online tests as part of its efforts to integrate technology into the country's examination system. Exam administration may be made more flexible and efficient, according on experience from some schools that have administered online tests. Nevertheless, there are still issues with technology availability and infrastructure that make it difficult to conduct online tests across the nation.

The number of schools or institutions using online exams, the number of students taking online exams, the types of exams that are administered online (such as multiple-choice or essay exams), and the degree of technical preparation of teachers and school staff in aiding online exams are some indicators that can be used to measure the adoption rate of online exams (Rahim & Yustiana, 2023). It is crucial to remember that there are particular consequences associated with taking tests online, particularly with regard to data security and cybercheating. To encourage the wider use of online tests, security precautions and the prevention of online fraud must be carefully examined and put into practice (Rahim & Yustiana, 2023).

C. Comparison of Exam Administration Efficiency

test efficiency is a crucial metric for assessing how much Malaysia and Indonesia have embraced technology to increase the effectiveness of their national test administration. Exam technology can make a big difference in how much less time, money, and effort are needed for the process of evaluating education.

The efficiency of national tests in Malaysia has been greatly enhanced by the use of technology in exam administration, including computer-based and online exams. One way to cut down on time is to use computer-based tests, like the Middle School Achievement Test (SPM), which distributes test papers after they are printed and assembled. Additionally, exam results may be collected more rapidly and made available online, giving instructors and students instant access to evaluation outcomes. Modern exam software facilitates a quicker and more precise automated scoring system. Consequently, there is an increase in efficiency and promptness in the exam administration procedure (Rahim & Yustiana, 2023).

In the meanwhile, there is a chance that Indonesia's national test system might become more efficient thanks to the usage of technology. Exam administration is made faster and more versatile by computer-based and online platforms. also, there are also regional differences in the pace at which technology is being adopted across the nation. Increased technological access and preparedness in all schools are necessary due to the use of technology in the national test system (Mahatika & Trisoni, 2022; E. Retnawati, 2019).

The time it takes to assist with the exam, the time it takes to announce the results, the cost of implementing the exam, the availability of the exam results online, and the degree of technological preparedness are some factors that may be used to gauge how efficiently the national exam is administered. Enhancing the effectiveness of exam administration may have a major positive impact on the educational system. High efficiency will enable educational institutions to concentrate more on the learning process and raise the standard of instruction overall by saving money and time.

D. Comparison of Availability of Technology Infrastructure

When assessing how much Malaysia and Indonesia have made it easier for technology to be used in the national test system, one important metric to consider is the availability of technical infrastructure. Sufficient technical infrastructure guarantees the seamless and uniform administration of computer-based and online tests across the nation.

As part of its attempts to incorporate technology into education, the Malaysian government has committed to improving the availability of technological infrastructure in schools. In an effort to expand the availability of technological infrastructure in schools, the Malaysian Ministry of Education and Culture introduced the MyDigitalSchool initiative in 2016. As part of this scheme, computers and internet connectivity are provided to all schools. 98% of schools have computer facilities available for administering tests, according to the study on implementing Malaysian education in 2021 (Avent et al., 2023; Sharon, 2020). This demonstrates a noteworthy advancement in Malaysian schools' access to technology infrastructure.

Nonetheless, there are still issues with Indonesia's technical infrastructure availability. Many outlying locations lack proper internet connectivity and computer infrastructure, despite government efforts to enhance technology in schools. In order to integrate technology into the national examination system, further work must be done to provide access to technical infrastructure across the whole nation. The government of Indonesia has acknowledged the need to expand the availability of technological infrastructure in schools in order to facilitate the adoption of computer-based and online tests in the guidelines for the 2022 Indonesian national exams.

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E. Comparison of Software Usage

test software is a crucial metric for assessing how much technology has been incorporated into the national test systems of Malaysia and Indonesia. A key component of the automated process of creating exams, administering them, and tallying the results is examination software. Education evaluation may be made more accurate, efficient, and high-quality by using advanced test software.

The use of exam software in Malaysia's national exam system has advanced significantly. Advanced exam software facilitates the delivery of computer-based tests, including the Middle School Achievement Test (SPM). Effective question preparation, online test administration, and automatic exam result scoring are all made possible by the program. The introduction of the e-SPM system in 2020, which has enhanced the effectiveness of exam administration and results scoring, is a prime illustration of the deployment of testing software.

Exam software has, nonetheless, also been used in a number of national exams in Indonesia. This program helps with question preparation, administering online tests, and automatically scoring test results. The exam software program is a component of an endeavor to improve test administration accuracy and efficiency. Exam software adoption is still hampered by a number of technological and infrastructure issues, particularly in rural regions with poor access to the internet.

Exam software can be used in a variety of ways to gauge its effectiveness, including the type of software that is manipulated, how well it integrates with educational institutions or school administration systems, how widely available it is in schools, how simple it is for teachers and other staff to use in creating questions, administering tests, and viewing results, and how flexible it is in handling different exam formats, like multiple choice, essay, and practice exams. The national exam system can benefit from the use of sophisticated and effective exam software (Tüfekçi et al., 2013). Exam software makes it possible to prepare items more quickly and accurately, administer exams online more effectively, and automatically score results more precisely.

F. Comparison of Technical Readiness

The integration of technology into the national test system in Malaysia and Indonesia must prioritize technical preparedness. In order to use exam software, administer computer-based exams, and handle any technical issues that may come up during exam administration, Malaysia's Ministry of Education and Culture has trained teachers and school personnel as well as offered technical support (Alhadza & Zulkifli, 2017; Yusupov & Suyunov, 2022). Through this endeavor, instructors and other school personnel will be more technologically prepared to deliver tests utilizing technology.

However, using technology in the national test system remains difficult for Indonesia due to a lack of technological preparedness. Teachers and other school employees have received training and technical support, but many still want further assistance in utilizing test software and handling challenging technological issues (Siswanto, 2022). To improve technical preparedness at all educational levels, extra measures are needed due to the use of technology in the national examination system.

Technical training for teachers and staff, their technological comprehension of the exam software and infrastructure, their proficiency administering computer-based exams, and the availability of technical support from educational institutions, government agencies, or technology support organizations are some of the indicators that can be used to gauge technical readiness. Furthermore, obtaining optimal technical preparedness in the implementation of technology-based exams depends on the state of school technological capabilities, including sufficient computer equipment and internet connectivity. Improving the technical proficiency of educators and school personnel in utilizing technology in the national examination system might yield noteworthy advantages in terms of enhancing the effectiveness, precision, and caliber of instruction.

IV. Conclusions

Malaysia has seen notable advancement in the national test system's acceptance rate of computer-based technologies since 2014, as evidenced by the introduction of computer-based examinations like the Middle School Achievement Test (SPM). With 98% of schools having computers for exams, the Malaysian Ministry of Education has been attempting to provide sufficient technical infrastructure in classrooms. However, due to infrastructural and technological limitations, computer-based technology adoption in Indonesia is still rather low. Nonetheless, the Indonesian government is working to completely adopt computer-based tests by 2022.

In both nations, the use of computer-based technologies and online assessments can improve exam administration efficiency, cut expenses and time, and speed up the delivery of evaluation comments. A few of Malaysian schools have begun offering online tests; in 2021, the Low School Achievement Test (UPSR) will be available online. Online tests are still administered in Indonesia, despite the country's lack of adequate technology infrastructure.

Facilitating the use of technology in the national test system also depends on the availability of technological infrastructure. Malaysia has made great strides toward supplying computers and internet connection to schools via the MyDigitalSchool initiative. Increased access to technology in schools is a continuous goal in Indonesia, particularly in rural regions.

Increasing the effectiveness of exam administration also requires the deployment of complex exam software. Exam software has made it easier to create questions fast, give online tests, and automatically score test results in Malaysia. However, there are still logistical and technological barriers to the use of test software in Indonesia.

One critical component of technology adoption in the national examination system is the technical preparedness of educators and school personnel. While a lot of work has

gone into giving teachers and other school employees in Malaysia training and technical support, many in Indonesia still require additional assistance while utilizing test software and handling challenging technological circumstances.

Measuring the degree of technology adoption, the accessibility of technology infrastructure, the usage of exam software, and technical preparedness is essential when integrating technology into the national exam system. We can better identify opportunities and challenges to increase the use of technology in the national examination system and support improvements in the effectiveness, precision, and caliber of educational evaluation by comparing the two countries, Malaysia and Indonesia.

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