DIGITAL TRANSFORMATION IN EDUCATION: ANALYZING THE EFFECTIVENESS OF PAPERLESS CLASSROOMS IN MALAYSIAN UNIVERSITIES

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Abstract: *This study aims to establish how the concepts of paperless classroom enhance learning and to further explore the students' perception of paperless classroom. This study focus on the Malaysian universities particularly on the effects of transformation to paperless environment on the students' engagement, motivation, performance and learning experience. The questionnaires were administered online and to the students of both public and private universities. The findings indicate that paperless classroom is beneficial since it provides opportunities as well as flexibility for learning and improving motivational level. Furthermore, this research explores that the students expressed mixed opinions, where some of the respondents acknowledge the advantages of digital learning, which includes improved motivation and easier access to resources. In addition, respondents expressed their concerns regarding technological readiness, digital literacy, and the financial costs of participating in a paperless classroom. The findings provide valuable insights for policymakers and educational institutions seeking to enhance digital transformation in education. Future research should further explore the long-term effects of paperless classrooms on various academic disciplines and the role of educators in facilitating this digital transformation. Furthermore, further research should focus on the population and data sampling process.*

Keywords: *paperless classroom, effectiveness, student engagement, educational experience.*

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Introduction

The digital technologies are changing the education environment by redesigning how knowledge is delivered and acquired. The evolution of technologies such as, artificial intelligence (AI), cloud computing and big data is improving the learning environment and fulfilling the various needs of learners in this digital environment (Mukul & Büyüközkan, 2023). In Malaysia, the needs for digitized education is crucial since universities aim to match with the world's progress in education despite challenges such as differences in the availability of technologies (Bui & Nguyen, 2023). According to UNESCO (2023) the Malaysian government has realized the need for digital education by implementing policies to provide a digital learning environment that has a comprehensive and accessible education. However, there are challenges that many institutions encounter in the proper implementation of digital initiatives, which results in differences in acceptances and perceptions of students on the shift towards paperless learning environment (McCarthy et al., 2023). Therefore, it is essential to assess the level of effectiveness of the launched digital initiatives at Malaysian universities and continue to highlight the opportunities that may contribute to the successful education transformation.

The development of paperless classrooms expresses a new evolution of the modern classrooms that transform the learning spaces across the world. Paperless classrooms not only replaces the conventional physical class, but also simplifies the processes of learning and teaching since it increases efficiency of the student involvement and cooperation. In paperless classroom, students can easily access information needed from any device thus ensuring that they are actively involved in their learning activity. In line to this, it assists in encouraging more engaging and lively learning environment as compared to conventional face-to-face classroom which has constraints to time and space (Wang, 2010). Furthermore, incorporating technology in learning helps in preparing students with relevant technology skills to cope with growing technological world jobs market. Apart from that, the paperless classrooms are critical in developing critical thinking and problem-solving skills among the students. Students can participate in group activities, get access to different types of information through the internet, and utilize different media tools to improve their knowledge (Wang, 2010). Through this collaborative learning process, students engage with each other, and this process enhances student interactions that are very crucial in motivating and helping students succeed.

As educational institutions continue to embrace this digital shift, understanding the effectiveness of paperless classrooms becomes essential in order to maximize their potential and overcoming the challenges align to this transformation. The aim of Malaysian universities regarding digitalization is to provide an environment that is both participative and productive for learning and teaching processes where paperless classrooms can be fully utilized. A study by Mukul and Büyüközkan (2023) highlights that all educational institutions should integrate the use of digital tools and resources into the teaching-learning processes for the benefit of both the learners and instructors to enhance their digital skills in the current world. Therefore, a well-defined strategic framework for digital adoption should be established by establishing objectives, expected outcomes, and support mechanisms in order to guide the transition towards the paperless educational environment. This transformation is crucial for enhancing the competitiveness of higher education in Malaysia, where digital literacy and ICT competence are essential for learning and career advancement.

However, Malaysian universities are currently facing significant obstacles in implementing digital transformation strategies despite of the clear benefits and increasing adoption of

paperless classrooms. Student and teacher digital literacy poses a challenge because most of them have not been exposed to new technologies that are available to support the teaching-learning process (Gkrimpizi et al., 2023). Besides, the issue of limited awareness among students and educators also contributed to the lack of both training and professional development (Aditya et al., 2020). This is also one of the factors that prevented digital resources from being utilized in the curriculum. Furthermore, some of the people are reluctant to change, are conservative and would refrain from embracing the paperless classroom since they prefer conventional educational practices. Another major concern is Malaysians universities' lack of digital resources, as well as budget to establish fully paperless environments. Other than that, many institutions have inadequate hardware, software, and network facilities to facilitate the digital learning experiences. According to McCarthy et al. (2023), there are main challenges that educational institutions must address including resistance to change and lack of proper digital tools in order to effectively implement paperless classroom.

The technological difference remain a barrier due to the limited financial resources. The research by Mohamed Hashim et al. (2022) reveals that most universities find it challenging to allocate adequate finances to enhance and support the digital platforms. As a result, the adoption of paperless classrooms is slower, where some departments or faculties have embraced technological advancement by incorporating paperless tools, while others are still struggling with their resources. In order to overcome these obstacles, it requires a comprehensive and coordinated approach that focuses on the technological, pedagogical, and cultural aspects of digital transformation. Jhones and Larramendi (2019) in a study further elaborates that educational leaders must focus on faculty and students' digital literacy, where support and training should be provided to ensure that a paperless environment is effectively embraced. In addition, universities must also consider adequate funding for the digital resources since hardware, software, and networks should also support digital learning environment (Jensen & Universities, 2019).

Malaysian universities must address the technological and human factor to introduce the paperless classrooms, which contribute to the successful implementation of the digital transformation initiatives. Educational institutions should prioritize comprehensive training programs to improve digital literacy among faculty and students. In a study by Oliveira and de Souza (2022), the authors argue that by provide training to the teachers and equipped them with knowledge on new technologies that could be employed in the classroom, the adoption of paperless classroom can be implemented. Moreover, educational leaders should emphasize the positive outcomes of digital change and persuading the university to consider adopting new approaches to teaching (Habib, 2023; Timotheou et al., 2023). Mukul and Büyüközkan (2023) in a recent study stated that, there is the need to address infrastructural challenges in order to experience paperless classrooms. The researcher further explained that universities should commit to enhancing their IT facilities so that every learner can get proper internet and other forms of technology. Furthermore, effective guidelines and policies on the utilization of technology assists in promoting the appropriate structure in technology usage among faculty, and learners thus enhancing a more structured engagement in technology learning (Bui & Nguyen, 2023). Hence, Malaysian universities can overcome the challenge and progress towards enabling a paperless classroom through training, change in culture, infrastructure development and policy formulation..

The purpose of this study is to assess the benefits of paperless classrooms at the Malaysian universities and to discover best practices that can facilitate the transition toward digital

environment in the universities. More specifically, this research seeks to evaluate the effects of going paperless on students' learning and experiences. Based on the perceived experience of the students, the research aims at identifying the advantages and limitations of the digital learning environment to provide better insights for future practice and policies (Bui & Nguyen, 2023). This study will involve participants who are currently using or have recently used the paperless environment in Malaysian IPTA and IPTS universities. This study adopts quantitative research approach where structured questionnaires were administered to the students via online with the an aim of getting their experience of perception towards the digital learning. Furthermore, the study aims to provide valuable insights that not only enhance the understanding of paperless classrooms but also contribute to the effective implementation of digital strategies in higher education settings.

Literature Review

Digital transformation in education shows the shift in the way educational institutions operate, utilizing advanced technologies to enhance teaching, learning, and administrative processes. The transitional process that leads to the adoption and incorporation of digital technologies assists in enhancing customization of learning, increasing accessibility and students' engagement (Mukul & Büyüközkan, 2023). The advancement of technologies, such as artificial intelligence, virtual and augmented reality, as well as cloud computing has also contributed to encourage the idea of paperless classroom and bringing significant changes to the traditional education process. Hence, it helps opening up new development areas for educational technology (McCarthy et al., 2023). Currently, educational institutions have incorporated the use of the digital strategies. However, they face challenges to transform their organizational frameworks, academic programs, and instruction in response to the expectations of the digital world (Bui & Nguyen, 2023). Study conducted by Adedoyin and Soykan (2023) the COVID-19 pandemic has further influenced this digital shift, highlighting the importance of digital readiness in education and prompting institutions to reconsider their approaches to technology integration. Besides, the digital transformation in education also has an impact on functions such as administration, research, and students.

The concept of paperless classrooms has become a significant source of this digital transformation. The paperless class is defined as an environment that has replaced traditional paper resources like books, papers, and assignments with their digital alternatives. Studies by Mtebe and Raisamo (2014) and (Shonfeld & Meishar-Tal, 2017) discussed that the paperless classrooms use technologies such as the laptops, tablets and clouds to transfer the learning contents, teaching instructions as well as the assessment in the paperless form. Besides, another study by Yuniarti (2014) described that paperless classroom is a educational environment where digital devices and platforms replace traditional paper-based materials, facilitating administrative tasks and promoting eco-friendly practices. The implementation of paperless classrooms is a vital change in pedagogical approaches, encouraging student-centered learning and enhancing digital literacy skills. The change towards paperless classrooms is also associated with the broader concept of e-learning, which integrates digital methods to facilitate learning, assessment, and communication within educational institutions (Tondeur et al., 2017). Moreover, the paperless classroom is also a preparation of the students to the requirements of the modern economy in line to the digital literacy (Grigoryan & Babayan, 2015).

The adoption of the paperless classroom has been growing in recent years and many educational institutions have realized the possible benefits. Research on the effectiveness of paperless classrooms also highlights several key benefits, which include improved learning outcomes,

enhanced student engagement, and environmental advantages. Masango et al. (2022) in a study outlined several advantages of adopting the digital transformation which are including enhanced interaction, organization of materials and also collaboration of students and lecturer. As the Malaysian universities strive to improve their global competitiveness and quality of education, understanding the impact of paperless initiatives on learning outcomes, student engagement, and institutional efficiency becomes increasingly crucial (Ismail et al., 2013). Other researchers have also pointed out that the use of digital technologies in education enhances student performance in a way that promotes personalized learning and cooperation, which leads to enhanced understanding of course content (Chauhan, 2017; Sung et al., 2016). Even though there are issues like requirements for technology support, preparation of the teachers and the students, the change to paperless environments is considered a significant step towards improved student outcomes and improved student outcomes. Recent studies also found that discovered that online education enhances the learning motivation and students' participation which leads to better performance (Lopez & Ramos, 2023). This study also suggest that e-learning has improve the level of student satisfaction and ease the process of learning.

The advancement in technology has opened up the way for paperless classroom in the Malaysian higher learning institutions (Ahmad et al., 2012). Recent studies by Toh et al. (2023) have discussed on the increasing adoption of technology in the country especially among the academicians. The Malaysian Education Development Plan highlighted information and communication technology as one of the major factors in the improvement of quality in the teaching and learning processes nationwide (Ngu, 2022). The author went further on to state that as a result of this the above initiatives have been developed, 1-BestariNet program where internet connectivity is being provided to the society and the new concept of virtual learning atmosphere in educational institutions. Moreover, the Interim Strategic Plan 2011-2020 has emphasized the use of the blended learning approaches that suitably integrate technology into the educational process. Consequently, Malaysian universities are progressively implementing best practices involving paperless classrooms by utilizing electronic content, tests and quizzes, and technologically supported collaboration (Ngu, 2022; Yeop et al., 2019). Studies have revealed that the use of paperless classrooms has many significant advantages for both students and teachers.

The effectiveness of paperless classrooms is influenced by several key factors, as highlighted in recent literature. Masango et al. (2022) in a study discussed that infrastructure and technology readiness also play a crucial role. Adequate access to the devices and reliable internet connectivity is essential for successful implementation. Another study by (Juhaňák et al., 2019) emphasized that awareness about the use of digital technologies among students and faculty is another important consideration. The author also clarified that the level of digital literacy determines the level of efficiency in the use of digital resources. Other than that, course design and delivery in paperless environments which was also noted to enhance positive outcomes (Craven, 2017). Digital content and interactive learning materials will enhance the student's engagement. Furthermore, the perceived usefulness and usability of the innovative technologies by the teachers and students also enhances the level of acceptance and the efficient implementation (Sayaf et al., 2022). Users who are familiar with the technology will be able to transform from the traditional method to the digital. n addition to technological and skill factors, it has also been established that support and training are also barriers to paperless systems (Mathipa & Mukhari, 2014). In particular, the implementation of the paperless classroom

practices with the development of the 21st-century skills has been regarded as one of the reasons for the efficiency of classrooms for preparing learners for careers.

On the other hand, there are issues that arise due to the development of paperless environment including trainer support, student support and facility of equal access to the technologies. Recent literature reveals a number of barriers and challenges associated with the use of paperless classrooms globally. The digital divide is an important challenge mentioned by Masango et al. (2022) where students have challenges accessing necessary technology. The authors state that not all students have equal access to the devices and the Internet connection at home, which contribute to education inequalities. Other than that, infrastructure and technology readiness in the school or other institutions are also the barriers to the implementation of paperless classroom (Ochi, 2021). There are concerns about connectivity and device management across some educational establishments. These challenges require thorough planning, ongoing support, and a balanced approach when implementing paperless classroom initiatives. Thus, the objective of this research is to understand the students' attitudes and experiences of paperless learning environments. In addition, this study contributes to assessing the effectiveness of paperless classrooms in Malaysian universities and to determining factors that can support the digital transformation of these universities. As Malaysia is s moving from paper base education to paperless education, it is crucial to determine the impact of using paperless classes in enhancing students' performance.

Method & Material

The research employed an online questionnaire survey for data collection. The objective of the research is to explore student perceptions and experiences with paperless learning environments thus, by following the works of previous researcher (Kundu & Bej, 2021; Ochi, 2021; Stuebner, 2016), online questionnaire survey was deemed as the best data collection method to meet the research objective. SPSS version 28 software were used to analyze and present data in meaningful way. The convenience purposive sampling was chosen due to researcher's access for data collection. Out of the 100 online surveys that were gathered, only 44 were considered suitable for data analysis because of missing and incomplete information. The analysis only includes descriptive technique, as the research is not seeking to establish any relationships.

Findings

Demographic Information

The first part of demographic information is gender of the student. As illustrated in Table 1, females are more dominant, at 65.9% (29 out of 44) of respondents, than females, at 34.1% (15 out of 44) of respondents. For the level of education among the respondents, it has been greatly dominant by bachelor's degree students with 63.6% (28 out of 44), while 34.1% (15 out of 44) hold a diploma and 2.3 % (1 out of 44) respondents are currently pursuing post-graduate studies at the master's level. Next for the category of university, 70.5% (31 out of 44) of respondents are from public university (IPTA) while 29.5% (13 out of 44) of the respondents are from private university (IPTS). Table 1, 2 and 3 indicates the demographic statistics for level of education and the category of university.

Table 1: Gender

Male (%)	Female (%)
34.1	65.9

Table 2: Education Level

Education Level	Percentage (%)
Diploma	63.6
Degree	34.1
Master	2.3

Table 3: Category of University

Category of University	Percentage (%)
IPTA	70.5
IPTS	29.5

University Students Opinions on Paperless Classroom

From the data studied, it was found that 52.3% (23 out of 44) admitted that they have no idea of what kind of technology offered and applied in paperless classroom. Besides using any systems or applications offered by the university itself, or by the internet, which can easily submit their works, other technology may still be unacknowledgeable by the students. Additionally, 25% (11 out of 44) students agreed that paperless classroom is costly to them which require them need to get a compatible device to easily continue paperless classrooms while 27.3% (12 out of 44) of the respondents unsure whether it is costly or not. However, 47.7% (21 out of 44) of the respondents are able and willing to pay to get better education in their studies. Moreover, the respondents were questioned about students' perceptions of academic competitiveness in line with the ownership of personal technological devices, such as laptops and tablets. The findings revealed that 70.5% (31 out of 44) of respondents agree that ownership of technological devices make them feel competitive in the paperless classroom while 29.5% (13 out of 44) of the respondents disagree. Figures 1, 2 and 3 illustrate the findings on students opinions on paperless classroom. From this finding it can be said that technological readiness as well as costs plays crucial role on the implementation of paperless classroom.
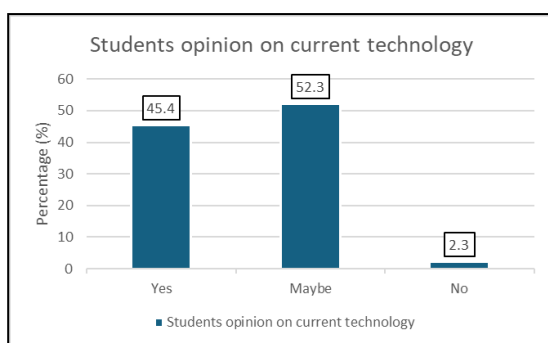
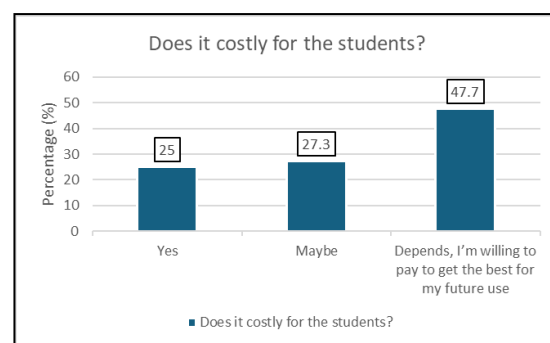

Figure 1: Students opinion on current technology

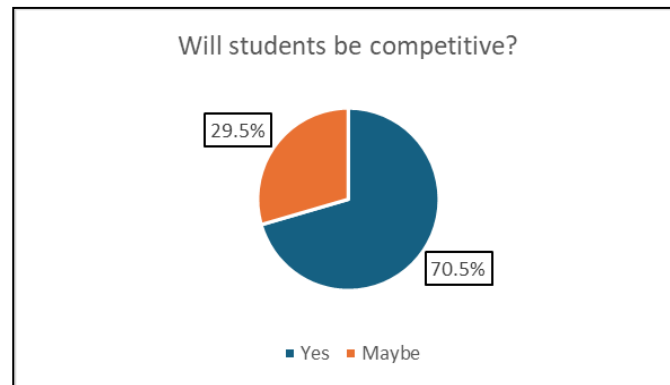**Figure 2: Does it costly for the students?**

Figure 3: Competitiveness among students

Effectiveness of Paperless Classroom

The study also questioned items regarding the effectiveness of paperless classroom. When asked about the effectiveness of paperless classroom to the students these days, most of the respondents state that they have mixed feelings as they did not fully adopt paperless classroom in their studies. From the data studied, it was found that 29.6% (13 out of 44) of respondents agree and 15.9% (7 out of 44) strongly agree that they learned more after applying paperless classroom in their studies. Additionally, 31.8% (14 out of 44) of respondents reported felt from neutral to strongly agree that paperless classroom made them learnt more. Furthermore, 13.6 (6 out of 44) admitted that they disagree, while 9.1% (4 out of 44) stated that they strongly disagree. Moreover, participants were questioned whether the application of paperless classroom increase their motivational level. The findings revealed that 9.0% (4 out of 44) and 36.4% (16 out of 44) of the respondents strongly agree and agree that paperless classroom improved their motivational level. In addition, 36.4% (16 out of 44) of respondents expressed that they felt neutral that paperless classroom increase their motivation. However, 13.6 (5 out of 44) admitted that they disagree, while 4.6% (3 out of 44) stated that they strongly disagree. Apart from that, the study also reported that 40.9% (18 out of 44) respondents agree and 31.8% (14 out of 44) respondents strongly agree that it is easier to work online rather than the way it used to be. Meanwhile, 22.7% (9 out of 44) respondents felt neutral and 4.6% (3 out of 44) respondents disagree that working online is more easier. Figures 4, 5 and 6 shows the findings of effectiveness of paperless classroom among the students. The findings suggest that when properly implemented, paperless classrooms can significantly enhance the educational experience by making work easier, improving motivation, and offering enriched learning opportunities.
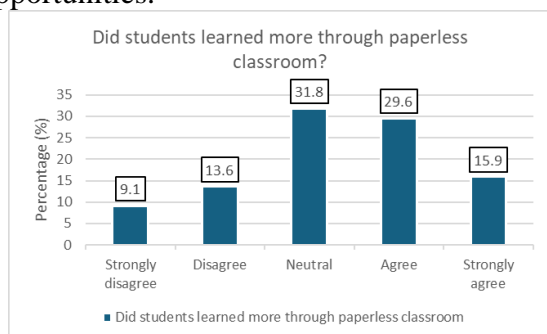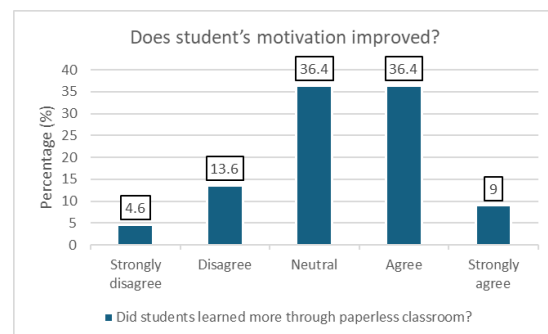

Figure 4: Did students learned more?

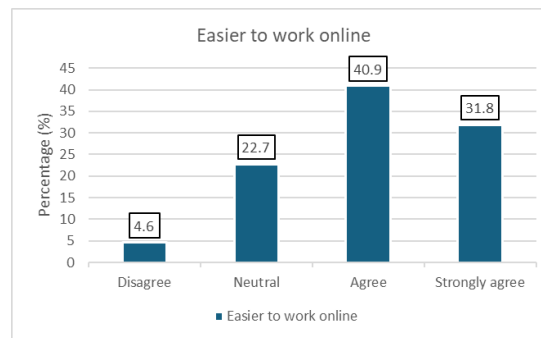**Figure 5: Does student's motivation improved?**

Figure 6: Easier to work online

Discussion

Despite the widespread adoption of advanced technologies in education, a significant number of students reported that they had no idea how these technologies bring significant benefits to their learning experience in the paperless classroom though the world has been introducing numerous technology that can somehow ease them in studying and future applications. According to the statistics from this study, where the respondents were questioned about whether the technology offered now brings any good, majority that goes by 52.3% (23 out of 44) claimed that they had no idea about the benefits of technology applied these days in their studies. Study by Ismail et al. (2013) indicates that the need to switch between multiple applications, manage digital distractions, and deal with technical issues may decrease the learning experience rather than enhance it. This could result in students feeling that the promise of paperless classrooms has not been fulfilled in practice. Apart from that, the study also indicates that cost is one of the factors that influenced the adoption of technology. However, most of the respondents are willing to incur additional costs to acquire technology that enhances their learning experience in a paperless classroom. Additionally, technology ownership promotes a sense of competitiveness among students. The findings of this study suggest that while some students may feel more competitive when they own the latest devices, others view technology as a means of enhancing collaboration rather than competition. The findings of this study also demonstrate positive outcomes from the student for the paperless classroom application, with a majority of students agreeing that it helps them learn more, improves their motivation, and makes their academic work easier. These positive perceptions emphasize the effectiveness of paperless classrooms in encouraging a conducive learning environment and enhancing educational outcomes. In addition, the results of this study paperless classrooms can positively impact learning outcomes, motivation levels among students, and ease of work.

Conclusion

This research was carried out with the intention of assessing the impact of paperless classrooms within Malaysian Universities in the context of digital learning environments. The study investigated the effects of these digital learning environments on the students' engagement, motivation, achievement, and effectiveness. Therefore, by using quantitative research, the data was collected from the students enrolled in both the public university and the private universities. The questionnaire was designed to capture their experiences and attitude towards the paperless environment. The study outcomes indicated that the paperless classrooms improve flexibility in learning and learning processes. However, there are still some barriers and difficulties concerning the technological equipment, the deficiency of digital competencies, and financial concerns among students. In general, the research contributes to a better understanding of the advantages and challenges that can be associated with paperless classrooms in Malaysian

Higher Educational Institutions. This study suggests further developments concerning both the infrastructure and teachers' training to enhance the effectiveness of using digital learning space.

Further research should be conducted on the effects of paperless approaches to classroom learning on the improvement of knowledge retention and academic performance. Moreover, future studies may investigate the effects of paperless classrooms on various academic disciplines because the learning tools may function differently depending on the subjects that requires a specific learning-teaching process. Furthermore, one of the subjects that could be discussed further is about teachers' contribution towards paperless teaching. Future researchers should change their attention on how educators use these environments, and the difficulties that they encounter when incorporating technology into classroom practices. Thus, it would afford a better understanding of the state of the digital transformation in education. Finally, future studies should also examine the requirements of universities especially in the rural areas in the aspects of IT infrastructure which supports digital learning and teaching environments. Hence, by focusing on these gaps, it is possible to plan the implementation of the paperless classrooms approach to the levels of Malaysian higher education.

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