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The Role of Digital Literacy and Its Relation with Performance of Madrasah Aliyah Students

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ABSTRACT

Purpose: In contemporary times, the acquisition of digital literacy has emerged as a crucial determinant of students' achievements on a global scale. Therefore, that aspect has garnered significant attention from researchers and policymakers, necessitating further investigation and policy development. Therefore, this study attempts to examine the influence of digital capabilities and digital innovation on student performance in Madrasah Aliyah, which refers to Islamic senior high schools in Indonesia. This study examines the moderating influence of digital institutional culture on the relationship between digital capabilities, digital innovation, and student performance in Madrasah Aliyah educational institutions in Indonesia. **Design / methodology / approach**: The study employed primary data collection methods and acquired data through the administration of questionnaires. The study additionally utilized the SPSS-AMOS software to assess the reliability of the data and examine the relationships between variables. **Findings**: The findings suggest that there is a favorable correlation between digital capabilities, digital innovation, and student performance in Madrasah Aliyah educational institutions in Indonesia. The findings also indicated that the digital institutional culture has a substantial moderating role in the relationship between digital capabilities, digital innovation, and student performance in Madrasah Aliyah, which refers to Islamic senior high schools in Indonesia. **Practical Implications**: The study assists policymakers in formulating policies aimed at improving student performance through the utilization of digital capabilities and innovation.

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Introduction

The field of Information and Communication Technology (ICT) has seen a significant transition in the 21st century, resulting in substantial changes in various aspects. Information and Communication Technology (ICT) encompasses the application of digital technology for the purpose of generating, disseminating, collecting, and managing data, as well as facilitating instantaneous communication. Information and Communication Technology (ICT) is widely recognized as an essential aspect of contemporary human existence, owing to its capacity to introduce groundbreaking innovations that greatly contribute to the improvement of living standards and overall quality of life (Park, Kim, & Park, 2020). ICT has been a subject of interest in relation to the issue of the digital divide since its inception in the 1990s. Its implementation has led to more diversity and expansion in the field of education, hence facilitating greater chances in developing nations. Additionally, ICT has played a significant role in the proliferation of digital libraries and has also brought about transformative changes in the realm of research. Prior studies have indicated that Information and Communication Technology (ICT) has played a significant role in various domains such as education, healthcare, banking, transportation, and e-governance initiatives. The utilization of Information and Communication Technology (ICT) has resulted in a multitude of advancements, leading to a transformative phenomenon known as digitalization. This revolution has significantly altered and reconstructed various aspects of human existence. New ideologies and concepts, such as digital tools and digital society, have given rise to various technologies, including communication tools, mobile devices, smart learning, and computer-aided tools (Reddy, Sharma, & Chaudhary, 2020). Previous studies indicate that the ongoing and rapid expansion of digitalization necessitates individuals to possess distinct abilities and skills in order to effectively address challenges and carry out activities within a digital milieu. The aforementioned abilities have been identified as digital literacy skills, which are defined as a collection of competencies required in the 21st century to effectively employ digital tools in order to facilitate the achievement of objectives. The arrival of digitalization has sparked a revolution in educational institutions, leading to the promotion and cultivation of digital literacy. Digital literacy refers to proficiency in utilizing digital tools and technology in a competent manner to assess, acquire, create, and disseminate data and information. In the contemporary era characterized by the pervasive influence of digital technology, the acquisition of digital literacy has become a crucial imperative for individuals across all domains. The promotion of digital literacy among students facilitates their utilization of a vast array of online resources and information, hence augmenting their learning experience beyond the confines of conventional educational paradigms (Reddy, Sharma, & Chaudhary, 2022). Digital literacy additionally serves as a catalyst for students to engage in critical thinking when meeting information, thereby equipping them with the ability to recognize biases, assess the credibility of resources, and formulate well-informed judgments. These digital platforms enable students to engage in conversation and collaboration with professionals and peers worldwide, thereby strengthening their communication skills and cultivating a global perspective. Digital tools not only serve as a catalyst for students to communicate and explore novel concepts, but also foster enhanced creativity by means of digital storytelling, artistic pursuits, and multimedia projects. During the current era characterized by significant societal changes, the integration of digital technology is profoundly influencing various industries. This integration plays a

pivotal role in equipping students with essential skills necessary for achieving success and facilitating their advancement in the contemporary labor market (Suwarto, Setiawan, & Machmiyah, 2022). Moreover, students have the ability to utilise these tools in order to address intricate challenges, do data analysis, simulate various scenarios, and foster experiential and practical learning methodologies and frameworks. Digital literacy plays a crucial role in facilitating students' ability to adapt to and effectively utilize new tools and technology, hence enhancing their performance and enabling them to traverse the ever-evolving digital landscape.

Digital capabilities indicate the ability of an organization or individual to proficiently and proficiently employ digital tools, resources, and technology in order to achieve desired objectives and results. These capabilities encompass a wide range of knowledge, skills, and competencies that enable businesses and individuals to effectively utilize and manage the digital environment. In the contemporary period characterized by technological advancements, digital capabilities assume a pivotal role across various domains, including education, personal life, organizations, and professional settings (Khin & Ho, 2018). Digital skills empower both organizations and individuals to effectively address complex projects and tasks, resulting in enhanced efficiency and significant savings of valuable resources and time. Digital capabilities play a crucial role in encouraging cooperation and promoting seamless communication, allowing individuals to effectively work together regardless of their geographical location. Digital capabilities have the potential to inspire and drive creative problem-solving and inventive thinking, facilitating the exploration of novel concepts and ideas. Digital capabilities facilitate the acquisition of global resources, skills, and information through online platforms for both organizations and individuals (Ardolino et al., 2018). People having strong digital skills are well-prepared to thrive in the digital labor market and effectively navigate a wide range of job responsibilities. Digital innovation refers to the advancement, generation, and execution of inventive solutions, concepts, procedures, or commodities that harness digital tools and technologies to foster beneficial enhancements and transformations (Teichert, 2019). It constitutes a variety of activities that use digital resources to enhance and transform various aspects of organizations, industries, experiences, and services. Digital innovation plays a significant role in enhancing economic growth, digital advancement, and social progress in the current digital era. Digital innovation consists of existing and emerging technologies such as machine learning, artificial intelligence, virtual reality, data analytics, and blockchain technology in various sectors and domains. Digital innovation has resulted in the creation of novel services and solutions that address a wide range of opportunities and challenges in diverse sectors, including education, healthcare, communication, and transportation (Ciriello, Richter, & Schwabe, 2018). Digital innovation facilitates the development of disruptive methods through the utilization of e-commerce, digital platforms, and online markets. In the realm of digital solutions, there is a growing emphasis on innovation, particularly in the context of boosting user experience. This is achieved through the implementation of personalized interactions, intuitive interfaces, and seamless integration (Kohli & Melville, 2019). Digital innovation involves the comprehensive examination of a substantial volume of data, the extraction of pivotal insights, the facilitation of enhancements, and the formulation of instantaneous decisions. Moreover, digital innovation plays a crucial role in facilitating collaboration among diverse stakeholders, including established enterprises, developers, researchers, and consumers, with the aim of

fostering collective growth and co-creation. The concept of digital institutional culture refers to the collective set of values, behaviors, practices, beliefs, and norms that exist within an organization and pertain to the incorporation, integration, and proficient utilization of digital tools and technologies (Hinings, Gegenhuber, & Greenwood, 2018). In the contemporary technological milieu, the cultivation of a favorable digital institutional culture assumes paramount significance, owing to its affirmative influence on various stakeholders, personnel, and enterprises within the context of digital advancement and metamorphosis. Proficient leadership assumes a pivotal role in the orchestration of organizational digital culture transformation, as it delineates a pivotal trajectory for digital discourse, inventive undertakings, and their concomitant import. The instantiation of a digital institutional culture begets the assimilation of pioneering protocols and technologies, accompanied by a proactive embrace of avenues for refinement and augmentation. Such a culture, which fosters the dissemination of information, collaborative synergy, and adept correspondence, engenders an environment conducive to the propagation of erudition and digital enterprises (Mihelj, Leguina, & Downey, 2019). Fostering and incentivizing the persistent enhancement of proficiencies, erudition, and proficiency in digital aptitude empowers personnel to maintain self-assurance and contemporary aptitude in the utilization of digital utilities. A cultural milieu that esteems inventive quandary elucidation and empirical exploration cultivates an atmosphere wherein staff members ardently adopt nascent and ingenious digital technologies and remedies.

Within the Malaysian context, the emphasis on digital literacy centers on the augmentation of digital technologies across diverse spheres encompassing education, daily routines, and economic realms. The governmental entities and affiliated organizations in Malaysia are diligently advocating the cultivation of digital literacy among the populace, thereby ensuring their acquisition of proficiencies imperative for prospering within the contemporary digital epoch. The Malaysian administration has inaugurated a series of initiatives aimed at fostering the assimilation of digital technology and literacy. One notable endeavor, denoted as "MY Digital," is prominently dedicated to expediting the proliferation of digital literacy and fortifying the digital economy on an individual level. This pursuit of digital literacy has been seamlessly incorporated into the educational curriculum, thereby furnishing students with the requisite acumen to effectively prepare for the imminent digital future (Mohd Abas, Yahaya, & Din, 2019). Educational institutions have been incorporating digital skills training into their curricula. Endeavors have been undertaken to bridge the digital divide by providing digital training and access to technologies in remote and rural locales (Tohara, 2021). Diverse workshops, training initiatives, and virtual courses are accessible to facilitate the acquisition of digital proficiencies encompassing internet navigation, computer aptitude, digital content creation, and online interaction. Nonetheless, educational institutions continue to grapple with certain challenges in the integration of digital literacy, a predicament that can potentially be surmounted by invigorating specific catalysts in subsequent endeavors. The primary aim of this scholarly research is to incite the application of digital literacy with the intent of augmenting student academic performance. In a similar vein, Anthonysamy, Koo, and Hew (2020) also center their focus on the realm of digital literacy within the context of Malaysia.

The structure of this document is compartmentalized into distinct segments. The first segment comprises an introduction, succeeded by the subsequent portion encompassing an exhaustive literature review. The next segment, the third one, encompasses the delineation of the methodology, entailing the elucidation of data collection procedures and subsequent data analysis. The fourth division accommodates an in-depth discussion, supplemented by the exploration of implications and the identification of limitations.

Literature Review

The study delves into the examination of the influence wielded by digital competencies and digital innovation over student performance. Additionally, it probes the moderating function exercised by digital institutional culture in the interplay between digital competencies, digital innovation, and student performance within the context of Madrasah Aliyah, an Islamic senior high school in Indonesia. The integration of digital resources and tools into educational instruction serves to facilitate a more interactive and captivating learning environment, capturing students' attention and fostering their active engagement. Proficiency in digital literacy equips educators with the means to enhance learning encounters tailored to individual needs, learning preferences, and interests, consequently culminating in efficacious learning outcomes. The amalgamation of classroom experiences with real-world applications through digital instruments aids students in comprehending the substantive essence of their studies. Moreover, digital literacy serves as a driving force behind the active involvement of students, enabling hands-on involvement in tasks such as content creation, research, and information presentation (Li & Yu, 2022). Digital instruments also facilitate avenues for swift self-evaluation and feedback, affording students the means to appraise their advancement and refine their achievements. Proficiency in digital literacy furnishes students with distinct proficiencies to excel and adeptly navigate the contemporary digital milieu (Liu et al., 2020). The incorporation of digital tools within the educational realm holds the potential to elevate the learning encounter for students, ameliorating their accomplishments and priming them for the prospects and complexities that lie ahead. Nevertheless, a multitude of factors, including digital competencies, digital innovation, and digital institutional culture, wield pivotal influence in elevating student performance.

Digital tools, including educational applications, interactive multimedia resources, and e-learning platforms, possess the potential to infuse the learning process with enjoyment and captivation for students, thus fostering an environment of engaging activities. This heightened engagement contributes to a more optimistic and enhanced motivation toward the educational journey (Castro, 2019). Furthermore, digital competencies facilitate the utilization of adaptive platforms, tailor-fitted to students' distinct learning styles, strengths, and areas of improvement. The internet also plays a pivotal role in affording students access to a diverse array of information, thereby facilitating exploration of creative subjects that extend beyond traditional materials and conventional projects. In tandem, virtual laboratories, digital simulations, and educational games contribute to immersive and experiential learning encounters, which serve to deepen students' comprehension of intricate concepts. Digital proficiencies play a pivotal role in fostering collaborative learning outcomes among students, enabling them to collaboratively engage in idea exchange, project collaboration, and effective communication through platforms such as

discussion forums, online interfaces, and video conferencing. These digital capabilities contribute to the provision of accessible learning materials, ensuring equitable access to information and education for all individuals. The incorporation of multimedia elements, such as animations, interactive graphics, and videos, aids students in visually comprehending complex concepts, thereby enhancing the memorability and efficacy of the learning process (Felszeghy et al., 2019). Furthermore, digital technologies empower students to connect and cooperate with experts, resources, and peers worldwide, fostering an environment conducive to cross-cultural comprehension. This discussion leads to the following discussion:

Hypothesis 1: The positive impact of digital capabilities on student performance.

Multimedia components and interactive digital materials, encompassing simulations, games, and videos, possess the capability to captivate students' interest and contribute to rendering their learning experiences both enjoyable and engaging, consequently fostering heightened participation and motivation in the educational trajectory. The integration of digital tools affords educational institutions the capacity to customize pedagogical approaches in alignment with the unique requisites of individual students. Tailored evaluations and adaptive learning platforms facilitate the discernment of students' competencies and areas requiring improvement, thus facilitating targeted interventions. In the same vein, digital technologies empower students with access to a diverse array of online resources, facilitating engagement with pioneering subjects beyond the confines of traditional educational materials (Agélii Genlott, Grönlund, & Viberg, 2019). Interactive dialogues facilitated through discussion forums, virtual platforms, and collaborative utilities foster a culture of teamwork and effective communication among students, thereby facilitating the exchange of ideas, project collaboration, and the seamless dissemination of information. The infusion of digital innovation plays a pivotal role in bridging the gap between theoretical constructs and real-world applications within educational institutions. This is achieved through the incorporation of case studies and virtual aids, which aid individuals in the transformation of theoretical concepts into tangible practical scenarios (Di Vaio et al., 2021). Digital resources additionally empower students to adeptly engage with intricate challenges via interactive problem-solving tasks and scenarios that necessitate analytical cognition. The integration of digital platforms serves to facilitate students in manifesting their creative impulses through mediums such as digital storytelling, video editing, graphic design, multimedia projects, and the composition of digital content. Consequently, this enhancement in the educational environment contributes to an elevated academic performance for students, consequently fostering their aptitude for succeeding in practical pursuits beyond the confines of the classroom. This discussion leads to the following hypothesis:

Hypothesis 2: The positive impact of digital innovation on student performance.

The interplay of digital institutional culture holds pivotal significance in the nexus between student performance and digital capabilities, acting as a mediating factor. This cultural dimension amalgamates the convictions, actions, principles, and protocols embedded within educational establishments, fostering an atmosphere that actively advocates for the assimilation and adept application of digital technologies to amplify student learning outcomes. A constructive digital culture serves as a catalyst for the

cultivation and augmentation of digital competencies among personnel, administrators, and educators alike, thereby establishing an ecosystem conducive to the advancement, education, and mastery of digital tools and proficiencies (Martínez-Caro, Cegarra-Navarro, & Alfonso-Ruiz, 2020). A digital environment that esteems innovation, collaborative synergy, and experimental exploration nurtures an atmosphere wherein students are granted the opportunity to delve into novel pedagogical approaches and innovative digital resources. Within such a culture of experimentation, educational institutions can devise inventive methodologies for incorporating technology into their instructional paradigms, effectively addressing the diverse requisites of students. The metamorphosis of the digital institutional culture heralds a transformation in approaches and methodologies, harmonizing technology into interactive teaching strategies. The ensuing policies and strategies have the potential to augment problem-solving acumen, collaborative aptitude, and critical analytical prowess, consequently culminating in the elevated performance of students (Kim, Hong, & Song, 2019). A digital environment that elevates data-driven and instantaneous decision-making fosters a climate that promotes the scrutiny of students' performance data. This data analysis aids in pinpointing strengths and discerning trends, thereby enabling educational institutions to recalibrate their content dissemination and strategic approaches to align with the individual needs of students. This discussion leads to the following hypothesis:

Hypothesis 3: Digital institutional culture significantly mediates between digital capabilities and student performance.

The digital ethos within educational institutions encourages students to embrace a disposition of receptivity towards experimentation and adaptation. This mindset proves integral for fostering swift innovation among students, educators, and academic establishments (Asbari et al., 2020). By fostering an environment that prioritizes and esteems digital innovation, an institution generates a milieu wherein educators gain access to novel technologies, pedagogical techniques, and resources that hold the potential to augment learning outcomes. A culture centered around innovation spurs the active implementation of inventive digital solutions, encompassing interactive content, online learning platforms, and digital educational tools, all of which collectively contribute to the enhancement of student learning engagement. The culture of digital innovation propels educators to cultivate and assimilate novel competencies within their instructional approaches, facilitated by the digital institutional culture's provision of dedicated resources, training, and guidance aimed at facilitating the seamless integration of digitization into teaching methodologies (Blau & Shamir-Inbal, 2017). Within this digital institutional framework, emphasis is placed on a personalized mode of learning, thereby affording students the privilege to collaborate on projects and engage with bespoke educational content. The facet of digital innovation gives rise to the creation of e-learning platforms and real-time analytics, enabling instructors to pinpoint areas necessitating enhancement for students. The adept assimilation of digital technologies has the potential to render learning more pertinent, dynamic, and engaging, wherein a culture of digital institutional practices fosters the adoption of virtual resources and multimedia materials that resonate with students' interests, thereby heightening their involvement. The impetus of digital innovation further amplifies collaboration and communication between students and educational establishments, facilitated by a digital culture that espouses the utilization

of video conferencing, collaborative utilities, and online forums, all of which converge to promote teamwork and elevate student performance. This discussion leads to the formulation of the following hypothesis**.**

Hypothesis 4: Digital institutional culture significantly mediates between digital innovation and student performance.

Research Methodology

The study delves into an examination of how digital capabilities and digital innovation affect student performance. Additionally, it delves into exploring how digital institutional culture moderates the relationship between digital capabilities, digital innovation, and student performance in Madrasah Aliyah within Indonesia. The research employed a primary data collection approach, utilizing questionnaires to gather data. The variables under investigation were operationalized through the formulation of pertinent questions. These inquiries were derived from prior research works. For instance, the dimension of digital capabilities comprises eight queries sourced from the work of Limniou et al. (2021). The domain of digital innovation encompasses ten questions extrapolated from the research conducted by Yousaf et al. (2021). The construct of digital institutional culture is represented by six questions adapted from the study by Zhen et al. (2021). Finally, the facet of student performance is evaluated through eight questions drawn from the research of Deng et al. (2019).

The participants of this research comprised students from Madrasah Aliyah, an Islamic senior high school in Indonesia. The survey instruments were administered to these students through in-person visits to their respective institutions. The selection of students for the survey was conducted using a simple random sampling method. The researchers distributed a total of 549 surveys, of which 292 responses were deemed valid and considered for analysis. This accounted for a response rate of 53.19 percent. Additionally, the study employed the SPSS-AMOS software to assess data reliability and establish associations among the variables. This tool delivers optimal results, even when intricate models or extensive datasets are employed by researchers (Hair, Gabriel, & Patel, 2014). Furthermore, the research incorporated two predictors, namely digital capabilities (DC) and digital innovation (DIN). Lastly, the investigation encompassed one predictive element, namely student performance (SP), along with a moderating factor called digital institutional culture (DIC). These variables are visually represented in Figure 1.

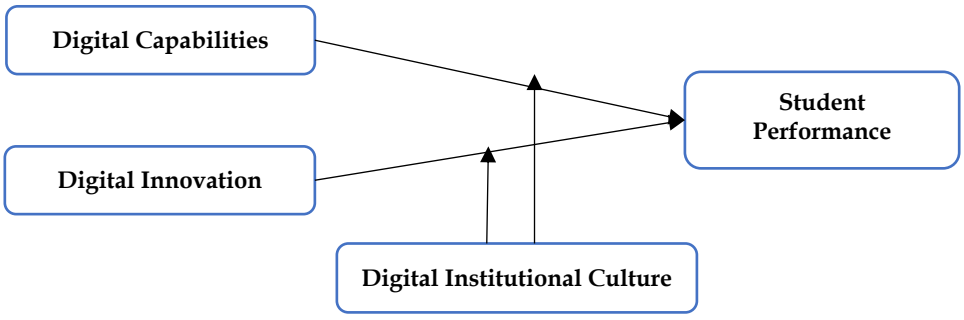

Figure 1: *Theoretical framework*

Research Findings

The article delves into the examination of how digital capabilities and digital innovation influence student performance. Additionally, it explores the moderating role of digital institutional culture within the context of Madrasah Aliyah, or Islamic senior high schools, in Indonesia. The findings of the study indicate the presence of convergent validity, elucidating the connections between various items. The results demonstrate that composite reliability (CR) values surpass 0.70, average variance extracted (AVE) values exceed 0.50, factor loadings surpass 0.50, and both MSV and ASV are lower than AVE. These figures highlight a substantial interrelation among items. These specific values are presented in Table 1.

Table 1

Convergent validity

Constructs	Items	Loadings	CR	AVE	MSV	ASV
Digital Capabilities	DC1	0.702	0.940	0.698	0.075	0.044
	DC2	0.727				
	DC3	0.996				
	DC4	0.687				
	DC5	0.708				
	DC6	0.979				
	DC8	0.969				
Digital Innovation	DIN1	0.832	0.939	0.606	0.477	0.342
	DIN2	0.833				
	DIN3	0.819				
	DIN4	0.814				
	DIN5	0.789				
	DIN6	0.659				
	DIN7	0.747				
	DIN8	0.731				
	DIN9	0.784				
	DIN10	0.759				
Digital Institutional Culture	DIC1	0.997	0.957	0.793	0.677	0.294
	DIC2	0.635				
	DIC3	0.996				
	DIC4	0.991				
	DIC5	0.634				
	DIC6	0.993				
Student Performance	SP1	0.500	0.906	0.552	0.272	0.165
	SP2	0.777				
	SP3	0.573				
	SP4	0.747				
	SP5	0.829				
	SP6	0.783				
	SP7	0.837				
	SP8	0.823				

The results of the study demonstrate discriminant validity, elucidating the relationships among the variables. The findings indicate that the initial value in the column surpasses the remaining values. These observations reveal a minimal correlation between the variables. These values are given in Table 2.

Table 2

Discriminant validity

	DIN	DC	DIC	SP
DIN	0.778			
DC	0.274	0.835		
DIC	0.423	0.140	0.891	
SP	0.522	0.192	0.431	0.743

Furthermore, the current article also assesses the strong suitability of the model by employing the Tucker-Lewis index (TLI) and comparative fit index (CFI). The scores for both indices surpass 0.90, and an evaluation is also carried out using the root mean square error of approximation (RMSEA), with values falling below 0.05. These results signify that the model exhibits a favorable fit. These specific values are provided in Table 3.

Table 3

Model Good Fitness

Selected Indices	Result	Acceptable level of fit
TLI	0.928	TLI > 0.90
CFI	0.929	CFI > 0.90
RMSEA	0.003	RMSEA < 0.05 good; 0.05 to 0.10 acceptable

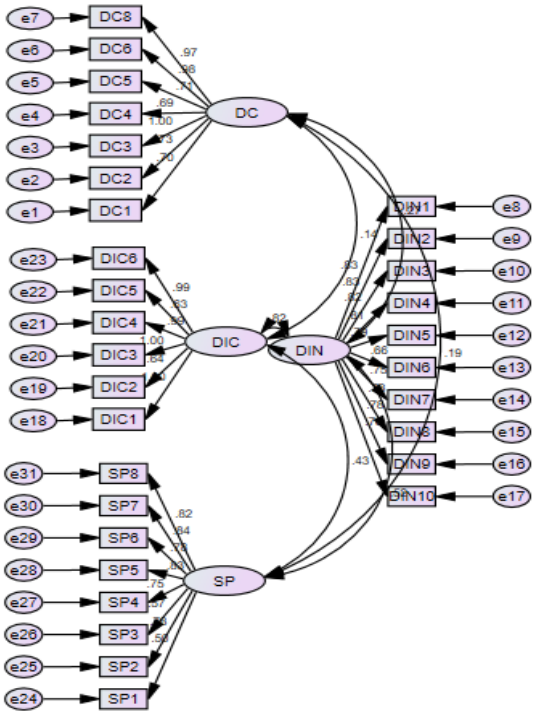

Figure 2: *Measurement model assessment*

In conclusion, the results demonstrated a positive correlation between digital capabilities and digital innovation with student performance in the context of Madrasah Aliyah in Indonesia, thus confirming the validity of H1 and H2 hypotheses. Additionally, the findings unveiled that digital institutional culture plays a significant moderating role in relation to digital capabilities, digital innovation, and student performance within Madrasah Aliyah or Islamic senior high schools in Indonesia. This confirms the H3 and H4 hypotheses. These relationships are detailed in Table 3.

Table 3

Path analysis

Relationships			Beta	S.E.	C.R.	P
Student Performance	<---	Digital Capabilities	0.201	0.040	5.028	0.000
Student Performance	<---	Digital Institutional Culture	0.197	0.037	5.401	0.000
Student Performance	<---	Digital Innovation	0.288	0.045	6.463	0.000
Student Performance	<---	DC x DIC	0.078	0.007	10.391	0.000
Student Performance	<---	DIN x DIC	0.014	0.007	2.000	0.048

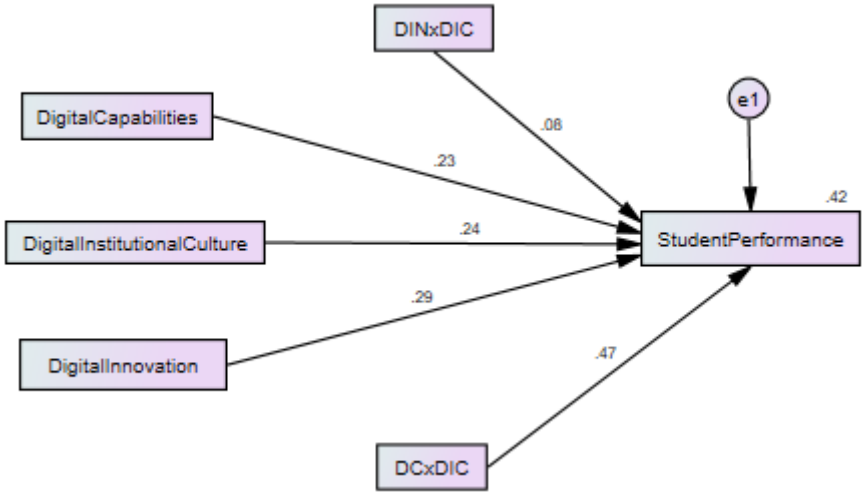

Figure 3: *Structural model assessment*

Discussions

The study delves into examining the influence of digital capabilities and digital innovation on student performance, while also investigating the moderating influence of digital institutional culture within the context of Madrasah Aliyah or Islamic senior high schools in Indonesia. The findings revealed a positive impact of digital capabilities on student performance. This observation aligns with prior research conducted by Limniou et al. (2021), which similarly supported this hypothesis. According to their findings, digital capabilities facilitate students in establishing connections with experts, peers, and educators worldwide. Through virtual classrooms, online conferences, and webinars,

students are empowered to participate in cross-cultural dialogues across the global sphere, thereby enhancing their learning journey. Contemporary employment demands in the workforce heavily rely on digital competencies, necessitating the infusion of digital capabilities into education to equip students for their forthcoming careers. Adeptness and adept utilization of online communication, data analysis, and analytical tools empower students to enhance their marketability. Digital capabilities serve to address and cater to the varied requirements of learning, as exemplified by assistive technologies like speech recognition and screen reader software, ensuring that all learning materials are accessible. This ensures that students not only engage actively but also accomplish their objectives successfully. Falloon (2020) also lent support to this conjecture. As per their perspective, digital capabilities empower students to progress towards honing critical thinking abilities. This progress is achieved through their engagement in maneuvering technological landscapes, distinguishing trustworthy information, and assessing online resources. These experiences provide them with essential skills to stay current within the digital realm. Consequently, digital capabilities yield a favorable influence on students' academic performance, manifested across various educational dimensions. These capabilities and skills augment students with a personalized learning experience, amplified educational prospects, globally applicable competencies, and pivotal connections, all of which are indispensable for triumphing in the digital era. The findings indicated a favorable influence of digital innovation on student performance. This finding aligns with a previous study conducted by Van Pham, Ta, and Nguyen (2019), which similarly corroborated this hypothesis. In their study, they observed that digital tools incorporate simulations and skill-enhancing activities that equip students with practical proficiencies relevant to real-world scenarios. Digital platforms facilitate cultural interchange and global networking, affording individuals the opportunity to engage with experts and peers worldwide. This exposure to diverse viewpoints readies them for a globalized society, thereby enhancing their educational journey. Moreover, digital innovation empowers educators with innovative tools capable of monitoring students' progress and identifying their areas of learning discrepancy, enabling them to customize their instructional approaches accordingly. Consequently, educational institutions can provide assistance and refine their pedagogical approaches, yielding improved results for students. This assertion is substantiated by the findings of Purwanto et al. (2023), who similarly endorsed this hypothesis. Furthermore, the incorporation of engaging digital content and interactive simulations has the potential to augment enthusiasm and motivation for learning. Active engagement with these innovative technological tools in academic studies can lead to better retention of knowledge and enhanced academic performance. The impact of digital innovation extends beyond revolutionizing education; it equips students with pioneering resources that elevate the learning experience, addressing individual needs and fostering a deeper comprehension of available information.

The findings indicated a substantial intermediary function of digital institutional culture in the relationship between digital capabilities and student performance. This notion is echoed by a preceding study conducted by Van Laar et al. (2020), which similarly endorsed this hypothesis. A culture that advocates for data-driven methodologies can emphasize the incorporation of digital tools for the analysis and aggregation of student performance data. This enables educators to adopt personalized teaching approaches and pinpoint learning objectives. The constructive digital culture within educational

institutions contributes to student motivation through the implementation of collaborative online platforms and interactive educational content. Engaged students, who actively involve themselves, tend to exhibit commendable participation and excel in their academic endeavors. Moreover, cultures that incorporate digital technologies can also contribute to students' exposure and foster connections across diverse cultures and viewpoints. Through online discussions and virtual collaborations, students are encouraged to engage with global matters and participate in a comprehensive educational experience. An educational establishment that champions blended and adaptable learning models, backed by technology, is poised to accommodate various learning preferences and styles. This accommodation aids students in effectively managing their academic obligations alongside other responsibilities, ultimately resulting in improved academic performance. A digital culture that emphasizes perpetual refinement and experimentation in instructional methods can contribute significantly to the educational achievements of students.

The findings demonstrated that digital innovation plays a constructive intermediary function between digital innovation and student performance. This viewpoint is substantiated by prior research conducted by Kohli and Melville (2019), which similarly lends support to this hypothesis. According to their insights, the integration of these groundbreaking digital tools and software into educational methodologies enriches educational approaches. An environment that advocates for collaboration and the nurturing of a communal spirit within educational institutions and among students, facilitated by digital tools, can cultivate a nurturing learning ethos. Virtual study groups, online forums, and peer interactions can foster collaborative platforms that positively influence students' academic accomplishments. The digital culture fosters an environment in which students are prompted to embrace adaptability and innovation in response to the swiftly evolving digital terrain. This environment encourages the cultivation of a growth mindset and the acquisition of digital literacy skills among students, achieved through the incorporation of innovative technologies. The intention behind this approach is to equip students with the tools they need to excel academically. The digital culture upheld by educational institutions can serve as a catalyst for stimulating innovation and research within the educational realm. Through collaborative efforts, researchers engage in the development and exploration of impactful tools, thus establishing a framework for sharing knowledge that ultimately enhances students' performance.

Implications

The Malaysian government is directing its efforts toward elevating students' achievements by integrating digital tools and methodologies into educational institutions and curricula. This initiative aims to equip students with the skills necessary to compete on a global scale. In the contemporary landscape, the advent of digitalization has ushered in transformative technologies that offer comprehensive information to students, reshaping the global panorama. The Malaysian government is actively pursuing numerous endeavors to infuse digital tools and approaches into education, fostering an environment of enhanced exploration for students.

This research paper outlines policies and strategies pertinent to governmental bodies, administrators, and non-governmental organizations. The central focus of this paper is to analyze the impact of digital capabilities and digital innovation on student performance,

along with examining the intermediary role played by digital institutional culture. Through this analysis, the goal is to comprehend how these factors interact between digital capabilities, digital innovation, and student performance.

Digital tools empower students to transcend conventional paradigms of thinking. The process of digitalization has given rise to a plethora of resources, including multimedia, virtual classrooms, and a multitude of social platforms that students can readily access to enrich their knowledge. Proficiency in digital literacy equips students with the skills necessary to effectively navigate, retrieve, and assess information from various online outlets. This proficiency aids them in distinguishing between unreliable and reliable sources, thereby fostering the development of informed and well-researched projects.

Furthermore, digital literacy cultivates critical thinking skills by prompting students to engage in synthesizing, analyzing, and evaluating digital content. As a result, students become adept at recognizing logical fallacies, identifying biases, and pinpointing inconsistencies present in online resources. This heightened discernment fosters a more analytical approach to their responses and engagement with digital information. Digital literacy not only serves as a repository of knowledge for students but also empowers them to generate dynamic content like video blogs, presentations, and infographics. These proficiencies not only augment but also refine students' capacity to effectively engage their audiences through impactful educational materials. Equipped with robust and impactful digital skills, students become adept at navigating the challenges presented in contemporary workplaces, as the global landscape increasingly pivots towards technology-driven operations. The pervasive use of technological tools and software in academia opens avenues for students to access and collaborate with researchers and experts, thereby expanding their intellectual horizons. This study not only offers insights into the role of digital capabilities and innovation in bolstering students' performance but also furnishes guidance for policymakers seeking to formulate strategies that leverage digital proficiencies to enhance educational outcomes.

Limitations

This paper makes a substantial contribution to the existing literature; nevertheless, it also bears certain limitations that offer opportunities for future advancements. The core focus of this study lies in examining the influence of digital capabilities and digital innovation on student performance. In forthcoming research endeavors, scholars could encompass additional factors such as digital libraries, technological access, digital tools, and communication channels to comprehensively investigate their influence on student performance. Furthermore, this study employs digital institutional culture as an intermediary variable to explore its role in the interplay between digital capabilities, digital innovation, and student performance. Future investigations could consider the incorporation of media literacy, training, and educational factors as mediators, thereby delving into their potential contributions to enhancing student performance.

Lastly, it is important to note that this study's framework is situated within developing countries, and its applicability might differ in developed nations. For future reference, researchers could extend this framework to developed countries, aiming to assess the effects of these variables on student performance within their distinct contexts.

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