RESEARCH ARTICLE

Unpacking the Realities of Digital Leadership Among School Leaders: A Quantitative Study

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ABSTRACT

In the age of globalization, technology has emerged as a pervasive force reshaping various sectors, including education and organizational management. However, despite its transformative potential, the effective implementation of digital leadership remains a challenge. This study aims to investigate the current level of digital leadership among school leaders in Perak. A quantitative approach was used with an adapted questionnaire. A total of 97 primary teachers were selected randomly and involved in this study. The findings revealed that the overall level of digital leadership among school leaders is high, indicating great potential for integrating digital technology into teaching methods and administrative processes. This suggests the importance of investing in developing digital leadership skills among school leaders to encourage ongoing innovation in education. It also highlights the need for further exploration of digital leadership strategies for school leaders. In conclusion, this study offers practical insights for improving teaching practices and organizational management in the digital era, aiming to drive positive change and innovation in Perak's schools.

Contribution/Originality: This study contributes to the existing literature by providing empirical evidence of the level of digital leadership among school leaders in Perak, Malaysia. While previous research has offered insights into digital leadership and its importance in educational settings, this study fills a knowledge gap by quantitatively assessing the digital leadership capabilities of school leaders in Malaysian context.

1. Introduction

Technology has emerged as a pervasive and rapidly evolving force in the age of globalisation (Sachs, 2019). Its influence is far-reaching, impacting everything from communication and medicine to economics, science, education, and even sports, construction, and military operations (Timotheou et al., 2022). This transformative process becomes particularly evident when comparing the early 20th century to the year

2000. The pace of technological advancement has only accelerated from the early 2000s to the present day, leaving a profound imprint on various sectors. For example, Collin et al. (2015) that the field of organisational management has undergone rapid transformation due to digital innovation. This shows how technology continues to reshape and redefine the world, creating new opportunities and challenges across the spectrum of human endeavours (Iansiti & Lakhani, 2020). The impact of digital technology on organisational management can be seen in the adoption of digital tools and platforms for communication, collaboration, and data analysis. These advancements have not only improved efficiency and productivity but have also necessitated a shift in leadership styles and workforce skills to adapt to the changing landscape. As technology continues to evolve, it is crucial for individuals and organisations to embrace a growth mindset and continuously learn and adapt to stay competitive in this rapidly changing digital era.

1.1. Problem Statement

Digital leadership is a multifaceted and evolving concept that plays a crucial role in navigating the complexities of the digital age, particularly in educational and organisational settings (Ming et al., 2023). The literature reviewed above offers a comprehensive view of the challenges, skills and opportunities associated with digital leadership and its relevance in today's rapidly changing technological landscape. Many of the reviewed works rely on qualitative insights and literature synthesis. A research gap exists in terms of quantitative validation, where empirical data and statistical analyses are needed to substantiate and quantify digital leadership. Furthermore, there exists a noticeable gap in the discussion surrounding specific strategies for implementing effective digital leadership in various contexts, particularly in K-12 education. While Brett (2020), Hafiza et al. (2021), and Ming et al. (2023) emphasise the significance of digital leadership in adapting to and leveraging technology, the literature falls short in offering comprehensive guidance on practical approaches and strategies for fostering digital leadership capabilities.

Karakose et al. (2021) and Tiekam and Myres (2023) have made valuable contributions by exploring the roles and skills associated with digital leadership in educational and organisational settings, respectively. However, there is a need for a more in-depth examination of the strategies and best practices that educational leaders should adopt to successfully implement digital leadership in their respective domains. The existing literature highlights the necessity of technology use, managerial skills, individual skills, adaptive leadership, and various digital competencies, but it does not sufficiently address how these aspects can be effectively incorporated into leadership practices. Therefore, a significant gap lies in the insufficient literature discussing the level of digital leadership and concrete strategies for implementing digital leadership despite acknowledging the challenges. To address this gap, this study aims to investigate the level of digital leadership among school leaders and provide practical insights into the strategies that they should implement to enhance their digital leadership capabilities and promote successful digital transformation within their organisations.

1.2. Research Objective

This study aims to measure the current level of digital leadership among school leaders in Perak.

2. Literature Review

2.1. Digital Transformation

The terms "digital," "digital innovation," and "digital transformation" are commonly utilised in contemporary industries, encompassing competitive sectors such as banking, healthcare, defence, manufacturing, and telecommunications (Saarikko et al., 2020). Even though these terms seem similar, their unclear definitions can be confusing (Ming et al., 2023). The objective of establishing a clear definition of the concept of digital transformation for educational administrators is to establish a foundation upon which a collective vision can be constructed (Dorner & Edelman, 2015). This definition seeks to underscore the notion that digital transformation encompasses more than mere technological advancements (Ming et al., 2023). In the field of education, digital transformation (DT) involves the conceptualization of novel approaches to integrate individuals, data, and procedures in order to provide improved learning environments for learners, teachers, parents, and educational administrators in the contemporary digital-oriented era. Additionally, DT aims to equip educational organisations with the necessary readiness to address forthcoming innovations and challenges.

Digital transformation in education aims to utilize information and communications technology (ICT) to improve teaching and learning and integrate technology-enabled education systems. When effectively guided, technology can facilitate a more comprehensive approach to education, broaden the availability of information and knowledge, enhance educational procedures, and enhance learning achievements (UNESCO, 2021). The advent of digital technology has sparked swift transformations and significant obstacles across the contemporary globe. The COVID-19 epidemic of 2019 has led to a significant increase in the practice of remote working and remote learning (Al Lily et al., 2020; Christensen & Alexander, 2020). It altered our perception of the locations and methods of our job and education. Although digital technologies have been widely adopted in other industries including mining and entertainment, the integration of digital transformational change in education institutions has lagged behind. While many schools have infrastructure for information and communications technology (ICT) (OECD, 2019), and pupils frequently have access to new technologies outside the classroom (Vlies, 2020), the education sector has been slow to adopt digitalization.

Several education systems, like Finland, Singapore, and Norway, are models for others aiming to improve their PISA scores. These systems have already implemented successful transformations (Schleicher, 2019; Vincent-Lancrin et al., 2019). Deng and Gopinathan (2016) highlights that strong teacher quality, effective school leadership, well-designed systems, and ongoing educational reforms are key factors in high-performing education systems. It goes further to identify the specific conditions within these systems that allow these factors to grow. To effectively guide their schools' digital transformation and integrate technology into the learning environment, school leaders need to address any gaps in their own technological knowledge and skills (Aksal, 2015). Thus, school leaders have to be digital leaders. Next, the digital leadership will be discussed.

2.2. Digital leadership

Digital leadership in education is a multifaceted concept that holds significant importance in the modern educational landscape. It represents a leadership style that

focuses on implementing digital transformation within educational organisations, shaping the future of learning and administration. Scholars and researchers have delved into various aspects of digital leadership, providing valuable insights into its definition, significance, leadership styles, challenges, and impacts (Ming et al., 2023). Firstly, digital leadership has been defined as a leadership style that emphasises the adoption of digital technologies and strategies to enhance educational processes and outcomes within educational organisations (Sağbaş & Erdoğan, 2022). It serves as a guiding force in aligning technology initiatives with educational goals, ensuring data privacy, and fostering a culture of innovation among all stakeholders, including administrators, teachers, and students. Furthermore, studies have highlighted different leadership styles within digitally transformed educational contexts, including transformational leadership, distributed leadership, and adaptive leadership (Arham et al., 2023). These styles have been found to be crucial in inspiring and motivating stakeholders to embrace digital changes, promoting collaboration among various educational stakeholders, and adapting to the evolving digital landscape.

However, the implementation of digital leadership in education is not without its challenges. Resistance to change, a lack of digital literacy among educators and leaders, budget constraints, and the need for ongoing professional development have been identified as common barriers (Arham et al., 2023; Muhammad Rasyid et al., 2023). Overcoming these challenges is crucial for successful digital leadership and the realisation of its potential benefits. Digital leadership in education is a dynamic and evolving concept, encompassing various leadership styles and strategies (Ming et al., 2023). It plays a pivotal role in shaping the future of education by harnessing the power of digital technologies to enhance learning experiences, streamline administrative processes, and foster innovation. As technology continues to advance, further research and practice in this field are essential to ensure that educational institutions meet the demands of the digital age. Hence, in order to effectively implement digital leadership, school leaders must strategically utilise available resources and opportunities to foster significant transformations within the school culture. This, in turn, can have a constructive influence on the education system, especially in the context of Malaysia, which seeks to leverage technology and digital proficiency to enhance students' competitiveness in the era of education 4.0 (Ahamad et al., 2014).

Hafiza et al. (2021) conducted a quantitative study to assess the level of digital leadership exhibited by principals, evaluate the extent of digital teaching practises among teachers, and determine the specific characteristics of administrators' digital leadership that are predictive of teachers' digital teaching levels. This study involved approximately 400 secondary school teachers in the Hulu Langat District, located in the state of Selangor. The results of this study indicate that both administrators and teachers demonstrate a high level of digital leadership and proficiency in their digital teaching practices. Their study indicates that the ability to strategize and structure digital leadership initiatives holds significance and has the potential to enhance students' academic achievements, even in the midst of the COVID-19 pandemic problem. The high level of digital leadership is also supported by AlAjmi (2022)'s study in Kuwait. The researcher examined how school principals' leadership in technology (digital leadership) affected teachers' use of technology during COVID-19. A total of 113 principals and 404 teachers from public elementary schools using two specific surveys: the Principal Technology Leadership Assessment and the Teacher Technology Integration Survey were surveyed. The study found a positive correlation between strong digital leadership from principals and teachers' increased use of technology during COVID-19. However,

AlAjmi (2022) suggested that further research may be able to fully explain the digital role of school leaders and see if a different learning environment changes how technology is used in their schools when the schools start up again.

While fostering a digital culture is crucial for supporting modern teachers, research by Domeny (2017) suggests it might not be straightforward. His study found a surprisingly weak link between a principal's digital leadership and teachers' use of technology in the classroom. The findings were supported by the study of Omar et al. (2019). Omar et al. (2019) indicated that school leaders have demonstrated their readiness to assume the responsibility of digital leadership inside educational organisations. The results of this study indicate that teachers agree on the active participation of principals in the formulation of strategic plans, particularly in relation to the integration of information and communication technology (ICT) and digital technology in instructional practices (Omar et al., 2019). Despite the importance of digital leadership, there seems to be a disconnect. Studies indicate teachers do not perceive school leaders as effectively promoting strategic use of technology in instruction through information and communication medium. This suggests a need for strategies to bridge the gap and strengthen the link between digital leadership and actual implementation in schools. School leaders must embrace their role as digital transformative forces. Their influence is crucial in fostering a culture of innovation for staff, students, parents, and the entire community.

Furthermore, one of the primary responsibilities of the school leaders is to provide assistance and foster the development of individuals. The phenomenon of growth is widely believed to occur mostly at the student level. Nevertheless, it is imperative for educational administrators to prioritise the professional development and advancement of their teachers (Sterrett & Richardson, 2020). In the study of Sterrett and Richardson (2020), they found that digital leaders play a crucial role in shaping the professional culture of educational institutions by actively embracing and promoting innovation, while also providing support for the professional development of their teachers through the lens of professional development aspects offered by Glickman et al. (2013), that includes "school-wide, group, and individual goals". However, in the context of Malaysia, their findings opposed the findings of the study conducted by Yusof et al. (2019) who found Malaysian schools lacking essential features in their digital learning platforms. This suggests that Malaysian school leaders may need to improve their implementation of digital leadership practices. In other words, there's room for growth in how Malaysian schools utilize digital tools for effective learning. They further emphasize that access to digital learning opportunities and participation in digital learning communities are crucial markers of a teacher's strong professional practice (Zhong, 2017). In order to enhance the professional practice of teachers, it is imperative for principals to offer professional development opportunities that facilitate the acquisition of practical skills.

3. Research Methods

3.1. Research Design

This study used a quantitative research approach to investigate the level of digital leadership of school leaders based on the perception of teachers. The data collection process for this study entailed involving a self-reported questionnaire to participants selected from various schools in Perak.

3.2. Population and Sampling

The population of the ICT teachers in Perak and a total of 106 participants that were selected based on Krejcie and Morgan (1970). In this study, these participants were teachers that play an important role in the digital transformation of their schools as ICT teachers. Furthermore, the inclusion criteria specified that the participants should have working experiences more than five years prior to the survey. The surveys were collected using a Google Form. In this study, a random sampling technique was used to distribute the questionnaires to all ICT teachers in Perak.

3.3. Instrumentation

In this study, the questionnaire was the primary instrument to collect data. A total of 15 items were derived from literature analysis and then verified by experts. The instrument was refined based on the experts' recommendations. After refining the instrument, a total of 10 items was tested with a group of 10 teachers to achieve the face validity. Instrument refinement was conducted again based on the feedback. Then it was tested in a pilot study with a group of 30 teachers to achieve the reliability of the instrument. After achieving the validity and reliability, the instrument consists of 10 items was formed and used in field study.

3.4. Data Collection Method

Prior to data collection, the researcher gained approval from the authority department for the purpose of study and the process for collecting survey data. The researcher shared the questionnaire of digital leadership and disseminated an electronic link to access the questionnaire through the use of Google Form. The purpose of this study, voluntary participation, the timeframe for completing the questionnaire, as well as ethical and confidentiality considerations were communicated to the teachers who chose to participate. All data were collected and secured in a password-protected folder on the researcher's computer as well as a folder in Google Drive. This data will be maintained by the researcher for one year and will destroy the file once the deadline expires.

3.5. Data Analysis Method

In this study, the collected quantitative data were analysed using descriptive statistics by calculating frequencies and percentages for teacher responses from the questionnaire. In order to conduct a descriptive analysis, the acquired data will be presented using fundamental statistical measures, specifically percentage, mean, and standard deviation, to elucidate the demographic characteristics of the participants. The Likert scale is used to assess the extent of digital leadership among school leaders in the state of Perak, employing a five-level division. This approach is commonly employed to facilitate the process of assigning relative importance to various categories under consideration, hence facilitating comparisons between them (Hamzah, 2008).

This study employed the methodology proposed by Davies (1971) to categorise the average score level. In this regard, the interpretation of the mean score (Davies, 1971) is facilitated through the three distinct levels, namely low, medium, and high. These levels are determined by calculating the difference between the highest and lowest scores and afterwards dividing it into the desired level. In this study, the researchers have established five distinct levels for the interpretation of mean scores. The level of school

leaders' digital leadership will be determined based on the mean score value and the level can be defined based on Table 1.

Table 1: Levels of Digital Leadership and its interpretations Based on Mean Score

Mean Value Range	Measurement Level	Interpretation of Each Level
1.00 - 2.33	Low	The level of teacher digital competence is low.
2.34 - 3.67	Moderate	The level of teacher digital competence is moderate.
3.67 - 5.00	High	The level of teacher digital competence is high.

Source: Davies (1971)

4. Results

4.1. Respondents' Demographic Information

The online questionnaire google forms were sent to the respondents. Their demographic information was obtained and presented in Table 2. Among the respondents, 61 (57.55%) are female and 45 (42.45%) are male. In this study, the respondents between 31 to 40 ages were found dominant. Regarding the education level, it was found that the majority of the respondents had a bachelor's degree. For the service experience, it was found the majority of the respondents have been servicing for more than 5 years.

Table 2: Respondents's Demographic Information

Demographic	Group	n	Percentage (%)
Gender	Female	61	57.55%
	Male	45	42.45%
Age	Between 20-30	12	11.32%
	Between 31-40	46	43.40%
	Between 41-50	42	39.62%
	Between 51-60	6	5.66%
Education Level	Bachelor	83	78.30%
	Postgraduate	23	21.70%
Experience	5 years and below	12	11.32%
	Between 6-10 years	46	43.40%
	Between 16-20 years	38	35.85%
	21 years and above	10	9.43%

4.2. The Level of Digital Leadership

Perception of respondents towards digital leadership of school leaders was analysed quantitatively. The frequencies and percentages for each item in the questionnaire were shown in Table 3.

Table 3: Frequencies and percentages of each item for digital leadership among teachers

No. Item	Likert Scale					Mean	Standard Deviation
	Strongly Disagree	**Disagree**	**Slightly Agree**	**Agree**	**Strongly Agree**		
Item 1	3 (2.8%)	1 (0.9%)	24 (22.6%)	48 (45.3%)	30 (28.3%)	3.95	0.898
Item 2	4 (3.8)	3 (2.8)	28 (26.4)	46 (43.4)	25 (23.6)	3.80	0.960
Item 3	1 (0.9%)	1 (0.9%)	24 (22.6%)	49 (46.2%)	31 (29.2%)	4.02	0.805
Item 4	1 (0.9%)	2 (1.9%)	23 (21.7%)	53 (50.0%)	27 (25.5%)	3.97	0.798
Item 5	2 (1.9%)	3 (2.8%)	28 (26.4%)	44 (41.5%)	29 (27.4%)	3.90	0.904
Item 6	2 (1.9%)	6 (5.7%)	30 (28.3%)	45 (42.5%)	23 (21.7%)	3.76	0.921
Item 7	2 (1.9%)	3 (2.8%)	24 (22.6%)	52 (49.1%)	25 (23.6%)	3.90	0.861
Item 8	1 (0.9%)	2 (1.9%)	28 (26.4%)	50 (47.2%)	25 (23.6%)	3.91	0.811
Item 9	2 (1.9%)	2 (1.9%)	20 (18.9%)	51 (48.1%)	31 (29.2%)	4.01	0.856
Item 10	2 (1.9%)	2 (1.9%)	24 (22.6%)	49 (46.2%)	29 (27.4%)	3.95	0.866
					Digital leadership	3.92	0.798

Based on Table 2, more than 90% of respondents found their school leaders to be adaptable and resilient in the process of change with highest mean value (4.02). However there were only two respondents (1.8%) who disagreed that their leaders were adaptable and resilient in the process of digital transformation. Item 9 showed the second highest mean value with 4.01. A total of 102 respondents (96.23%) agreed that their leaders prioritise the learning experience of students. However, there were four respondents who disagreed as they perceived their leaders did not prioritise the learning experience. a total of 104 respondents (98.11%) responded with mean value (3.97). They believed that the decisions made by their leaders were data-driven.

Item 1 and item 10 had the same mean value of 3.95. A total of 102 respondents (96.23%) believed that their leaders are visionary thinkers who can drive innovation. There were four respondents (3.77%) who disagreed with the statement. For item 10, most of the respondents (96.23%) believed their leaders value continuous learning to stay updated on digital trends. However, four respondents (3.77%) disagreed with the statement. Furthermore, a total of 103 respondents (97.17%) found their leaders to be agile and responsive to educational shifts for item 8 (3.91). Only three respondents (2.83%) disagreed with item 8. Item 3 and item 7 also had the same mean value of 3.90. For item 3, a total of 104 respondents (98.11%) found my leader to be adaptable and resilient in the process of change but two respondents (18%) responded differently.

For item 7, there were a total of 101 respondents (95.28%) believed their leaders foster collaboration and networks effectively. However, five respondents (4.72%) disagreed. For item 2, 99 respondents (93.40%) thought their leaders possessed a deep understanding of digital technologies. Several respondents (6.60%) disagreed that their leaders possessed a deep understanding of digital technology. Item 6 had the lowest mean value of 3.76 where 98 respondents (92.45%) thought their leaders had expertise in leading digital transformations, and eight respondents (7.55%) thought their leaders did not have expertise in leading digital transformations. Overall, the level of digital leadership in this study is high based on the interpretation (see Table 1).

The findings of the study suggest that school leaders in Perak exhibit commendable adaptability, student-centeredness, data-driven decision-making, visionary thinking, and technological proficiency among themselves. However, the study also identified areas for potential enhancement, such as further strengthening expertise in leading digital transformations. By addressing these areas of opportunity, school leaders in Perak can continue to drive positive change and innovation in schools.

5. Conclusion

In conclusion, this study investigated the level of digital leadership among school leaders in Perak, Malaysia. The findings reveal a high level of digital leadership of school leaders. However, despite the overall high level of digital leadership, the study identified areas for further improvement such as aspects in fostering collaboration, enhancing expertise in leading digital transformations, and addressing dissenting perspectives on certain leadership attributes. By addressing the identified areas for improvement, school leaders in Perak can pave the way for transformative change and innovation in the digital age.

Ethics Approval and Consent to Participate

The research adhered to ethical guidelines set by Universiti Pendidikan Sultan Idris's Research Ethics Committee. This ensured all procedures involving human participants followed ethical research principles. Informed consent was obtained from all participants.

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Conflict of Interest

The authors declare no conflict of Interest.

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