ANALYSIS OF DIGITAL LEADERSHIP IN HIGHER EDUCATION IN CREATING A WORLD-CLASS UNIVERSITY AT STATE UNIVERSITIES

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Abstract

The rapid advancement of technology 4.0 has resulted in significant changes in society's lifestyle, bringing both benefits and complex issues, including those in higher education. To address these challenges, university leaders play a crucial role in leveraging digital technology toward a better future. This study aims to assess the implementation of digital leadership in achieving a world-class university in the era of Industry 4.0 in state universities in Malang City. Using a quantitative approach and survey research design, the study's population comprises students and lecturers from four state universities in Malang City. From the population of 151,921, 347 respondents were selected using Isaac and Michael's (1983) formula with a 5% error rate. The study collected data through a questionnaire and analyzed it using Statistical Package for the Social Sciences (SPSS) and Microsoft Excel to present descriptive data on the perspectives of the three parties. The one-way analysis of variance (ANOVA) used in this study tested the hypothesis that there is no significant difference in the implementation of digital leadership in state universities in Malang City. The results revealed a significant difference in the implementation of digital leadership. The academic community in state universities in Malang City strongly agreed that their leaders need to provide the necessary information systems to achieve digital leadership toward a world-class university. However, digital leadership is not yet comprehensively implemented.

Keywords: Digital, Leadership, World Class University, Academic, 4.0 Era, Higher Education, Malang City, System Information

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1. INTRODUCTION

People's lifestyles are experiencing very rapid changes, along with changes in the industrial technology era 4.0 (Alexandru et al., 2019). Digital transformation stems from changes related to the application of digital technology in all aspects of human life. This digital revolution has led to increased flexibility in production, increased speed, new dimensions of mass production, advanced levels of productivity, superior quality results, and emerging new business models (Oberer & Erkollar, 2018). The digital revolution has brought tremendous advances in information gathering, the speed and volume of information transmission, modes of reception, and breadth of access. Digital

technology has transformed nearly every aspect of our lives over the past few decades including the way we communicate shop and read. Digital technology has the potential to offer necessary solutions for human life if supported by adequate investment and regulatory support (Steinhubl et al., 2019).

The impact of these developments raises increasingly complex challenges and issues (Moos, 2003). Higher education leaders are responsible for the continuity of education. The ability to always make development efforts in facing various challenges that are currently developing is the key to the sustainability of educational institutions in the global era (Ruiz Vargas et al., 2019). Higher education leaders have an important role in preparing their institution's response to all changes, and in practice school principals are required to remain able to build trust, collaboration, and collaborative leadership in all situations. The success or failure of a university is fundamentally influenced by the leadership of the chancellor (Kurland et al., 2010).

Higher education leaders must have a leadership vision. Leadership vision is very important to deal with changing crucial conditions (Heikka et al., 2019). Leadership vision is the key to success for the chancellor, in order to be able to continue to exist in various changing situations and conditions (Fullan et al., 1980). The results of several existing studies have found that digital leadership can improve and can encourage digital teaching and learning processes (Richardson et al., 2012). Leadership is a real action (Sheninger, 2019) to influence (Oberer & Erkollar, 2018) in order to maintain the future development (Moos, 2003) of the institution, at the same time, to manage activities with clear instructions (Fried, 2017) and work distribution (Oberer & Erkollar, 2018).

Digital leadership is the art of directing, influencing others, initiating sustainable change through access to information, and building relationships to anticipate changes critical to the school's future success. For this reason, a dynamic combination of mindset, behavior, and skills is needed to change or improve school culture through the help of technology (Sheninger, 2019). This digital leadership framework is designed based on a combination of technology, motivation, and leadership style (Frey & Berger, 2016).

Digital leadership is a strategy that can be applied by leaders of higher education institutions to improve student achievement and enhance the competitiveness of the institution (Sheninger, 2019). Digital leadership is a highly appropriate, rapid, cross-hierarchical, group-oriented, and collaborative approach with a primary focus on innovation (Oberer & Erkollar, 2018). Intense and two-way communication between stakeholders in educational institutions is required (Sheninger, 2019). Based on the background described above, the focus of this study is to determine the differences in the implementation of digital leadership in realizing a world-class university in state universities in Malang City.

This paper is divided into several sections. Section 1 discusses the background, objectives, and problem formulation that underlie this paper. Section 2 provides a literature review related to previous research that is relevant to this study. Section 3 describes the appropriate method used to ensure the validity of the research. Section 4 presents various data and facts found during the research process. Section 5 provides an in-depth discussion and analysis based on the data found, and Section 6, the final section, is the conclusion, which contains important points resulting from the research that can be used for further studies. This section also discusses the limitations of this research.

2. LITERATURE REVIEW

According to Antonopoulou et al. (2021), the adoption of digital leadership, which is a type of transformational leadership, has a positive relationship with enhancing the efficiency and effectiveness of the academic community in higher education. Digital leadership refers to utilizing the organization's digital data strategically to achieve business goals, at both the organizational and individual levels. As the digital age advances, educational institutions must continue to adjust and modernize their practices to stay relevant. Hence, it is essential to identify the digital competencies that characterize an effective leader. The study found that a high level of transformational leadership is linked to a high degree of digital leadership implementation in higher education. Previous research in academic institutions indicates that transformational leadership has a positive and statistically significant impact on digital leadership, while transactional and passive leadership styles do not have a statistically significant effect. Additionally, a higher number of declared digital properties result in increased levels of efficiency and satisfaction from leadership training. Recent research also suggests that leadership outcomes have a positive and statistically significant effect on digital leadership, implying that the greater the leadership effectiveness and satisfaction, the more digital leadership is practiced.

Bejinaru (2019) explains the importance of digitization in higher education institutions. Digitization is currently one of the most important trends that is transforming society and businesses. Undoubtedly, the digital economy is deeply changing the methods that companies use to produce and deliver goods and services worldwide. Therefore, in the education sector, digitization can be applied to administration, teaching-learning, evaluation, research, development, and for the benefit of society. Although it brings many advantages such as saving time, transparency, overcoming geographical limitations, continuous 24/7 flow, minimizing human errors, in the adaptation process, higher education institutions must focus on a significant improvement in their core mission of teaching and learning. Currently, society expects much more from universities regarding their contribution. They must develop a third mission that concerns providing services to the community and more active engagement. In a world full of rapid and unexpected changes that cause a volatile business environment, higher education institutions not only need to adapt to all these changes but also become a driving force for change and leaders in building new contracts. Universities must develop strategies to enhance their

intellectual capital and become digital organizations. In the new economic and social landscape, universities must be able to lead change and innovation. The significance of digitization makes the role of university leadership must begin to change and adapt to the digital world.

3. RESEARCH METHODOLOGY

This study uses a quantitative approach with a survey design. According to Fowler (2014, p. 8), survey research, through statistical calculations, is projected to provide a description of the characteristics of the intended population through the respondents' answers. The population of this study was students and lecturers of state universities in Malang City, namely Brawijaya University with a total of 72,696 students and 2,113 lecturers, Malang State University with a total of 41,748 students and 1,081 lecturers, Islamic State University of Maulana Malik Ibrahim Malang (Malang Islamic State University) with a total of 19,533 students and 629 lecturers and Malang State Polytechnic with a total of 13,523 students and 598 lecturers, bringing the total research population to 151,921 (Ministry of Education and Culture, https://pddikti.kemdikbud.go.id/). Therefore, the sample for this study was obtained from 347 respondents using Isaac and Michael's (1983) formula with an error rate of 5%. The instrument used to collect data was a questionnaire adapted from Grigorian et al. (2010) using a Likert scale. The items asked in the questionnaire are the perceptions of students and lecturers from Brawijaya University, Malang State University, Malang Islamic State University, and Malang State Polytechnic regarding the analysis of digital leadership in tertiary institutions in realizing a world-class university in the industrial era 4.0. These items are processed and developed from theory and research results which consist of the following variable lattice.

Table 1. Variable grid

Variable	Subvariable	Indicator
Digital leadership	*Deeply understanding people*	• Understanding other people • Understand other people • Amazed by other people • Respect for others
	Digital organization	• Digital power • Dynamic capabilities • Ability to integrate digital practices and human labor • Creating digital uses • Grow digital usage • Digital skills • Digitization operations
	Drive and integrate technology trends	• Controlling technology trends • Integrate technology trends • Identify technology trends • Creating new trends • Creativity power

In this study, a one-way analysis of variance (ANOVA) was used to compare the readiness of four populations, namely state universities in Malang City (Brawijaya University, Malang State University, Malang State Islamic University, and Malang State Polytechnic) towards becoming world-class universities, measured by the implementation of digital leadership in each university. The prerequisite for using ANOVA is that the data must be normally distributed and the data must be homogeneous.

The normality test in this study was conducted using the Kolmogorov–Smirnov method, which is a commonly used test for normality. The advantage of using this method is its simplicity and the lack of perceptual differences among different observers. A homogeneity test was conducted using the SPSS application. The data is considered to be normally distributed if the significance value is > 0.05. As for the homogeneity test, Levene's test was used with the help of the SPSS application. In Levene's test, the data is considered homogeneous if the significance level is > 0.05. Then, the hypothesis test was conducted using a one-way analysis of variance (ANOVA). This analysis was used to test which hypothesis would be accepted, whether it is the null hypothesis (H_0) that there is no significant difference in the application of digital leadership between Brawijaya University, Malang State University, Malang State Islamic University, and Malang State Polytechnic, or the alternative hypothesis (Ha) that there is a significant difference in the application of digital leadership between these universities. H_0 is accepted if the significance value is < 0.05 and rejected if it is > 0.05.

4. RESEARCH RESULTS

4.1. Descriptive analysis

From Table 2 above, it can be seen that Brawijaya University has the highest average score in the implementation of digital leadership on their campus with a score of 52.01, followed by Malang State University with an average score of 50.61, followed by Malang Islamic State University and Malang State Polytechnic with average scores of 47.29 and 44.29, respectively. It can be concluded that the implementation of digital leadership at Brawijaya University is more extensive compared to the other three universities. The lowest score given by respondents regarding their research on the implementation of digital leadership came from Malang Islamic State University with a score of 18. Meanwhile, the highest scores were given by respondents from Brawijaya University, Malang State University, and Malang Islamic State University with a score of 79, approaching a perfect score of 80.

Table 2. Descriptives

Digital leadership		95% confidence interval for the mean						
	N	*Mean*	*Std. Dev.*	*Std. Error*	*Lower bound*	*Upper bound*	*Minimum*	*Maximum*
Brawijaya University	87	52.01	12.769	1.369	49.29	54.73	20	79
Malang State University	87	50.61	13.910	1.491	47.64	53.57	20	79
Malang Islamic State University	87	47.29	14.503	1.555	44.20	50.38	18	79
Malang State Polytechnic	86	44.29	13.738	1.481	41.35	47.24	19	77
Total	347	48.56	14.009	0.752	47.08	50.04	18	79

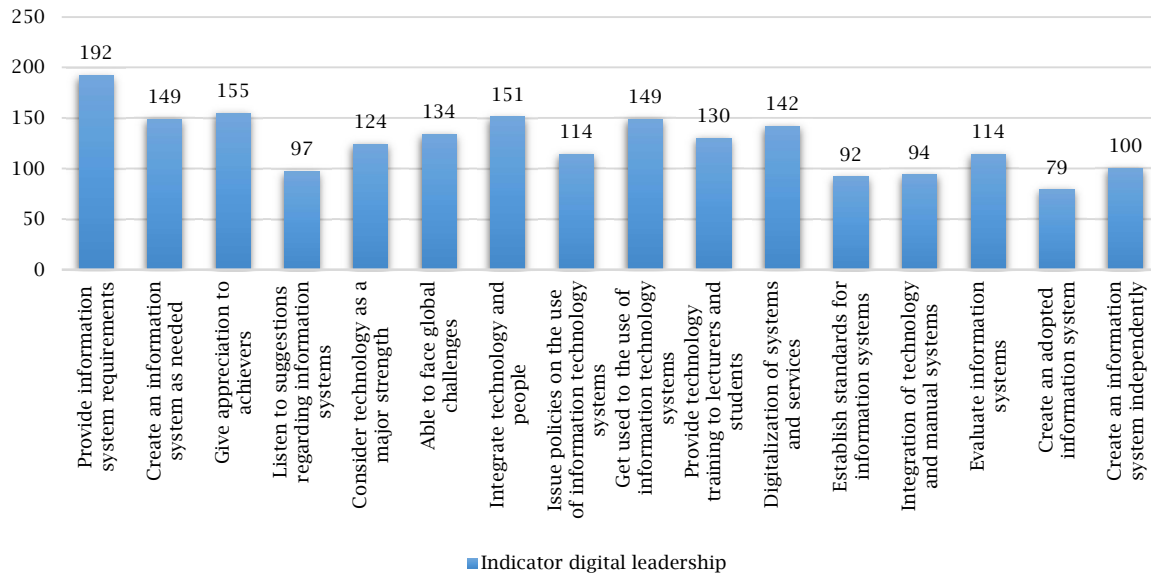**Figure 1.** Digital leadership analysis of state universities in Malang City

Figure 1 shows that the digital leadership of state universities in Malang City is in a good category, this can be seen in the results of an analysis of the responses of a sample of 347 respondents from Brawijaya University, Malang State University, Malang State Polytechnic, and Malang Islamic State University on digital leadership indicators with the choice "strongly agree", namely state universities' leaders in Malang City provided information system needs with 192 respondents, made information systems according to needs with 149 respondents, gave appreciation to those who excel with 155 respondents, listened to suggestions regarding information systems with 97 respondents, considered technology as the main strength with 124 respondents, able to face global challenges with 134 respondents, integrated technology and people with 151 respondents, issued policies on the use of information technology systems with 114 respondents, getting used to using information technology systems with 149 respondents, providing technical training technology to lecturers and students with 130 respondents, digitalization of systems and services with 142 respondents, standardization of information systems with 92 respondents, integration of technology and manual systems with 94 respondents, evaluating information systems with 114 respondents, creating an adopted information system with 79 respondents, and

create information systems independently with 100 respondents. The rest of the respondents chose "agree" and "enough".

Of the several dimensions of digital leadership, the indicator of providing information system needs is the highest score with 192 respondents, and the lowest score is obtained by the dimension "create an adopted information system" with 79 respondents. The results show that the digital leadership of state universities in Malang City is not evenly distributed and the maximum implementation is in realizing the organization to become a world-class university in the industrial era 4.0.

4.2. Test of normality

The result of the normality test can be seen in Table 3. The column to note is the Kolmogorov–Smirnov column, specifically the Significance column.

It can be seen that the data obtained from the research conducted at Brawijaya University, Malang State University, Malang Islamic State University, and Malang State Polytechnic, all have a normal distribution with a significance value > 0.05.

Table 3. Test of normality

University		Kolmogorov–Smirnov[a]			Shapiro–Wilk		
		Statistic	*df*	*Sig.*	*Statistic*	*df*	*Sig.*
Digital leadership	Brawijaya University	0.080	87	0.200*	0.979	87	0.158
	Malang State University	0.074	87	0.200*	0.983	87	0.312
	Malang Islamic State University	0.073	87	0.200*	0.982	87	0.250
	Malang State Polytechnic	0.088	86	0.100	0.977	86	0.133

*Note: * This is a lower bound of the true significance. [a] Lilliefors significance correction.*

The results of the normality test for the group of Brawijaya University are 0.158, Malang State University is 0.312, Malang Islamic State University is 0.250, and Malang State Polytechnic has a significance value of 0.133. Figure 2 below shows that the pattern is normally distributed. Therefore, it can be concluded that all data from each group have a normal distribution.

Figure 2. Path of data distribution
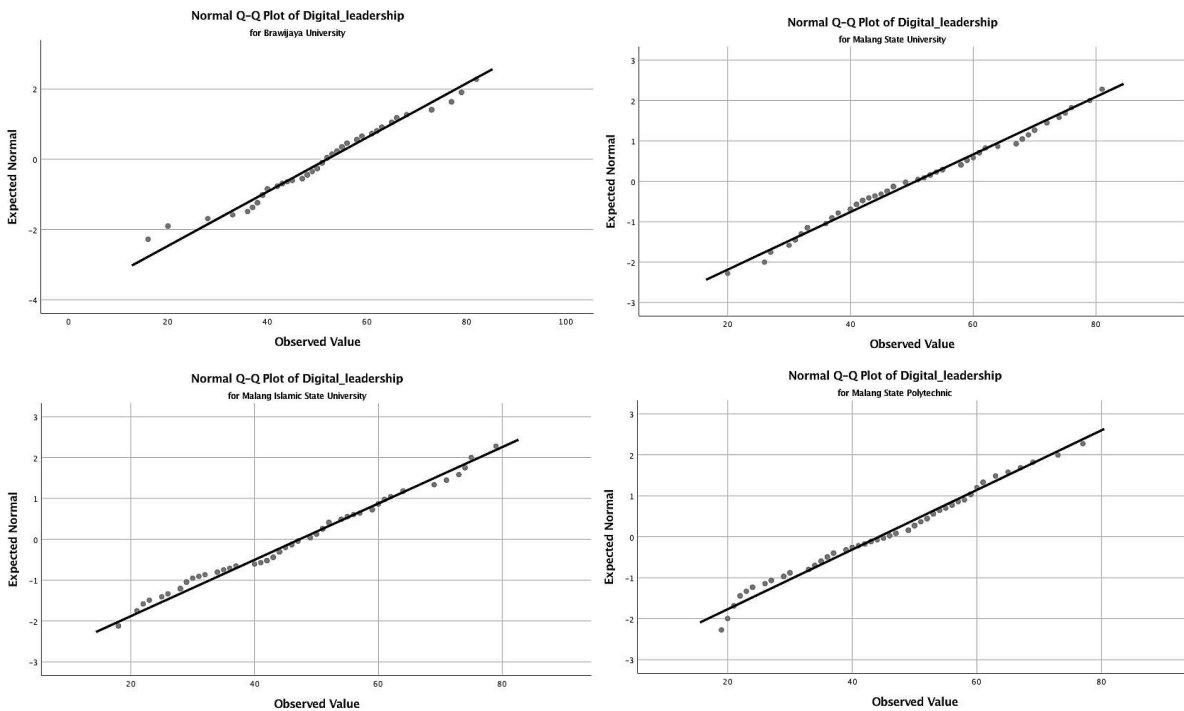
4.3. Test of homogeneity of variances

The results of the homogeneity test can be seen in Table 4 with a focus on the "based on mean" row in the Significance column.

From Table 4 it can be seen that the homogeneity test results for all variants based on their means have a significance value of 0.291, meaning that the significance value is > 0.05. Thus, it can be concluded that the variants in the study are homogeneous. Based on the results of normality and homogeneity tests, the one-way analysis of variance (ANOVA) can be continued because all the ANOVA prerequisites have been met, i.e., the data are normally distributed, and all the variants are homogeneous.

Table 4. Test of homogeneity of variances

		Levene Statistic	df1	df2	Sig.
Digital leadership	Based on mean	1.253	3	343	0.291
	Based on median	1.183	3	343	0.316
	Based on median and adjusted df	1.183	3	336.479	0.316
	Based on trimmed mean	1.240	3	343	0.295

4.4. One-way analysis of variance (ANOVA)

One-way analysis of variance (ANOVA), which in this paper will be referred to as ANOVA analysis, is used to see the average implementation of digital leadership on state campuses in Malang. The results of the ANOVA analysis can be seen in Table 5.

Table 5. One-way analysis of variance (ANOVA)

		Sum of squares	df	Mean square	F	Sig.
Digital leadership	Between groups	3123.994	3	1041.331	5.452	0.001
	Within groups	65514.882	343	191.005		
	Total	68638.876	346			

The significance level from the test results in Table 5 is 0.001, which means < 0.05. In this test, it means that H_0 is rejected and *Ha* is accepted. This indicates a significant difference in the average application of digital leadership among public universities in Malang. Due to the significant difference, it is necessary to continue with a post hoc test that will examine the detailed comparison of the four populations being compared. The following are the results of the post hoc least significant difference (LSD) test.

Table 6. Multiple comparisons

(I) University	(J) University	Mean difference (I – J)	Std. Error	Sig.	95% confidence interval	
					Lower bound	Upper bound
Brawijaya University	Malang State University	1.333	2.095	0.525	-2.79	5.45
	Malang Islamic State University	4.713*	2.095	0.025	0.59	8.83
	Malang State Polytechnic	7.709*	2.102	0.000	3.58	11.84
Malang State University	Brawijaya University	-1.333	2.095	0.525	-5.45	2.79
	Malang Islamic State University	3.379	2.095	0.108	-0.74	7.50
	Malang State Polytechnic	6.376*	2.102	0.003	2.24	10.51
Malang Islamic State University	Brawijaya University	-4.713*	2.095	0.025	-8.83	-0.59
	Malang State University	-3.379	2.095	0.108	-7.50	0.74
	Malang State Polytechnic	2.997	2.102	0.155	-1.14	7.13
Malang State Polytechnic	Brawijaya University	-7.709*	2.102	0.000	-11.84	-3.58
	Malang State University	-6.376*	2.102	0.003	-10.51	-2.24
	Malang Islamic State University	-2.997	2.102	0.155	-7.13	1.14

*Note: * The mean difference is significant at the 0.05 level.*

From Table 6 above, it can be seen that the average implementation of digital leadership at Brawijaya University is not significantly different from Malang State University because the significance value is 0.525 > 0.05. However, there are significant differences when compared to Malang Islamic State University and Malang State Polytechnic because their significance levels are 0.025 and 0.000 < 0.05, respectively. Meanwhile, when Malang State University is compared to Malang Islamic State University, there is no significant difference with a significance level of 0.108 > 0.05. However, when compared to Malang State Polytechnic, there is a significant difference with a significance level of 0.003 < 0.05. As for the comparison between Malang Islamic State University and Malang State Polytechnic, there is no significant difference with a significance level of 0.155, which means it is > 0.05.

5. DISCUSSION

From the overall results of the study, it can be concluded that the majority of leaders of state universities in Malang have shown good performance in implementing digital leadership, although not all indicators have reached the desired level. Specifically, there are indicators related to establishing standards for information systems, integrating technology and manual systems, evaluating information systems, creating adopted information systems, and creating independent information systems that need improvement. Overall, the leaders of state universities have made efforts to adapt to the era of Industry 4.0, where digitization is the main instrument.

These results are comparable to the theory which explains that leaders in the digital technology era have a big burden and responsibility to be able to adapt to the global revolution that is happening. Leaders in the era of digital technology must understand that the existence of technology does not only function as something that has use value alone but also be used as a revolutionary force itself. Leaders who do not consider capabilities in digital contexts or who do not understand how to leverage them will be sorely missed and essentially left behind (Bennis, 2013).

A leader who has a future orientation acts more like a community manager than an authoritarian. A balanced combination of universal characteristics and digital leadership traits has the potential to guide a leader through gradual transformation year after year with optimism and idealism (Sahyaja & Rao, 2018).

Digital leadership implies meaning that a leader focuses his activities in the digital context while building strategies and business models, information technology, talent, opportunities, and other relevant digital capabilities as resources in creating unique value for the organization (El Sawy et al., 2016).

In order to achieve organizational goals in the digital era as it is today, there are many aspects to fulfilling them, including elements of leadership or leaders who think digitally. Because the success of an organization is not only measured by the performance of its staff or personnel, the most important is the competency factor of the organization's leaders. A new leadership style is needed that has entrepreneurial skills (Kazim, 2019), and even dynamic digital leadership traits are needed to encourage digital transformation (Oberer & Erkollar, 2018).

From the research results, it is known that Brawijaya University has the highest average value compared to the other three state universities in Malang with a value of 52.01. This has also been proven by the inclusion of Brawijaya University in the top university campus ranking (1001–1200), while the other three campuses have not yet entered

that ranking. However, all of these campuses need to improve the quality of their universities, and one way to do this is to maximize the role of leaders by implementing digital leadership. A leader must have digital leadership characteristics as conveyed by Klein (2020) below.

First, characteristics-digital business, namely a digital leader must have innovative visionary characteristics which are not enough to just think far ahead, but also have innovation. Another important characteristic is networking intelligence, a digital leader must be able to coordinate knowledge, skills, and team resources. It is no less important that a digital leader must act as a digital talent scout. It is also expected to have the characteristics of a complexity master, namely a digital leader must be able to understand complex situations and be able to solve problems in difficult situations. In addition, there are other important characteristics, namely business intelligence in order to build new business models.

Characteristic-social attitude, namely a digital leader acts as a motivating coach, as a motivator and becomes a role model for team members or personnel. Another thing for the characteristic of digital leadership is the democratic-delegative style, designing the organization with a minimalist hierarchy and bureaucracy so that a digital leader is personnel-oriented and focuses on the development and progress of the personnel. No less important is the characteristic of openness which has the nature of transparency.

Second, characteristics-general mindset, in addition to the characteristics above, there are general characteristics, namely being agile, easily adapting to new business models, and being able to create transformation strategies. The interesting thing about the characteristics of digital leaders is the ability to learn by error, learning from mistakes is important to move better. Another important characteristic of a digital leader is having a knowledge-oriented and lifelong learner, with the desire to continue learning.

Further skills are needed for a digital leader, according to Kevin Olp of the Digital Workplace Group quoting Sullivan (2017):

1) Digital literacy is knowledge and skills in using digital media and information technology and the Internet. It requires not only technical skills but also cognitive, critical, and creative skills.

2) Digital vision is the ability to predict and convince others of the long-term opportunities of new technologies and prepare digital strategies.

3) Defense, namely the ability of digital leaders to determine the conditions needed by the organization. The defense will motivate HR towards a digital vision. Leaders' commitment to increasing their own literacy encourages others to follow suit.

4) Presence, namely the presence of a leader is a form of suggestion that is real and practicable. Leaders can have a clear digital vision and can explain well but, if they are out of sight of their staff, no one will follow them.

5) Communication is a leader's way of communicating in supporting the strength of the message conveyed. It is important to think about how communication can support the digital vision.

6) Adaptability, the most challenging aspect of adaptation for leaders is to tolerate innovation.

7) Self-awareness is a leader's approach and the process of influencing others must take place naturally and continuously.

8) Cultural awareness, namely cultural awareness is a reflection of digital vision. Leaders must understand and be mindful of cultural differences that may arise bearing in mind the sensitivity of digital workings in communication and participation processes.

In addition, digital competence is the ability to explore in dealing with new technological situations to analyze, select, and evaluate data and information to take advantage of the potential of technology to solve problems (Gallardo-Echenique et al., 2015). The aspects covered in digital competency are broader and more comprehensive than digital skills, which include technical aspects related to hardware and software management. The concept relies on a group of basic pillars such as information, communication, security, content creation, and problem-solving (Jarad & Shaalan, 2020). In the digital age like today, members or employees must have digital competence, even at a basic level. The European Commission's division of digital competency components into several areas: 1) information and data literacy, 2) communication and collaboration, 3) creation of digital content creation, 4) security, and 5) problem-solving. Considering that the success of an organization is highly dependent on the quality of its human resources, the organization relies heavily on its competent members as the strength of the organization.

6. CONCLUSION

Based on the research objectives and findings of the study on the differences in the implementation of digital leadership in public universities in Malang City, the researcher can conclude that there are significant differences in the application of digital leadership in public universities in Malang, with Brawijaya University having the highest average score compared to Malang State University, Malang Islamic State University, and Malang State Polytechnic. However, in general, the academic community of public universities in Malang agrees that their leaders provide the academic community's information system needs to achieve digital leadership and move towards world-class universities. Additionally, the academic community of public universities in Malang agrees that their leaders implement digitalization in their work to achieve digital leadership and move towards world-class universities. However, digital leadership has not been comprehensively implemented. This research has some limitations as it only assesses differences in the implementation of digital leadership without conducting further research to assess how much the implementation is carried out. Therefore, this can be an opportunity for the next researcher who wants to continue similar research.

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