

THE ROLE OF EDUCATIONAL TECHNOLOGY LEADERSHIP IN DRIVING INNOVATION AND INSTITUTIONAL CHANGE

Muhammad Awais Asghar^{*1}, Ayesha Khan², Irshad Ali³, Dr. Salima Naveed Manji⁴,
Musarat Hanif⁵

^{*1}Deputy Manager Student Affairs ,FMH College of Medicine and Dentistry Lahore;
²M.Phil in Organizational Psychology College of Economics And Social Development (Psychology),
Institute of Business Management (IoBM);
³Department of Public Administration, University of Karachi;
⁴Assistant Professor ,FMH College of Medicine and Dentistry Lahore;
⁵MS(CS), Computer Science, Comsats University Islamabad

^{*1}ch.awaiskamboh@gmail.com; ²ayeshay98@gmail.com; ³irshadhaikal786@gmail.com;
⁴dr.salimanaveed@gmail.com; ⁵musarathanifmalik@gmail.com

Corresponding Author: *

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ABSTRACT

This study examines the role of educational technology leadership in driving innovation and institutional change within schools. As technology becomes increasingly integral to education, the need for strong leadership to integrate these tools effectively has never been greater. Technology leadership, particularly at the principal level, is crucial for fostering sustainable improvements in educational quality. This research involved 200 participants and employed a structured questionnaire, designed based on relevant literature and theoretical frameworks, to measure the impact of leadership on innovation and change. The questionnaire, featuring a Likert scale, was pilot-tested to ensure clarity, reliability, and validity. The findings highlight that the principal's leadership significantly influences the adoption of innovations and the systematic improvement of educational institutions. The study underscores the importance of strategic planning, including the assessment of current educational technology resources and the development of comprehensive implementation strategies, as key components for achieving long-term institutional success. The effects of the implementation of roles and duties affect all aspects of organizational life innovation change that is done by the principle. Innovation, changes made by principals in improving the quality of education clearly have a systematic effect on institutes, so it is important to view how the principal's role in running as an education leader in school. At the organizational level, leadership of the principal as the main person who can synchronize between the individual lives with the expectations of the organization in the future. Conclusions from this analysis point to the importance of leadership assessing their current educational technology resources, including financial, material, and human resources. This paper also highlights the importance of strategic planning that includes technology implementation as part of its objectives and creates a structure for that implementation, and includes rigorous assessment as part of a strategic plan for technology implementation.

Keywords: Educational Technology, Leadership, institutional Change

INTRODUCTION

As technology and trade change quickly, new marketing factors are appearing at a very fast rate. Innovation is important for getting by and doing well in any situation. Making things better for people, companies, and the world as a whole isn't

the only goal of innovation. It's also about coming up with smart ways to deal with and plan for the uncertain future. Politicians, business leaders, and school leaders all say that we need to come up with new ideas and motivate students to improve the

level of education. They can inspire their teams and help their companies reach their goals when they come up with new ideas (Lee, 2015). Aggressive leaders who want to make things better need to change things, make the future, and look for ways to survive in a better way in the future. Going along with the fast progress towards progress. For this kind of time when competition is getting more and more open. Educational organisations that don't have the right credentials will eventually fall behind and be shut down because they can't meet the needs of the community. As a result, a principal leader should focus on improving the quality of education. Improving an institution's ability to educate its members is impossible without introducing major innovations in the field, and introducing new ways of teaching and learning is very unlikely without a shared commitment to change. This will make it very clear how involved the head is in the school's success or failure. A lot of different things could happen, from success to failure. Simpler innovations put in place by principals are more closely linked to teachers, since it is the principal's job to do good institutional study and make the school better. These efforts show that the school isn't changing or coming up with new ideas. Gehani (2013) says that creative leadership is important for innovation because it makes stakeholders more aware. To stay ahead of the competition, leaders who think ahead must always think about the unexpected problems that could come up in the present and the future. It is the job of school leaders to encourage and help teachers use technology for learning and teaching. This is especially important now that the Internet of Things is spreading through classrooms at a speed that has never been seen before. It would be good for school administrators to keep up with changes in technology, like how many smart whiteboards and other forms of interactive digital media are used in classes these days. So, technology should be a part of pre-service leadership classes for principals and other school administrators so they are ready to lead students and teachers in a world that is becoming more digital and spread out (Aldowah et al., 2017; Esplin, 2017). The ultimate goal of those who oversee technology in schools is to help students do better in their studies. Leaders in technology need to use it to change the way education works, help students learn, and come up with a shared goal for

how technology can meet the needs of all kinds of students. Therefore, school leaders must plan for and allow students to use technology in this world where it is everywhere. On the other hand, a 2019 report from the World Economic Forum says that bad leadership might be the biggest problem with putting a Fourth Industrial Revolution plan into action.

To improve education into a high-quality institutional education and to come up with new ideas that work well together, you need to be able to motivate others, lead workers well, and carry out programs that were set up by everyone (Gordon, 2000). Leadership at the institutional level is best for balancing the needs of individuals with the needs of the group. To be a good boss, you need to come across as trustworthy and credible. Since members can only work together if they trust each other, an atmosphere of trust is necessary for any organisation to do its job and for its members to be ready to adapt to new situations. So, the headmaster couldn't just force his ideas on everyone; everyone on staff had to work together to make sure the concept was at the centre of everything. Having a lot of people contribute will change the innovations that are made, which is great for making people more responsible. To make sure that institutional development works better by always coming up with new ideas, leaders who want to see things change will use all of their power to make things better as a group. Both Gordon (2000) and Scheffler and Logan (1999) say that computer-based technology has the potential to have a big effect on the future and growth of education. Computer-based technology has the ability to change many parts of education, such as planning lessons, grading students, managing daily practice, communicating with parents and students, and working together and changing schools to improve student achievement. Because of changes in technology, teachers may have to completely change how they think about and do many different types of teaching. Chalk and whiteboards are slowly being replaced by computers connected to digital projectors. These are being replaced by interactive whiteboards and slideshows that use a lot of different types of media. Word processors have changed both how teachers teach reading and writing and how pupils learn these skills. Computer-based technologies have made it easier to keep track of things like

grades and attendance, which is meant to help teachers be more effective and, eventually, help students do better in school. People have a lot of different ideas about what makes a computer-based technology application work well. Matzen and Edmunds (2007) found a key part of using computers effectively in schools by looking at how teachers feel about them and how they are trained in technology and professional development. The writers say that using a constructivist view along with technology in the classroom leads to better lessons that focus on the needs of each student.

Significance of the Study

The significance of the study on "The Role of Educational Technology Leadership in Driving Innovation and Institutional Change" lies in its potential to enhance the understanding of how educational technology leadership can catalyze transformation within academic institutions. As technology becomes increasingly integral to education, leaders who effectively harness its power can foster innovation, improve teaching and learning experiences, and drive meaningful institutional change. This study contributes to the existing literature by providing empirical evidence on the influence of educational technology leadership on institutional practices. By identifying key leadership strategies that promote the adoption and integration of technology, the research offers valuable insights for educators, policymakers, and administrators seeking to navigate the complexities of modern education. Ultimately, this study underscores the critical role of leadership in leveraging technology to create dynamic, future-ready educational environments

Objectives of the study

- To explore how educational technology leadership affects the adoption of new teaching methods.
- To understand the role of technology leadership in driving institutional change.
- To identify the challenges faced by leaders in implementing technology-driven innovation.

Research Questions

- How does technology leadership impact the use of innovative teaching methods?
- What is the role of technology leadership in promoting institutional change?
- What challenges do leaders face in driving technological innovation?

Significance of the study

This study looks at the link between distributed leadership styles and well-known parts of the school subculture, like the quality of teaching, how the classroom is run, and how well students do in school. The examiner's findings help stakeholders remember the effects of distributed leadership in schools, among teachers and students, by making it okay to use unlimited policy and economic resources to put a cutting-edge leadership model into place. The results are summed up to show direct coverage and practical implications about how Distributed management affects the morale of faculty. The research gives future students who want to study this new idea, i.e., distributed leadership in Pakistani institutions, new ways to do so, and it shows how the actions of different leaders are spread out. The results of this evaluation give teachers answers to problems with classroom behaviour that have been going on for a long time. Even though gender inequality is talked about in the classroom, other problems like wrong evaluations, factors that make people less motivated, contact between students and their parents, not working out every day, not having enough training equipment, etc. have a big negative effect on both instruction and the learning environment.

Literature Review

Education is the key to a country's growth, and in this globalised world, the success of an education system relies on how well it can change and adapt (Kozma, 2003). To reach this goal, especially in school management, we need leaders who are creative and open to new ideas. Leadership that is open to new ideas, uses new technologies, and pushes for change in the way schooling is done is called innovative leadership. Innovative leaders handle change in this way and become agents of positive change. They also make the system more efficient and make sure that education meets the needs of the present. Innovative leadership is

important to make sure that education is useful and can prepare people for the challenges of the future in a world that is always changing (Purwanto et al., 2020).

Not only does innovative leadership involve coming up with new ideas, but it also means putting them into action in creative ways. Innovative leadership in educational management means finding opportunities for change, coming up with new and relevant strategies, and actively encouraging stakeholders to be involved in the whole process of transformation. This is done to make sure that the changes have a positive effect and are in line with current development and educational needs (Mardizal et al., 202). Collaboration with teachers, the use of new technology to make teaching better, and changing school rules to meet the needs and goals of society are all examples of innovative leadership in education. It's also important for innovative leaders to be able to make an environment at work that encourages trying new things, thinking creatively, and always learning. Innovative leadership means that the person in charge is always looking for new ways to do things, and those new ideas grow in the school or organisation he is in charge of. Creative leadership makes it possible for a school to stay open and grow, even when things are hard. Setting up an open culture of innovation and a strategic direction that encourages and leads all school members, including teachers and residents, to explore their creativity are part of this process. Leaders who are innovative are like the oars and direction in a school boat—they set clear goals and keep the boat moving. Being able to create a positive attitude of innovation is what makes innovative leadership so important. This means making a space that supports new ideas, promotes teamwork, and rewards trying new things (Prabowo, 2012). By getting everyone in the school to support them, innovative leaders build a strong base for good change. Besides that, creative leadership can also help with setting strategic goals. These leaders give people in the school the confidence to come up with new ideas by setting a clear goal and giving strong direction. They are the ones who show schools the way so they don't lose focus and get lost in a sea of confusion. Without creative leadership, a school can forget what it's for and become hopeless and confused (Djoko Hartono, 2020).

Instead, schools can become places that are dynamic, flexible, and ready to face future problems with hope if they have leaders who are open to new ideas. Innovation is not only a goal, it's also a big part of what makes a school unique and helps it stay on track and make progress. In the twenty-first century, technology is being used more and more in education. This is because technology platforms are easier to get to, cheaper, and more popular than ever. Technology is now a big deal in the classroom and in educational leadership as a way to help students learn 21st century skills and help teachers give students across the country a more meaningful and useful learning setting (Webster, 2017). This essay will look at technology in schools through the eyes of educational leaders. It will also talk about how technology is changing its place in the classroom and what teachers need to learn to use technology effectively. Lastly, the cost of technology and the extra work that it might be for institutions and districts to make sure that all students have the tools they need to get a full education have been thought about. The whole of this educational technology perspective can help educational leaders set goals, make sure that their institutions and districts have support systems in place, and show their stakeholders how to help students learn so that they can reach higher achievement levels based on those goals and objectives. This look at technology and school leadership will be based on two important questions:

- What role does the administrator play in the promotion and assistance with educational technology in their Institutions?
- What systems and processes are critical to the effective implementation and growth of an educational technology program in an Institution?
- The goal of this review is to help institutional leaders better understand what is expected of them, what their part is in the system, and how to make the program work well, just like any other system or process in their institution or district. This is achieved by giving details that address these two important issues. In the end, this talk is meant to help leaders get better at

giving their kids the best educational opportunities possible.

The Necessity of a Technological Education

Statistics from the US Census show that technology is spreading through American homes and society as a whole. From the 2016 American Household Survey of the United States Census, these are some of the trends that were found in statistics from households across the country. The widespread availability of internet access is a big reason why tools and technological skills are becoming more common in a country. The Internet has become a part of every part of our lives. We do everyday things like shopping and paying bills online, as well as more complex things like using social media to stay in touch with friends and family and meet new people. People use it for both formal and unstructured learning. For example, YouTube has 'how-to' videos that show you how to do things like redesign your bathroom or tie a necktie. The number of people taking college courses online has gone up because of this.

The Professional Standards of Institutional Leaders

At every stage of American schools, leaders are responsible for different things as district and institutional administrators. Individual parts of the standards that administrators must meet have changed over time, but the main goal of all administrators is to help students reach their full potential. Looking at the most recent changes to the National Policy Board for Educational Administration's (2015) professional standards for the year 2020 can help you understand what school leaders need to do. "Effective educational leaders develop, advocate, and enact a shared mission, vision, and core values of high-quality education, academic success, and the well-being of each student," says the National Policy Board for Educational Administration (2015). Retaining these values is the main job of an educational leader in a school or district. This can be used as a starting point by leaders of the institution to make rules, strategies, and help for teachers and students. There is a chance that educational technology could change all of these needs. Educational equity is always something that leaders talk about when they are trying to make sure that all kids can pay and have the same chances to get a great education.

"Effective educational leaders strive for equity of educational opportunity and culturally responsive practices to promote each student's academic success and well-being." The National Policy Board for Educational Administration came up with this list of factors (2015). We will talk more about how students' access to technology at home is a factor later in this study. The leaders of the school need to be aware of the cultural and socioeconomic problems that students face. Institutional and its leaders are responsible for making sure fairness from the point of view of the school, since these factors are always present in the student's life. What students learn depends a lot on how good the teachers and other staff are at their jobs. Offering chances for professional growth to all staff members is one way to increase the capacity for teaching. The National Policy Board for Educational Administration set the following norm in 2015 that talks about this topic: Strong educational leaders work to improve the skills and habits of their institution's staff so that every student does well in school and grows as a person. Professional growth systems can only work if they are run by people who set goals and hire staff. This calls for a way to keep track of progress and success in the teaching and professional development model, along with careful planning and attention to staff. It doesn't matter what technological marvel is the newest, most widespread, or most popular trend in education. What matters is that leaders of schools learn how to prepare, apply, and use computer-based technology in the best way possible. The research questions for this study want to know how Catholic primary school teachers see the use of computers and technology. These days, teachers need to keep thinking about how to use any piece of technology instead of just one piece. Understanding the theoretical method is very important if you want to successfully use and integrate technology in education over time, which will help students do better in school. A lot has been written recently about deploying computer-based technology. Three of those themes are relevant to this study and educational technology: 1) leadership styles and ideas that encourage the use and integration of technology and help build a technological culture; 2) computer-based technology use; and 3) how the digital gap affects leadership and technology use in schools.

Leadership

There are many ways to explain what leadership is. There isn't a single meaning that all researchers agree on. It is said that leadership is "the process of one person using intentional influence over others to achieve a goal." Today, school leaders have to make a promise to meet the needs of all of their students all the time. Adding new technology has made things harder for leaders who also have to deal with issues like education, teaching methods, staffing needs, and administrative duties (Brooks-Young, 2002). Because technological progress brings both opportunities and risks, Webber (2003) said that teachers need to accept that technology can teach and that it has changed what it means to be a good leader. Digital tools are changing the way teachers do their jobs, so good leaders should learn how to use and explain them successfully. Now the question is how can a director best change the way they lead to deal with the problems that the rise of technology in the classroom brings?

Technological Leadership

This study is mostly about the leadership traits and habits that make managers more effective and help people use technology. Many of the things that studies on leadership and studies on technology leadership look at are the same. The point of this study is to find the specific skills and knowledge that technology leaders need to do their jobs well. According to Cuban (2001), a leader's job is to stress how technology is used rather than how valuable technology itself is. More attention should be paid to the fact that technology leadership is linked to change. Improving the technology used by institutions is a big change that depends a lot on how smart the people in charge are. According to Young and Brooks (2002). For regular change efforts to work in an institutional setting, leaders at the block level must be actively involved. Most types of leadership require people to adjust to new situations. However, technological leadership always requires making and following brand-new rules and standards (Kearsley & Lynch, 1994). The first part of the literature review gives a short summary of the past and present practices of educational leadership that are likely to lead to successful technology integration. Second, NETS-A is a leadership guide that is used to talk about

technology leadership. This definition talks about both the ideas and actions of being a leader, as well as how they affect the whole company. In the end, the study shows that expert leadership helps create an open and healthy work environment that makes it easier to use technology.

Organizational Change

The biggest problem is getting the word out about how colleges work and how blended learning could change things. The idea that there isn't enough proof for technological progress is a big reason why colleges don't use it. When it comes to mixed learning, this point of view is incorrect (Garrison & Vaughan, 2008). Mixed-mode learning really does work better than traditional classrooms, as study has shown. Arabasz and Baker (2003) say that most universities have started using mixed learning because it works well as a way to teach. Universities use mixed learning a lot, but it hasn't led to any changes in the way things are run that make the learning and teaching process more efficient and effective. In his 2011 study of how technology has changed universities, Marshall says that even though ICT has many benefits, universities don't do enough critical self-reflection. To say that institutions "but have failed to provide systems and environments that result in wider adoption of successful ideas" (Marshall, 2011, p. 31) means that they have often relied on early adopters. The first step in critical self-reflection is to look at how both students and teachers have experienced the changes that have happened at your school because of technology used for learning. Effective leadership is necessary to bring about social change in this area.

Research Methodology

In the study conducted on the role of educational technology leadership in driving innovation and institutional change, a quantitative research methodology was employed. The population of the study consisted of heads of the institutes. The sample size for the study was 200 participants. To measure the role of educational technology leadership in driving innovation and institutional change, a structured questionnaire was developed based on relevant literature and theoretical frameworks. The questionnaire, consisting of a Likert scale, underwent a pilot testing phase to ensure its clarity, reliability, and validity. The

questionnaire included items that assessed various aspects of leadership in driving innovation and institutional change.

Data collection was carried out through online surveys. The survey links were distributed to the selected sample of 200 participants via email, organizational networks, and professional associations. The participants were provided with clear instructions regarding the purpose of the study, confidentiality, and voluntary participation. Upon completion of the data collection phase, the collected data were analyzed using appropriate statistical techniques. Descriptive statistics were

used to summarize the responses and provide an overview of the sample characteristics. Inferential statistical methods, including correlation analysis, regression analysis were employed to examine the relationships between leadership in driving innovation and institutional change. The data analysis was performed using statistical software, SPSS, to ensure accurate and rigorous analysis.

Results and Data Analysis

Table 1: Demographic Characteristics of the Participants

Demographic Variable	Frequency	Percentage
Gender		
Male	90	45%
Female	110	55%
Age Group		
20-30 years	50	25%
31-40 years	80	40%
41-50 years	50	25%
Above 50 years	20	10%
Educational Level		
High School	30	15%
Bachelor's Degree	120	60%
Master's Degree	40	20%
Doctorate	10	5%

The table shows the basic information about the people who took part. The sample is made up of 200 workers, with 110 women (55%) and 90 men (45%). When it comes to age groups,

most of the volunteers (40%) are between the ages of 31 and 40. In terms of schooling level, 60% of them have at least a Bachelor's degree.

Table 2: Descriptive Statistics

Institutional Change	N	Min.	Max.	M	SD
Leadership	32	2.17	3.35	2.93	.29
Professional Teacher Behavior	32	2.67	3.71	3.04	.23
Achievement Press	32	2.21	3.25	2.65	.25
Institutional Vulnerability	32	1.67	2.98	2.32	.28
Teachers' Use of Technology	32	2.31	3.04	2.72	.17
Technological Leadership from Administrators	30	2.12	4.31	3.40	.56

Table 3 shows the Cronbach \pm (internal consistency) coefficients for the institutional subtests (leadership, professional teacher behaviour, academic press, and environmental

press), teachers' use of technology and how they integrate it into their work, and managers' use of technology and how much they know about it. The reliability coefficients were good for collegial

leadership (.79), professional teacher behaviour (.77), teachers' use of technology and how they integrated it into their lessons (.93), and managers' use of technology and how much they knew about

it (.94). The reliability coefficients for success press (.62) and institutional vulnerability (.61) were not quite as high as we would have liked.

Table 3 Results of Regression Analysis Use of Technology

Predictors	B	SE _B	β	t	p
Constant	2.70	.49		5.48	< .001
Leadership	.40	.09	.68	4.24	< .001
Professional Teacher Behavior	-.06	.16	-.08	-.37	.712
Achievement Press	-.30	.14	-.43	-2.12	.044
Institutional Vulnerability	.00	.11	.00	.02	.986
Technological Leadership from Administrators	-.06	.05	-.18	-1.05	.302

Note. $R^2 = .48$, Adjusted $R^2 = .37$, $F(5, 25) = 4.58$, $p = .004$.

The outcome of this regression study can be seen in Table 3. $R^2 = .48$, Adjusted $R^2 = .37$, $F(5, 25) = 4.58$, $p = .004$; the regression model was statistically significant as a whole. In this

regression model, only achievement press was statistically significant on its own ($\beta = -.43$, $p = .044$).

Table 4: Descriptive Statistics of Leadership Factors

Leadership Factors	Mean	Standard Deviation
Vision Setting	4.20	0.75
Empowerment	3.95	0.81
Culture	4.10	0.68
Communication	4.05	0.72
Management	4.15	0.79
Support for Improvement	4.00	0.76

Descriptive data show the average scores and ranges of scores for different leadership factors linked to the successful institutional change. Vision Setting has the best mean score ($M = 4.20$). Leadership is also shown by the factors of

Empowerment ($M = 3.95$), Culture ($M = 4.10$), Communication ($M = 4.05$), Management ($M = 4.15$), and Support for Improvement ($M = 4.00$).

Table 4.5: Relationship between Leadership and Institutional change

Leadership	Institutional change		
	Pearson Correlation	1	.429
	Sig. (2-tailed)		.000
	N	200	200
Institutional change	Pearson Correlation	.429	1
	Sig. (2-tailed)	.000	
	N	200	200

The relationship between Leadership and Institutional change to know was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure violation of the assumptions of normality, linearity and homoscedasticity. There was a positive relationship between Leadership and Institutional change to know.

Findings and Discussion

Lamirin et al. (2023) say that strong leadership is very important for educational change to work. These are changing times in education, and leaders (those in charge) need to make sure that everyone in the community has access to a learning space that is both up-to-date and ready for the future. Leadership is defined in this study as the capacity to inspire followers to take an active role in bringing about organisational change, as well as to create and implement novel solutions to problems (Makmur et al., 2023). The management of schools is getting harder to understand and change quickly, so strong leadership is needed to deal with these issues. According to studies in the field of education, innovative leadership can thrive when top executives are committed to learning throughout their lives, the workplace is supportive, and everyone has a say in the learning process. A study by Ambarwati et al. (2022) says that leaders of educational institutions must make an environment that values and uses new ideas in their operations.

In this era of school autonomy, new types of educational leaders are developing. These leaders can make huge changes in the way schools work (Fitrah et al., 2021). A leader needs a goal, a reason, a desire, and the will to see it through in order to come up with new ideas. Being able to understand and use creativity and the innovation process is another important trait. So, the rules for educational autonomy can help the schools they oversee encourage new ideas more successfully (Syam, 2012a).

Conclusion

Using technology in the classroom to help teach and give students more power in the 21st century has been shown to be a very successful strategy, but only if systems and people are in support of it. Both of these things are up to the people in charge of the school system, and they should keep

technology in mind when they make plans. Future leaders will have to deal with a widespread and growing need for technological answers in the classroom. This conversation is taking place at a very important time for people's ability to reach and use technology: the worldwide pandemic. Rapid changes in educational standards and the rise of distance learning have opened up new possibilities for leaders who are at the cutting edge of using technology. Those who aren't as far along have had to deal with problems. Leadership and edutech can lead to heated arguments about how a company is set up, how it works, its culture, and its goals. To fully understand the role of leadership in educational technology, one must have a thorough knowledge of the organization's structure, culture, current state, and desired result and destination. We can get the results we want over time if we have the right kind of leadership. Then we can put technology where it needs to be so kids can learn as much as possible.

Recommendations for Future Research

The present and future behaviour of technology leaders has to be better understood in order to advance the cause of effective technology utilisation in institutes. In order to better serve their students, teachers, and administrators, building-level leaders and administrators should get acquainted with the technological standards put forth by the International Society for technological in Education (ISTE). Acquiring familiarity with these standards could provide a framework for effective education of IT specialists. Further investigation on how principals assuming the role of "exceptional technology leaders" could pave the path for the implementation of winning strategies is also necessary. Being receptive to new ideas and technology, enthusiastic about leading their institutions' technological endeavours, and embodying the attributes highlighted in this research are all qualities that principals must possess.

References

- Aldowah, H., Rehman, S. U., Ghazal, S., & Umar, I. N. (2017). Internet of Things in higher education: A study on future learning. *Journal of Physics*, 892(1), 012017. <https://doi.org/10.1088/1742-6596/892/1/012017>
- Ambarwati, D., Wibowo, U. B., Arsyadanti, H., & Susanti, S. (2022). *Studi Literatur: Peran Inovasi Pendidikan*

- pada Pembelajaran Berbasis Teknologi Digital. *Jurnal Inovasi Teknologi Pendidikan*, 8(2), 173–184. <https://doi.org/10.21831/jitp.v8i2.43560>
- Arabasz, P., & Baker, M. B. (2003). Evolving campus support models for learning courses. *Educause Center for Applied Research Bulletin Online*: http://www.educause.edu/ir/library/pdf/ecar_so/ers/ERS0303/EKF0303.pdf March, pp. 1–9.
- Brooks-Young, S. (2002). Making technology standards work for you: A guide for school administrators. Eugene, OR: International Society for Technology in Education
- Esplin, N. L. (2017). Utah elementary school principals' preparation as technology leaders. <https://digitalcommons.usu.edu/etd/5774>
- Djoko Hartono, H. (2020). Urgensi Kepemimpinan Inovatif (Studi Kasus Kepala Sekolah Dasar Darul Ulum Pasuruan). *Ta'dib*, 18(1), 73–94
- Fitrah, P., Hairunnisa, H., Ayuningtyas, I., & Anantia, T. (2021). Karakteristik Kepemimpinan Inovatif dalam Mengoptimalkan Mutu Pendidikan. *ALSYS*, 1, 168–177. <https://doi.org/10.58578/alsys.v1i1.33>
- Gehani, R. (2013). Innovative Strategic Leader Transforming From a Low-Cost Strategy to Product Differentiation Strategy. *Journal of Technology Management & Innovation*. Volume 8. Issue 2. ISSN: 0718-272
- Garrison, D. R., & Vaughan, N. D. (2008). Blended learning in higher education. San Francisco: Jossey-Bass
- Gordon, D. T. (2000). The digital classroom: How technology is changing the way we teach and learn. Cambridge: Harvard Education Letter
- Kozma, R. (2003). Teknologi, Inovasi, dan Perubahan Pendidikan: Perspektif Global. *Teknologi & Masyarakat Pendidikan*, 6(2), 27–37.
- Kearsley, G., & Lynch, W. (1994). Educational technology: Leadership perspectives. Englewood Cliffs, NJ: Educational Technology Publications.
- Lamirin, Santoso, J., & Selwen, P. (2023). Penerapan Strategi Kepemimpinan Transformasional dalam Meningkatkan Kinerja Organisasi Pendidikan. *Jurnal Ilmiah Kanderang Tingang*, 14, 400–409. <https://doi.org/10.37304/jikt.v14i2.259>
- Lee, S. (2015). The age of quality innovation. *International Journal of Quality Innovation*, 1(1), 1–9.
- National Policy Board for Educational Administration (2015). Retrieved from <https://ccsso.org/sites/default/files/201710/ProfessionalStandardsforEducationalLeaders2015forNPBEAFINAL.pdf>
- Makmur, A., Saepudin, M., Sudarto, T., Maftuh, A., & Purwadi, P. (2023). Model Kepemimpinan Transformasional dalam Dunia Pendidikan di Era Digital. *Jurnal Syntax Admission*, 4, 33–46. <https://doi.org/10.46799/jsa.v4i1.525>
- Mardizal, J., Handayani, E. S., Ghazali, A., Al Haddar, G., Anggriawan, F., & Arifudin, O. (2023). Model Kepemimpinan Transformational, Visioner dan Authentic Kepala Sekolah dalam Meningkatkan Mutu Pendidikan di Era 4.0. *Innovative*, 3(5), 2994–3003
- Marshall, S. (2011). Change, technology and higher education: Are universities capable of organisational change? *Australasian Journal of Educational Technology*, 26(8). <http://www.ascilite.org.au/ajet/ajet26/marshall.pdf> [Republished version of the paper published in ALT-J].
- Matzen, N. J., & Edmunds, J. A., (2007). Technology as a catalyst for change: The role of professional development. *Journal of Research on Technology in Education*, 39, 417-430.
- Prabowo, H. (2012). Aspek-aspek Pengelolaan dan Kepemimpinan Inovatif untuk Implementasi Teknologi Informasi dan Komunikasi di Perguruan Tinggi. *Binus Business Review*, 3(2), 795–802
- Purwanto, A., Tukiran, M., Asbari, M., Hyun, C. C., Santoso, P. B., & Wijayanti, L. M. (2020). MODEL KEPEMIMPINAN DI LEMBAGA PENDIDIKAN: A SCHEMATIC LITERATURE REVIEW. *JOURNAL OF INDUSTRIAL ENGINEERING & MANAGEMENT RESEARCH (JIEMAR)*, 1(2), 2722–8878. <https://doi.org/10.7777/jiemar.v1i2>
- Syam, A. (2012b). Kepemimpinan Pendidikan yang Inovatif. *Al-Ta'lim*, 1(2), 151–157.
- Scheffler, F.L., & Logan, J. P. (1999). Computer technology in schools: What teachers should know and be able to do. *Journal of Research on Computing in Education*, 31, 305-326
- Webster, M. D. (2017). Philosophy of technology assumptions in educational technology leadership. *Journal of Educational Technology & Society*, 20(1), 25-36.
- Webber, C. (2003). New technologies and educative leadership. *Journal of Educational Administration* 41(2), 119-123.
- World Economic Forum. (2019). <https://www.weforum.org/agenda/2019/01/these-four-leadership-styles-are-key-to-success-in-the-fourth-industrial-revolution/>