

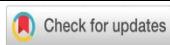


AI-BASED LEARNING MANAGEMENT: THE INFLUENCE OF THE USE OF AI AND LEARNING ORGANIZATION ON STUDENT LEARNING INNOVATION

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ABSTRACT

The transformation of higher education in the era of the Industrial Revolution 4.0 and Society 5.0 requires institutions to integrate technology and build adaptive learning ecosystems. One of the technologies that is increasingly used is Artificial Intelligence (AI), which is able to personalize the learning experience and increase learning effectiveness. On the other hand, the application of the concept of learning organization is believed to strengthen collaboration, creativity, and adaptability in the academic environment. This study aims to analyze the influence of the use of AI and learning organization on student learning innovation, both partially and simultaneously. The research method used is a quantitative approach with survey techniques. The research sample consisted of 118 active students in semesters 4–8 who had used an AI-based learning platform for at least one semester. The research instrument was a Likert scale closed questionnaire, which was analyzed using multiple linear regression with the help of SPSS 26. The results of the study show that (1) the use of AI has a positive and significant effect on student learning innovation; (2) learning organization has also been proven to have a significant influence on learning innovation; and (3) the simultaneous use of AI and learning organization has a significant influence on student learning innovation. However, the R Square value of 0.112 indicates that there are still other factors outside of this study that also affect learning innovation.

ABSTRAK

Transformasi perguruan tinggi di era Revolusi Industri 4.0 dan Society 5.0 mengharuskan institusi untuk mengintegrasikan teknologi dan membangun ekosistem pembelajaran adaptif. Salah satu teknologi yang semakin banyak digunakan adalah Artificial Intelligence (AI), yang mampu mempersonalisasi pengalaman belajar dan meningkatkan efektivitas belajar. Di sisi lain, penerapan konsep organisasi pembelajaran diyakini dapat memperkuat kolaborasi, kreativitas, dan kemampuan beradaptasi di lingkungan akademik. Penelitian ini bertujuan untuk menganalisis pengaruh penggunaan AI dan organisasi pembelajaran terhadap inovasi pembelajaran siswa, baik sebagian maupun simultan. Metode penelitian yang digunakan adalah pendekatan kuantitatif dengan teknik survei. Sampel penelitian terdiri dari 118 mahasiswa aktif pada semester 4–8 yang telah menggunakan platform pembelajaran berbasis AI setidaknya selama satu semester. Instrumen penelitian adalah kuesioner tertutup skala Likert, yang dianalisis menggunakan regresi linier berganda dengan bantuan SPSS 26. Hasil penelitian menunjukkan bahwa (1) penggunaan AI memiliki efek positif dan signifikan terhadap inovasi pembelajaran siswa; (2) organisasi pembelajaran juga telah terbukti memiliki pengaruh yang signifikan terhadap inovasi pembelajaran; dan (3) penggunaan AI dan organisasi pembelajaran secara simultan memiliki pengaruh yang signifikan terhadap inovasi pembelajaran siswa. Namun, nilai R Square 0,112 menunjukkan bahwa masih ada faktor lain di luar penelitian ini yang juga mempengaruhi inovasi pembelajaran.

Kata Kunci: Artificial Intelligence, Organisasi Pembelajaran, Inovasi Pembelajaran

INTRODUCTION

The world of higher education, including in Indonesia, is in the midst of a major transformation triggered by two concepts of the digital era, namely the Industrial Revolution 4.0 and Society 5.0. Both are not just technological discourses, but a new paradigm that fundamentally disrupts the values, methods, and goals of higher education itself. In this context, it is important to understand how these two concepts interact with each other and affect the development of higher education, as well as how educational institutions can adapt to meet the demands of the times.

The Industrial Revolution 4.0 has brought significant changes in the world of work, where most jobs are now controlled by technological advancements. In this era, we are witnessing the emergence of automation, an artificial intelligence of AI that is changing the way we work and interact. For example, in the manufacturing sector, the use of robots to improve production efficiency has become common. Therefore, the world of education is required to shift its education system in order to produce graduates who have skills that are relevant to the needs of the current job market. This means that the curriculum must be updated regularly to include the technology, problem-solving, and interpersonal skills required in the modern workplace.

The Industrial Era 4.0 is a digital revolution that combines cyber technology and automated technology. In the context of higher education, this means that teaching and learning must adapt to the increasingly sophisticated use of technology. For example, the use of online learning platforms and mobile applications has become an effective tool to support the teaching and learning process. Through this technology, students can access learning resources from anywhere and anytime, allowing for more flexible and personalized learning. However, the challenge that arises is how to ensure that students are not only users of technology, but also able to understand and develop these technologies. Therefore, higher education must create an environment that supports the development of technical skills and creativity.

On the other hand, society 5.0 is a concept that Japan launched as an answer to the challenges of the 4.0 revolution. If industry 4.0 focuses on optimization through technology, society 5.0 emphasizes on solving social problems by integrating cyber and physical spaces. In the context of education, this means that institutions must teach students to think critically and innovate in finding solutions to complex social problems. For example, students can be involved in research projects that focus on issues such as climate change, social inequality, or public health. Thus, students not only learn theory, but also apply their knowledge to create a positive impact on society.

Learning-based *Artificial Intelligence* (AI) is one of the technologies that can personalize the learning experience. AI can monitor each student's progress, provide appropriate learning recommendations, and provide in-depth feedback(Hasnah et al., 2023). For example, learning platforms that use AI can analyze student learning patterns and adjust the material delivered according to individual needs. Innovation in this learning process is essential to meet future needs and support the vision of a society 5.0 that is human-focused, sustainable, and technology-driven. By utilizing AI, educational institutions can create a more effective and efficient learning experience, as well as prepare graduates who are ready to face the challenges of the world of work.

In addition, the concept of *learning organization* popularized by Peter Senge provides a vital philosophical and systemic framework in the context of higher education. The application of learning organizational principles, such as personal mastery, mental models, shared vision,

team learning, and systems thinking, can create an environment where students not only learn from the institution but also learn with the institution. For example, campuses that apply this concept encourage collaboration between students and lecturers in research projects, group discussions, and extracurricular activities. This environment becomes a fertile ground for the growth of innovation, because students feel safe to try, fail, and relearn. Thus, educational institutions not only serve as a place to impart knowledge, but also as a community of learners who support each other and develop together.

In conclusion, the transformation that has occurred in the world of higher education due to the industrial revolution 4.0 and society 5.0 requires educational institutions to adapt and innovate. Through relevant curriculum updates, the use of technologies such as AI, and the application of learning organizational principles, higher education can produce graduates who are not only ready to face the challenges of the world of work, but also able to contribute positively to society. Thus, higher education in Indonesia can play a role as a driver of social and economic progress, as well as create a more sustainable and inclusive society. This transformation is not only the responsibility of educational institutions, but also requires collaboration between government, industry, and society to create an educational ecosystem that supports the development of future generations.

Artifical Intelligence

Artificial Intelligence or commonly referred to as AI is a machine or computer ability that can mimic human cognitive abilities. AI can provide lessons, think, reason and can solve problems. The goal is to create a system that can run on its own and have intelligence. The definition of AI cannot be single and can be seen from several perspectives, namely: a. Systems that think like humans: machines can mimic the way the human brain works, such as in the field of cognitive psychology. When a computer thinks like a human, it performs tasks that require intelligence (as opposed to memorization procedures) from humans to succeed, such as driving a car. To determine whether a program thinks like a human. b. Systems that act like humans: intelligent AI behavior such as in the Turing test, machines are considered intelligent if they cannot be distinguished from humans. When a computer acts like a human, it best mirrors the Turing test, in which the computer succeeds when a distinction between a computer and a human is not possible. c. Rational thinking systems: creating systems that use logic to reach the best conclusions. Studying how humans think using multiple standards allows for the creation of guidelines that describe typical human behavior. A person is considered rational when following this behavior to a certain degree of deviation. A rational thinking computer relies on recorded behavior to create guidance on how to interact with the environment based on existing data. The goal of this approach is to solve the problem logically, if possible. In many cases, this approach will allow for the creation of basic techniques for solving problems, which will then be modified to actually solve the problem. d. Rational acting systems: more broadly creating intelligent agents that act optimally to achieve goals. Studying how humans act in certain situations under certain constraints allows us to determine which techniques are efficient and effective. Computers that act rationally rely on recorded actions to interact with the environment based on conditions, environmental factors, and existing data. Like rational thinking, rational action relies on solutions in principle, which may be useless in practice. However, rational action does provide a basis on which the computer can begin to negotiate the completion of the goal.

Thomas W. Malone explained that AI is not a substitute for humans, but AI is used to improve human cognitive, analytical and creative abilities. There are the main principles put forward by Thomas W. Malone, namely:

1. Human-Machine Collaboration: humans work alongside AI, not being replaced.
2. Cognitive Enhancement: AI expands human thinking capabilities through data-driven analysis and recommendations.
3. Individual Empowerment: technology gives humans the tools to make better and more efficient decisions.
4. Collective Intelligence: the result of human and AI collaboration leads to more innovative solutions

To build a functioning AI system, three main components are needed, namely data, algorithms and hard ranking(*Hardware*)(Rojabi & Publisher, 2025). The existence of AI in the world of education has a significant impact on educators and students. Education in this era emphasizes the concept of *humanize technology* which means allowing the involvement of technology in meeting the needs of daily life(Kristianti, 2023). Various types of AI-based education applications provide convenience for educators and learners in learning learning materials.

AI in the world of education has a significant impact on educators and students, which includes aspects of plagiarism, ethics, and biases and misinformation. Plagiarism is an act that uses the work of others without listing the source(Kristianti, 2023). To avoid plagiarism, a software tool called turnitin was created. Turnitin is able to detect high or low similarities in scientific papers.

Quoted from CNBC, the ChatGPT application is the most popular in 2023. A recent survey Writerbuddy.ai showed that ChatGPT received more than 14 billion visits from September 2022 to August 2023, showing high interest and use of Artificial Intelligence (AI). In addition, ChatGPT is also the most popular AI among students where this type of AI was developed by OpenAI, functioning as a virtual assistant that can interact with users through text conversations or chatbots. Chatbots themselves are artificial intelligence-based virtual assistants that can interact with users and offer help or information as needed. Chatbots are used in higher education institutions to assist students in terms of administration and academics(Nenia Nabila Patimah et al., 2024).

For example, in the context of information search, students can now easily ask questions to AI systems or chatbots directly and instantly. This is especially helpful for them when they need a definition of a concept or want to get certain facts quickly. The ease of access to information offered by this technology clearly makes a great contribution in helping students complete academic tasks that often require accurate and fast data and information. Thus, the use of AI not only simplifies the learning process, but also increases efficiency and effectiveness in completing various academic tasks faced by students.

H1: The use of AI has an effect and is significant on student learning innovation

Learning organization

Knowledge management in organizations, according to Garcia-Perez and Mitra (2008) is defined as a series of four types of processes: (1) knowledge acquisition. Involves the process of creation and development of knowledge; (2) knowledge conversion. Storage of useful information in a repository that facilitates individual access to attention; (3) application of knowledge. This is the way knowledge is explored and applied; (4) Knowledge protection(Ouyang & Jiao, 2021)

Organizational learning is seen as a dynamic, knowledge-based process. This translates through different levels of action, from the individual level to the group and organizational level, repeating the initial process. Eisenhardt dan Martin argues that dynamic capabilities

become more real through the process of learning that generates new knowledge. Resources and the ability to change define dynamic capabilities and can be realized through an organization's learning process. Thus, dynamic capabilities through the mediation of organizational learning processes become the main source of competitive advantage. The positive impact of organizational learning and dynamic capabilities on company performance is also mediated by innovation (Giniuniene & Jurksiene, 2015). Breznik and Hisrich argue that innovation is the result of the learning process. Other authors also argue that organizational knowledge, and organizational learning, allows for the strengthening of innovation through the acquisition, sharing, development, and transformation of knowledge.

According to Marquardt (Shaffar, 2001), the organization will be able to become an organization as a forum to build a group of people who have diverse competencies and are able to carry out cooperation so that they are able to share visions, knowledge to be synergized and transformed into the intellectual capital of the organization. Meanwhile, Senge (1990) stated that learning a person can improve himself, doing learning will accelerate his ability to create something he wants.

Learning organizations are believed to help improve long-term performance by transforming organizations into learning that can adapt and respond quickly to changes in the organization to promote continuous improvement. The implementation of learning organization helps improve the quality of teaching and learning by encouraging collaboration, reflection and curriculum updates. The important elements that must exist in an organization are learning, organization, knowledge and technology. Haryanti (2006) argues that organizational learning is the ability of organizations to generate, acquire and share information on new ideas.

Peter Senge in his book entitled *The Fifth Discipline* defines that a learning organization is an organization where individuals work consistently to develop their abilities to achieve the desired results. There are five dimensions, according to Father Sange about learning organization, namely(Hendrawati, 2024);

a. System thinking

Systems Thinking is a core discipline that blends all other disciplines. It's a framework for looking at interactions and overall patterns, not just isolated events. Senge (1990) emphasizes that organization is a complex system in which actions in one area can affect another, often with unintended consequences. Rather than solving problems in a linear (direct cause-and-effect) way, Systems Thinking encourages us to look at the underlying structures that create these patterns of behavior.

b. Personal Mastery

Personal Mastery is the discipline of continuous individual growth and learning. It's not just about having competencies or skills, but more about a deep commitment to lifelong learning and realizing the things that matter most to yourself. Individuals with high Personal Mastery live in a constant state of creativity, never feeling finished. They have a clear personal vision and can see the current reality clearly, which creates a creative tension that motivates them to learn and change.

c. Mental Models

Mental Models are deeply held assumptions, generalizations, images, or images that influence how we understand the world and how we take action. Often, we are unaware of our own mental model. The discipline of Mental Models involves introspection to uncover our deepest assumptions, test them against reality, and be open to changing them if necessary. This is especially important because untested mental models can hinder

learning and innovation.

d. Shared Vision (Visi Bersama)

A Shared Vision is not just a formal vision statement hung on the wall. It's a picture of a future that is truly shared and held together, that fosters real commitment and engagement. A shared vision provides focus and energy for learning.

e. Team Learning (Pembelajaran Tim)

Team Learning is the discipline of developing collective capacity to align aspirations and produce desired shared outcomes. This is not just a harmonious teamwork. Senge distinguishes between "dialogue" (exploration of complex issues, listening deeply, and suspending assumptions to achieve common insights) and "discussion" (presentation of different views to defend them and seek acceptance). Effective team learning requires dialogue and discussion skills, as well as the ability to overcome defensive patterns that hinder learning.

H2: Learning Organization has a positive and significant effect on student learning innovation

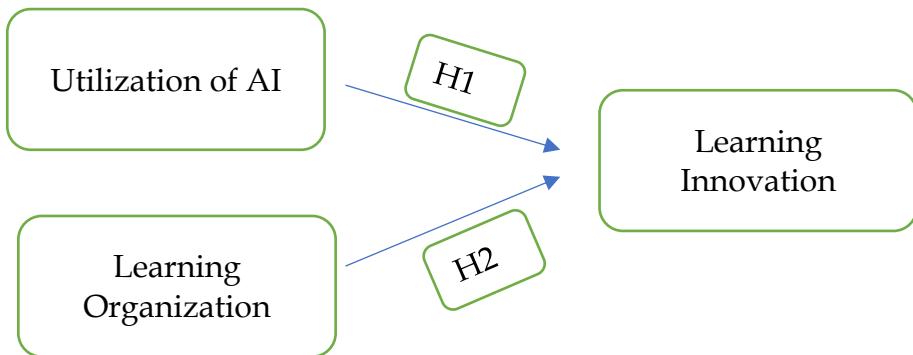
Learning Innovation

Talking about learning innovation, there are two terms that surround it, invention and discovery. Invention is the discovery of something completely new from the result of human creation. Meanwhile, discovery is the discovery of something that has existed before. The term innovation is always interpreted differently by several experts. According to Suryani(Suryani & Consumer, 2008), Innovation in a broad concept is actually not just limited to products. Innovation can be in the form of ideas, methods or objects that are perceived by a person as something new(Asrori, 2019).

The word "innovative" means the introduction of new things or inventions. Therefore, innovative learning can be interpreted as learning designed by teachers whose nature is new and does not normally do and aims to facilitate students or students in building their own knowledge in the context of the process of changing behavior for the better in accordance with the potential possessed by students(Darmadi, 2009). Innovative learning also means learning that is packaged by teachers or other instructors which is a form of ideas or techniques that are seen as new in order to be able to facilitate students to make progress in the learning process and outcomes. Innovative learning can adapt from a fun learning model. "Learning is fun" is the key applied in innovative learning. (Happyanto, 2013).

Ability to identify and find the right questions that can lead to better problem solving. The information obtained will be developed and analyzed so that it will be able to answer these questions properly

H3: The use of AI and Learning Organization has a significant effect on student learning innovation



Picture 1 Research Model

RESEARCH METHODS

This study uses a quantitative approach with a survey method, because it aims to measure the relationship and influence between variables numerically based on empirical data. The quantitative approach provides an opportunity for researchers to conduct objective hypothesis testing through statistical analysis. According to Sugiyono (2022), quantitative research is research used to research a specific population or sample, by collecting data using standardized instruments, as well as statistical data analysis to test the hypothesis that has been formulated. Therefore, this approach is relevant in examining the influence of the use of Artificial Intelligence (AI) and learning organization on student learning innovation.

Populasi

The population in this study is all students who have implemented AI-based learning. From this population, the researcher determined a sample in the form of active students in semesters 4 to 8 who have used AI-based learning platforms for at least one semester. The selection of this sample was carried out to ensure that respondents have adequate experience in utilizing AI in the learning process so that the answers given in the research instrument are more accurate and representative.

Data collection techniques

The data collection technique used is a questionnaire. Questionnaires were given to respondents to measure variables in the use of AI, learning organization, and student learning innovation. The instrument used is a closed questionnaire with a Likert scale, so that respondents can choose answers according to the conditions they experience. The closed questionnaire type was chosen because it facilitates the process of measuring variables as well as statistical analysis.

Variables and Indicators

Table 1 Variables and Indicators

VARIABEL	INDICATOR
Utilization of AI	<ol style="list-style-type: none">1. Understanding of AI2. The use of AI in learning activities3. Learning efficiency4. Quality of learning outcomes5. AI attitudes and acceptance
Learning Organization	<ol style="list-style-type: none">1. Personal Mastery (Penguasaan Diri)2. Mental Models (Open Mindedness)

	<ol style="list-style-type: none">3. Shared Vision (Visi Bersama)4. Team Learning (Belajar Kelompok)5. Systems Thinking (Berpikir Sistemik)
Learning Innovation	<ol style="list-style-type: none">1. Creativity in learning2. Utilization of new technologies3. Adaptability4. Experimentation and reflection5. Innovative collaboration

Data Analysis Techniques

The data analysis process was carried out through multiple linear regression analysis, which aims to test the magnitude of the influence of two independent variables – the use of AI and learning organization on the dependent variable, namely student learning innovation. The analysis was carried out with the help of SPSS (Statistical Package for the Social Sciences) statistical software, so that the results obtained were more accurate and easy to interpret in the context of the relationship between variables.

To ensure that the research instrument is suitable for use, a validity test was carried out using *the Corrected Item-Total Correlation* technique. This test correlates the score of each statement item to the total score of its variable. The analysis was carried out using SPSS version 26 with *product moment* correlation. An item is declared valid if *the calculated r value* is greater than *the r of the table* at a significance level of 5%. Instruments that meet these criteria are considered to be able to measure variables precisely.

Furthermore, a reliability test was carried out to determine the internal consistency of the research instrument. Reliability test using Cronbach's Alpha method via SPSS 26. A variable is declared reliable if Cronbach's Alpha value is greater than 0.6, indicating that the instrument has a good level of consistency when used repeatedly under the same conditions.

The final stage is the hypothesis test, which includes the t-test and the F-test. The t-test is used to determine the partial influence of each independent variable (X_1 and X_2) on the dependent variable (Y). This test was carried out by comparing *the t-value of the calculation* and *t of the table* at a significance level of 0.05 or using a significance value (*p-value*). A variable is declared to have a significant effect if *t calculates > t table* or *p < 0.05*. Meanwhile, the **F test** is used to determine the influence of independent variables simultaneously on dependent variables. If the significance value of the F test is less than 0.05, then the two independent variables together have a significant effect on student learning innovation (Indraferi, 2023). With this series of statistical tests, research hypotheses can be tested comprehensively and scientifically.

Result

In testing instruments for validity, five items of instruments from the use of AI, four instruments from learning organizations and five items from student learning innovation instruments. The resulting r value exceeds the critical r table value, indicating the validity of all items. In addition, the reliability test yielded a Cronbach Alpha value of ≥ 0.60 , confirming the suitability of the measurement instrument to capture the construction under investigation. Furthermore, the Normality Test using the Kolmogorov-Smirnov showed values of $0.274 > 0.05$ for the standard residue data, confirming the normal distribution.

Table 2 Reliability Test

Variabel	Cronbah's Alpha	Role of Thumb	Information
X1	0,758	0,60	Reliebel
X2	0,793	0,60	Reliebel
And	0,892	0,60	Reliebel

Normality Test

Tests of Normality						
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Itself.	Statistic	df	Itself.
X1	0.150	118	0.000	0.967	118	0.006
X2	0.222	118	0.000	0.876	118	0.000
And	0.156	118	0.000	0.883	118	0.000

The results of the normality test using Kolmogorov-Smirnov and Shapiro-Wilk showed that all research variables had significance values below 0.05. The variable X1 obtains a value of sig. 0.000 (K-S) and 0.006 (S-W), the variable X2 obtains sig. 0.000 on both tests, and the variable Y also indicates sig. 0.000 on both tests. Significance values smaller than the 0.05 probability limit indicate that all three variables are not statistically normally distributed. Thus, the data of this study does not meet the assumption of normality, so further analysis needs to consider a robust statistical approach or data transformation if necessary.

Multicollinearity Test

Model Summaryb				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.335a	0.112	0.097	5.066

The results of the *Model Summary* show that an R value of 0.335 indicates a positive but weak relationship between independent variables and dependent variables. The coefficient of determination (R Square) of 0.112 indicates that the model is only able to explain 11.2% of the variation in the dependent variable, while the rest is influenced by other factors outside the model. The *Adjusted R Square* value of 0.097 confirms that the contribution of independent variables remains low after adjusting for the number of variables and sample size. In addition, the *Standard Error of the Estimate* value of 5,066 indicates that the rate of prediction error is still relatively high. Overall, the model is significant but has limited explainability.

Pengujian hypothesis

Table 3 Uji Hypothesis

Variabel	T Count	itself	information
X1	115.62	0,00	Valid
X2	111.747	0,00	Valid
And	89.371	0,00	Valid
F count	7.263	R	0,335
F sig	0.001	R Square	0,112

The results of the validity test show that all items in variables X1, X2, and Y have met the instrument validity criteria. This is indicated by a very high *calculated t-value* for each variable, which is 115.62 for X1, 111.747 for X2, and 89.371 for Y, with a significance value of 0.00. Since

the significance value is well below the limit of $\alpha = 0.05$, all items of the instrument are declared valid and able to reflect the measured construct consistently.

Furthermore, the results of the simultaneous significance test (F test) show that the regression model has an adequate level of feasibility. The F-value of 7.263 with a significance value of 0.001 indicates that the variables X1 and X2 together have a significant effect on the variable Y. Thus, the regression model used can be interpreted as a model that is suitable to explain the change in dependent variables based on their independent variables.

The determination coefficient also provides an overview of the model's predictive capabilities. An R value of 0.335 indicates a positive relationship although relatively weak between the free variable and the bound variable. Meanwhile, the R-Square value of 0.112 indicates that the 11.2% variation in variable Y can be explained by the combination of variables X1 and X2. The rest, amounting to 88.8%, was influenced by other factors outside the research model. These findings suggest that although the influence of X1 and X2 is significant, their contribution to changes in the Y value is still limited and there may be other variables that are more dominant in influencing the dependent variables.

Overall, these results confirm that the research instrument has good validity and the regression model used is worthy of further analysis. However, the contribution of independent variables to relatively low bound variables is an important indication for further research to consider other variables that can provide a more comprehensive explanation of the variation of the Y variable.

Discussion

The effect of the use of AI on student learning innovation

The first hypothesis shows that the use of AI has a significant effect on learning innovation. AI provides easy access to knowledge, personalization of materials, and the ability to explore new ideas. This technology encourages students to learn creatively through tools such as chatbots, idea generators, automated reference applications, and data analysis tools. These findings show that the increase in the level of use of artificial intelligence in the learning process, including the use of adaptive learning platforms, learning analytics, and assessment automation systems, correlates with the increasing opportunities for innovation in teaching and learning activities. The use of AI is able to provide a more personalized and efficient learning experience, while encouraging the growth of creativity in both students and educators. Thus, the role of AI can be seen as one of the strategic factors that contributes significantly to encouraging the renewal and development of learning strategies. These findings are in line with the opinion of Ouyang & Jiao (2021) who explain that AI in education can function as a *tool, tutor, and peer*, thereby improving the ability to think innovatively.

The Influence of Learning Organization on Learning Innovation

In research, Learning Organization has been proven to have a significant effect on learning innovation. Institutions that inculcate values such as *personal mastery, shared vision, team learning and mental models* creating an academic climate conducive to the birth of creativity and renewal of learning strategies. These findings indicate that institutions that implement learning organizational principles such as *personal mastery, shared vision, team learning, mental models and systems thinking* tend to have a stronger capacity to produce various forms of innovation. Work environments and learning environments that facilitate collaboration, continuous reflection, and adaptability, allow educators and students to develop more creative and relevant learning strategies and methods. Thus, the higher the level of organizational orientation towards the characteristics of the learner's organization, the greater the potential

for innovation that can be realized in the context of education. These findings are in line with Peter Senge's concept that learning organizations have the ability to increase individual capacity to generate change and innovation. This is also in line with Sulaiman's research that says that learning organization has a significant effect on learning innovation (Salim et al., 2011)

The effect of the use of AI and learning organization on learning innovation

The findings show that the integration of the two independent variables, namely the use of artificial intelligence technology and the application of learning organizational principles, contributes to strengthening the capacity of educational institutions to produce innovations in learning strategies, teaching methods, and improving the quality of the overall educational process. These results are in line with the theoretical view that learning innovation does not only depend on technological readiness, but also on the condition of organizations that are adaptive, collaborative, and have a vision of long-term learning.

Thus, the regression model used in this study can be declared to have statistical feasibility and be able to adequately describe the relationship between independent variables and dependent variables.

CONCLUSION

The results of the t-test showed that the use of AI made a positive contribution to increasing creativity, adaptability, speed of obtaining information, and the effectiveness of the learning process. AI is a learning support tool that is able to personalize learning, simplify access to references, and expand students' ability to explore new knowledge.

A learning environment that applies learning organizational principles such as *personal mastery, shared vision, team learning, mental models, and systems thinking* can increase collaboration, reflection, and student courage in experimenting. A strong organizational culture encourages students to produce new innovations in their learning process.

The results of the F test show that the two variables together have an influence on learning innovation. The integration of AI technology with an adaptive learning environment strengthens students' ability to create innovative learning strategies. However, the R Square value of 0.112 indicates that there are still other variables outside of this study that also affect student learning innovation.

The use of AI facilitates the efficiency and effectiveness of learning, while Learning Organization creates space for knowledge development, reflection, and collaboration. These two factors complement each other in shaping students' innovation skills in the era of the Industrial Revolution 4.0 and Society 5.0.

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