# Digital Transformation Readiness in Higher Education Institutions in Indonesia: A Systematic Literature Review

**Rizka Latifah, Cucuk Budiyanto, and Herman Saputro**
Vocational Teacher Education
Faculty of Teacher Training and Education
Universitas Sebelas Maret
Surakarta, Indonesia
rizka.latifah62@student.uns.ac.id, cbudiyanto@staff.uns.ac.id,
hermansaputro@staff.uns.ac.id

## Abstract

Digital transformation is a process of accelerating and integrating digital technology spread across society. This process changes lifestyles by utilising a combination of information technology, communication, compilation, and connectivity. Although digital transformation has become a worldwide topic lately, little research still discusses it in Indonesia. However, indeed, digital transformation has occurred in Indonesian higher education. This study's purpose is to analyse the readiness of higher education in Indonesia to face digital transformation. This research was conducted with a systematic literature review framework with a PRISMA approach for selecting the article and thematic analysis for data analysed. The data analysed will be focused on educational stakeholders, namely students, teachers, and institutions. In students' focus, we discovered a theme, namely flexibility learning, that means students can study every time and everywhere without restriction. We also found one theme in the teacher's focus: trained teachers, which means teachers must have competencies to adapt to digital transformation. And finally, four themes were found in institutions focus, namely creating educational platforms, managing data, managing IT infrastructure, and overcoming cultural barriers. We can realise the four themes through online classes and a change in mindset at the university.

## Keywords
digital transformation readiness, education preparedness, higher education, PRISMA approach, systematic literature review

## 1. Introduction

Along with the development of technology, innovation has occurred in various areas of life. This innovation focuses on increasing knowledge, skills, and competencies to develop technology that can simplify human life. The process of spreading the use of digital technology in society is called digital transformation. Limani, Hajrizi, Stapleton, and Retkoceri (2019) stated that digital transformation could be interpreted as a strategy to change activities, processes, competencies, and models in digital technology.

Digital transformation has attracted the world's attention lately. Iivari, Sharma, and Venta-Olkkonen (2020) stated that digital transformation is about taking advantage of digital technology and interpreting digital technology into everyday life to get the benefits. Digital transformation can also mean a change in the digital environment in all life, such as social, business, entertainment, and education. However, we need to emphasise that changing the use of digital tools is not a digital transformation. Digital transformation is more related to changes in mindset, way of working, and management in a digital environment (Sklyarov, Vorotyntseva, Komyshova, & Sviridova, 2020). Education has become the main target for the development of digital transformation. Educational institutions can adjust and design the education system according to current conditions. Furthermore, digital transformation moves in line with the development of the education system (Oz & Balyer, 2018). The education system that was only face-to-face can now be implemented using distance learning methods by utilising digital transformation.

Digital transformation in higher education aims to determine universities' needs in providing education, research, and community service by utilising digital technology for all stakeholders (Hakan, 2020). That means with digital transformation services; universities hope that lecturers and students can adapt and have advanced digital-level capabilities. Digital transformation services in universities include the internet, social media, Internet of Things,

Big Data, cloud computing, fast and high-capacity connections, and artificial intelligence. After all, the ultimate goal of digital transformation in higher education is to create a digital university.

Following the new trend, digital transformation has also occurred in Indonesian higher education. However, few studies address digital transformation phenomena in higher education within the context of Indonesian higher education. This case can be seen from the few articles that discuss digital transformation in education with the scope of Indonesian research published in the Scopus database. By using the keywords digital transformation and education and Indonesia, there found only 19 articles. Likewise, in Southeast Asia, research related to digital transformation is also still lacking. Whereas in the Scopus database, there are hundreds of articles discussing research on digital transformation in education.

That is why questions arise. How is Indonesian higher education readiness to face digital transformation? Although there are still few articles that discuss it, digital transformation has indeed occurred in Indonesia. This study aims to analyse the readiness of Indonesian higher education to face digital transformation. This study contributes to understanding digital transformation readiness in Indonesian higher education, focusing on students, teachers, and institutions.

## 2. Theoretical Foundation

### 2.1 Digital Transformation Framework

Since first coined in the 1990s, there has been a trend towards digital transformation in recent years. Digitalisation or digital transformation means the process of changing all kinds of information (written, voice, images, videos, and all sorts of data) into a digital language (Machekhina, 2017). Converting a whiteboard into a projector or a book to a PDF is a change using digital tools, not digital transformation. This statement follows what was stated by (Iivari et al., 2020) that digital transformation is about taking advantage of digital technology and the ability to interpret digital technology into everyday life so that we get the benefits. Digital transformation is more related to changes in mindset, way of working, and management in a digital environment (Sklyarov et al., 2020).

### 2.2 Role of Higher Education Stakeholder in Digital Transformation

Digital transformation has been acknowledged as a systemic change that involves four entities: human, hardware, software, and infrastructure (Daniel Schallmo, 2017). From this statement, the readiness of digital transformation is related to stakeholders' influence. In higher education, the stakeholders are students, teachers, and educational institutions, where students act as implementers, teachers as lecturers, and institutions as the main contributors.
The active role of students is the spearhead of successful learning. Its means, students are required to be more independent and apply the "do-it-yourself" concept to succeed in digital transformation (Block, 2018). Student can discipline their study time and develop their appropriate learning patterns (Cendon, 2018). This statement follows the concept of digital transformation in education, where learning is flexible. Learning flexibility means that learning is carried out according to students' wishes without limited space and time (M Abd-Elhafiez & H Amin, 2021). This system eliminates the time and places constraints in the learning process. Learning does not have to be done in school, nor does it have to be done during school hours.

Teachers are the trigger for developing the digitalisation of services and teaching (Brink, Packmohr, & Vogelsang, 2020). Universities are advised to employ many competent teachers to enable education more effectively. The more capable the teacher is, the more skilled he is in imparting knowledge to students. Plotnikova (2019) revealed that universities that have implemented digitalisation provide training for their teachers. Training is an essential strategy for increasing work capacity and competitiveness(Makarova, Shubenkova, Buyvol, Mavrin, & Mukhametdinov, 2018). Trained teachers can focus on creating long-term content and learning media.

Universities are the main contributor to realising digital transformation in education. After all, the existence of digital transformation in a university depends on the university's will. Plotnikova (2019) stated that universities that play an active role in digital transformation must prepare three things: providing ICT infrastructure, creating educational platforms, and training staff. University can do these three things by creating an online course. In online classes, students and teachers can interact directly with IT equipment. However, universities require significant funds to develop an online system. The teacher's IT skills and ICT equipment are the main factors in making an online course. Considerable funds are required to provide ICT equipment and to train teachers. By making courses online, the university also has to create an education platform. That platform is usually becoming the primary goal of digital transformation in higher education.

## 3. Methods

This research was conducted with a systematic literature review framework (Butler-Henderson & Crawford, 2020) and followed the PRISMA approach (Moher, 2009) for selecting articles. The first step is to determine the research question. The research question in this study is how Indonesian higher education readiness to face digital transformation. From these research questions, we can determine keywords to conduct article selection. The keywords used are TITLE-ABS-KEY (digital AND transformation) OR TITLE-ABS-KEY (education) AND TITLE-ABS-KEY (Indonesia). This search was conducted in the Scopus database. The criteria for eligible documents are articles or conference papers, that published between 2016 and 2021.

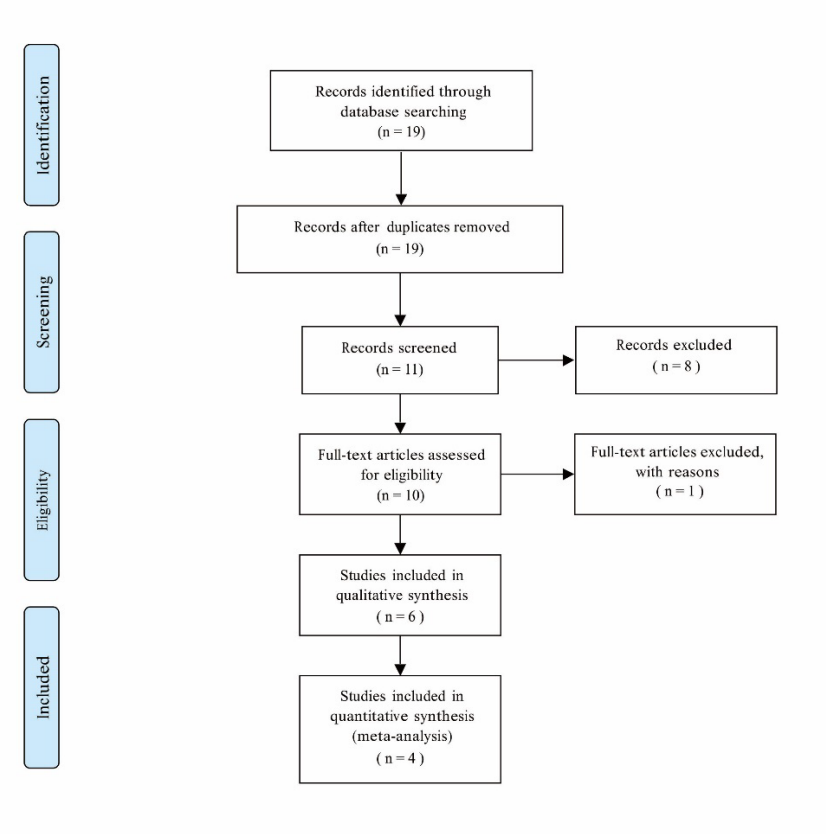


Figure 1. PRISMA Diagram

As depicted in Figure 1, the article selection process involves searching related keywords in the Scopus database and finding 19 articles. The selection continues with screening by publication time, 2016 – August 2021, and document type, resulting in 19 articles. Furthermore, the filtering focuses on the scope of higher education, and 11 papers were considered relevant to the content. The last stage is a careful selection by reading and producing ten articles that meet the eligibility criteria.

In the article selection, articles were selected from 2016 to 2021. However, the ten chosen articles had a publication period between 2018 and 2021. As shown in Figure 2, most articles were found in 2018 and 2019, i.e., three articles each year. In 2020 and 2021, two articles were found each year. Meanwhile, between 2016 and 2017, there were no articles that contained digital transformation in Indonesia. This result proves that in Indonesia, digital transformation has not been so popular in 2016 and 2017. Its popularity only started in 2018 and continues to grow until 2021. Even so, there are still very few articles that cover this topic.


Figure 2. Publication Year Bar Diagram

## 4. Results and Discussion

The data analysis used in this research is a thematic analysis following the process described by (Braun & Clarke, 2006). The thematic approach was undertaken to identify common themes identified in each article. This process involves six stages: familiarisation, generating, searching theme, reviewing theme, defining and naming themes, and report. Familiarisation with the literature was achieved during the study selection with the PRISMA diagram. Generating, searching, reviewing, defining, and naming were archived when creating a matrix concept. This process will be focused on students, teachers, and institutions to determine the appropriate theme. And finally, the report procedure will be explained in the result and discussion.

In students' focus, we discovered one theme, namely flexibility learning. We also discovered two themes in the teacher's focus: well-trained technical support staff and innovative teaching strategies. And the last four themes were found in the institution's guide: creating educational platforms, managing data, managing IT infrastructure, and overcoming cultural barriers.

### 4.1 Flexibility Learning

In Table 1, there is one theme related to student view is facing digital transformation. These themes were chosen based on students' perceptions who have experienced digital transformation in their university. The theme is flexibility learning (40%), which means students are willing to accept a new learning method that will be carried out without limited space and time.

Table 1. Summary of Students' Perceptions

| Theme | Number of Articles |
|---|---|
| Flexibility Learning | 4 |

The focus of teaching and learning activities is being able to make students successful in learning. Digital transformation in education has triggered a change in the learning system to using digital technology. Students do not feel disadvantaged by learning using digital technology. Brink et al. (2020) stated that students are open and willing to accept the new learning culture changes. Students enjoy a new learning system using digital technology and carry out learning activities without limited space and time.

The main factor that supports digital transformation in education is the flexibility of learning. Flexibility learning means learning is carried out according to individual requests (Mallam, Nazir, & Renganayagalu, 2019). Students can register and choose the courses they want without geographical or time restrictions (Fajar, Nurcahyo, & Sriratnasari, 2018). This concept eliminates the mindset that learning must take place in schools and during school hours.

Massive Online Open Courses (MOOCs) are a form of learning flexibility in higher education. MOOCs are based on the principle of unlimited scalability, openness and can be made available online (Fadli, Maharani, & Liemanto, 2020). Students from all over Indonesia can access MOOCs anywhere and anytime. This reason makes several universities in Indonesia use MOOCs to support lectures in the digital transformation era.

MOOCs offer support and flexibility of learning. At Raharja University, MOOCs are autonomous, not rigid, and flexible according to students' wishes (Kamil, Rahardja, Sunarya, Aini, & Santoso, 2020). This policy is carried out to increase the link and match between schools and industry and prepare students for work. This learning

system is also applied at Gajah Mada University (UGM). UGM created a MOOC called e-Learning Open Knowledge Sharing (eLOK) to learn independently and flexibly (Kamil et al., 2020).
The Ministry of Education and Culture of the Republic of Indonesia (*Kemendikbud*) has also initiated a program to support freedom of learning, namely the Merdeka Campus. Merdeka Campus provides educational institutions, lecturers, and students to choose the preferred learning process (Kamil et al., 2020). Merdeka Campus is considered capable of producing an education system that has been rigid so far, becomes more flexible, and creates innovations in the learning process. After all, the first step in the education development process is to create a new curriculum (Dobudko, Korostelev, Gorbatov, Kurochkin, & Akhmetov, 2019). Schlenz et al. (2020) states that an appropriate curriculum structure makes it easier for students to accept learning. The existence of the Merdeka Campus allows the university to create a curriculum that is following digital transformation. However, it should also be emphasised that not all subjects can be applied to digital technology.

### 4.2 Trained Teacher

In Table 2, there are two themes related to teacher view is facing digital transformation. These themes were chosen based on teachers' perceptions who have experienced digital transformation in their university. These themes are well-trained technical support staff (60%) and innovative teaching strategies (10%). And these themes will be explained as a trained teacher.

Table 2. Summary of Teachers' Perceptions

| Theme | Number of Articles |
|---|---|
| Well-trained technical support staff | 6 |
| Visionary Teaching Strategies | 1 |

Teachers are the trigger for developing services and teaching in the digital transformation era (Brink et al., 2020; Ritu Gupta, Seetharaman, & Maddulety, 2020). Digital transformation forced teachers to think and implement digital technology in the learning process (Lindell, 2020). Teachers are required to increase their competencies and develop technology-based learning media. Teachers need to think of innovative teaching strategies to implement digital technology in their learning. The competencies required of a teacher depend on their institution. Teachers need support from institutions to be able to meet all these demands.

The existence of digital transformation affects the management of human resources in higher education. Fadli et al. (2020) states that the need for teachers will be minimised and replaced by MOOCs. Students prefer to get learning from world-class experts rather than less competent teaching staff. For the teacher's role to not be returned, they must increase their soft skill (Gaol, 2021).

Rahman, Arifin, and Furqan (2019) states that digital transformation in higher education depends on technical issues related to human resource capacity. In Indonesia, pressure from the government and society has forced many institutions to prepare their teaching staff. Universities are advised to employ many competent teachers to enable teaching more effectively. The more capable the teacher is, the more skilled he is in imparting knowledge to students.

### 4.3 University Readiness

Universities are prominent supporters of realising digital transformation in education. In Indonesia, universities are the key to the success of the digital transformation. After all, service and teaching activities that occur are regulated by the university.
In Table 3, there are four themes related to university readiness in facing digital transformation. These themes were chosen based on the university's preparations in facing digital transformation. These themes, namely, is creating an educational platform (30%), data management (30%), managing IT infrastructure (40%), and overcoming cultural barriers (40%).

Table 3. Summary of University Perceptions

| Theme | Number of Articles |
|---|---|
| Creating Educational Platform | 3 |
| Data Management | 3 |
| Managing IT Infrastructure | 4 |

| Theme | Number of Articles |
|---|---|
| Overcome Cultural Barrrier | 4 |

These four themes follow (Plotnikova, 2019) statement. Plotnikova (2019) stated that three preparation universities must be ready to play an active role in digital transformation, namely providing ICT infrastructure, creating educational platforms, and training staff. And we can realise these three things by creating an online class. After all, online classes are a form of changing learning patterns by adapting to digital transformations that occur in society (Budiyanto, Drajati, Wahyuningsih, Rojokiningshi, & Sugini, 2021).

Learning Management System (LMS) has become a solution for creating an online class. LMS platform has been used in many education institutions. LMS can also be integrated with other services owned by the university so that it allows data management at the university to be more organised. Moreover, Wong (2019) stated that the criticism and suggestions from students were related to the management of data that was not organised. LMS can be a solution to data management problems. This reason has become the main factor for universities in Indonesia to develop their own LMS. In addition to more organised data, the security of student and teacher data is more guaranteed.

However, having its online classroom platform requires adequate ICT infrastructure. The digital transformation in the education system also depends on the level of the ICT infrastructure in each school (Dneprovskaya, Shevtsova, & Bayaskalanova, 2019). Some mid-rank universities in Indonesia cannot optimally carry out digital transformation due to a lack of resources (Johan & Handika, 2019). Soni and Nugroho (2018) stated that the most important thing that must be owned by higher education is the availability of computer network infrastructure. The use of ICT infrastructure is not only for the learning process but also for completing administrative tasks. The demands of ICT infrastructure are influenced by student needs and learning objectives (Orr, Weller, & Farrow, 2019). Thus, universities must upgrade their ICT infrastructure to prepare transformation digital.

And the essential factor to facing digital transformation is to overcome a cultural barrier. For institutions to implement digital transformation comprehensively, it is necessary to conduct counseling or introduction to digital transformation to each stakeholder. Especially for developing countries like Indonesia, introducing digital transformation will be more difficult and complex and will take long. (Aditya, Ferdiana, & Kusumawardani, 2021) also states that digital transformation in Indonesian higher education must consider all the cultures in their institution. After all, digital transformation is related to changes in mindset (Sklyarov et al., 2020). Therefore, to start the digital transformation in universities, it is necessary to change the mindset of the stakeholders. The learning mindset that is only done face-to-face learning changed with a flexible learning mindset. (Johan & Handika, 2019) states that an organisation can start a change in mindset by increasing the ability of its employees, self-improvement, and improving organisational performance.

## 5. Conclusion

This study aims to analyse the readiness of Indonesian higher education to face digital transformation with stakeholders as the focus. In students' focus, we discovered a theme, namely flexibility learning, that means students can study every time and everywhere without restriction. We also found one theme in the teacher's focus: trained teachers, which means teachers must have competencies to adapt to digital transformation. Finally, four themes were found in institutions focus, namely creating educational platforms, managing data, managing IT infrastructure, and overcoming cultural barriers. We can realise the four themes through online classes and a change in mindset at the university.

The result shows that institutions must prepare online classes and change the learning mindset to face digital transformation. Universities are the key to the success of the digital transformation. After all, service and teaching activities that occur are regulated by the university. The willingness of teachers and students to participate in digital transformation is dependent on their universities too. Digital transformation forced teachers to think and implement digital technology in the learning process. Teachers are required to increase their competencies and develop technology-based learning media. Therefore, teachers need support from the institution to improve their competence. And students enjoy a new learning system using digital technology. Students do not feel disadvantaged by learning digital technology and accept the recent learning culture changes.

## Acknowledgements

The research is supported by the research grant "The Internet of Things Laboratory Development to Pave the Way to Digital Transformation in Education. " of the Institute of Research and Community Service Universitas Sebelas Maret number: 452/UN27.21/PN/2020.

## References

Aditya, B. R., Ferdiana, R., & Kusumawardani, S. S., Identifying and prioritizing barriers to digital transformation in higher education: a case study in Indonesia. *International Journal of Innovation Science*, 2021.

Block, B.-M. *An innovative teaching approach in Engineering Education to impart reflective digitalization competences*. 2018 IEEE Frontiers in Education Conference (FIE), pp. 1-5, 2018.

Braun, V., & Clarke, V., Using thematic analysis in psychology. *Qualitative Research in Psychology,* vol. 3, no. 2, pp. 77-101, 2006.

Brink, H., Packmohr, S., & Vogelsang, K. *The digitalization of universities from a students' perspective*. 6th International Conference on Higher Education Advances (HEAd'20), pp. 967-974, 2020.

Budiyanto, C. W., Drajati, N. A., Wahyuningsih, D., Rojokiningshi, T., & Sugini, *Pengelolaan Kelas Digital*. Surakarta: Fakultas Keguruan dan Ilmu Pendidikan, Universitas Sebelas Maret, 2021.

Butler-Henderson, K., & Crawford, J., A systematic review of online examinations: A pedagogical innovation for scalable authentication and integrity. *Computers & Education,* vol. 159, pp. 104024, 2020.

Cendon, E., Lifelong Learning at Universities: Future Perspectives for Teaching and Learning. *Jornal New Approaches in Education Research,* vol. 7, no. 2, 2018.

Daniel Schallmo, C. A. W., Luka Boardman, Digital Transformation of Business Models — Best Practice, Enablers, and Roadmap. *International Journal of Innovation Management,* vol. 21, no. 8, 2017.

Dneprovskaya, N., Shevtsova, I. V., & Bayaskalanova, T., Study of Digitization of Russian Higher Education as Basis for Smart Education. *Institute of Electrical and Electronics Engineers*, 2019.

Dobudko, T. V., Korostelev, A. A., Gorbatov, S. V., Kurochkin, A. V., & Akhmetov, L. G., The organization of the university educational process in terms of digitalization of education. *Humanities & Social Sciences Reviews,* vol. 7, no. 4, pp. 1148-1154, 2019.

Fadli, M., Maharani, D. P., & Liemanto, A., A new paradigm of regulation for massive open online courses (MOOCs) in higher education in Indonesia: From disruptive innovation to sustaining innovation. *International Journal of Innovation, Creativity and Change,* vol. 11, no. 6, pp. 442 - 457, 2020.

Fajar, A. N., Nurcahyo, A., & Sriratnasari, S. R., SOA System Architecture for Interconected Modern Higher Education in Indonesia. *Procedia Computer Science,* vol. 135, pp. 354-360, 2018.

Gaol, P. L. *Implementation of Performance Management in Artificial Intelligence System to Improve Indonesian Human Resources Competencies*. IOP Conference Series: Earth and Environmental Science, pp. 012010, 2021.

Hakan, K. Ö., Digital transformation in higher education: a case study on strategic plans. *Высшее образование в Россuu*, no. 3, 2020.

Iivari, N., Sharma, S., & Venta-Olkkonen, L., Digital transformation of everyday life - How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care? *International Journal of Information Management,,* vol. 55, pp. 102183, 2020.

Johan, A. P., & Handika, R. F. *Digital Transformation: Insight from Leaders in the Mid-rank Universities in Indonesia*. Proceedings of the 2019 3rd International Conference on Education and E-Learning, pp. 52-55, 2019.

Kamil, M., Rahardja, U., Sunarya, P. A., Aini, Q., & Santoso, N. P. L. *Socio-Economic Perspective: Mitigate Covid-19 Impact on Education*. 2020 Fifth International Conference on Informatics and Computing (ICIC), pp. 1-7, 2020.

Limani, Y., Hajrizi, E., Stapleton, L., & Retkoceri, M., Digital Transformation Readiness in Higher Education Institutions (HEI): The Case of Kosovo. *IFAC PapersOnLine*, 2019.

Lindell, T. L., Teachers calling for organizational support to digitalize teaching. *The International Journal of Information and Learning Technology*, 2020.

M Abd-Elhafiez, W., & H Amin, H., The Digital Transformation Effects in Distance Education in Light of the Epidemics (COVID-19) in Egypt. *Information Sciences Letters,* vol. 10, no. 1, pp. 18, 2021.

Machekhina, O. N., Digitalization of education as a trend of its modernization and reforming. *Revista Espacios,* vol. 38, no. 40, 2017.

Makarova, I., Shubenkova, K., Buyvol, P., Mavrin, V., & Mukhametdinov, E. *Interaction between education and business in digital era*. 2018 IEEE Industrial Cyber-Physical Systems (ICPS), pp. 503-508, 2018.

Mallam, S. C., Nazir, S., & Renganayagalu, S. K., Maritime Education and Training in the Digital Era. *Journal of Marine Science and Engineering*, 2019.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G., Preferred Reporting Items for Systematic Reviews and Meta-Analyses- The PRISMA Statement.pdf. *Annals of Internal Medicine*, 2009.

Orr, D., Weller, M., & Farrow, R., How is digitalisation affecting the flexibility and openness of higher education provision Results of a global survey using a new conceptual model. *Journal of interactive media in education,* vol. 2019, no. 1, pp. 1-12, 2019.

Oz, O., & Balyer, A., Academicians views on digital Transformation in education. *International Online Journal of Education and Teaching (IOJET,* vol. 5, no. 4, pp. 809-830., 2018.

Plotnikova, E. *Digitalization of education in the leading universities of Saint Petersburg*. IOP Conference Series: Materials Science and Engineering, pp. 012047, 2019.

Rahman, A. A., Arifin, M. A., & Furqan, A., Adopting learning management system in Indonesian higher education: The encountering challenges to the transformation. *Asian EFL Journal,* vol. 23, no. 3, pp. 83-97, 2019.

Ritu Gupta, Seetharaman, A., & Maddulety, K., Critical success factors influencing the adoption of digitalisation for teaching and learning by business schools. *Education and Information Technologies,* vol. 25, no. 5, pp. 3481-3502, 2020.

Schlenz, M. A., Michel, K., Wegner, K., Schmidt, A., Rehmann, P., & Wostmann, B., Undergraduate dental students' perspective on the implementation of digital dentistry in the preclinical curriculum: a questionnaire survey. *BMC Oral Health,* vol. 20, no. 1, pp. 78, 2020.

Sklyarov, K., Vorotyntseva, A., Komyshova, L., & Sviridova, A. *Methods of digital transformation of the educational environment of agricultural universities*. E3S Web of Conferences, pp. 15001, 2020.

Soni, F. S. G., & Nugroho, H. *An Evaluation of E-Readiness Cloud Computing Service Model Adoption on Indonesian Higher Education*. 2018 6th International Conference on Information and Communication Technology (ICoICT), pp. 28-33, 2018.

Wong, N. P. *Measuring the Maturity Level of ITSM Using ITIL Framework*. Fourth International Conference on Informatics and Computing (ICIC), pp. 1-6, 2019.

## Biography

**Rizka Latifah, S.Pd.** is a master's student in Vocational Teacher Education at Sebelas Maret University. She was born in Sukoharjo, Central Java, Indonesia, in June 1996. She earned her bachelor degree from Universitas Sebelas Maret, Indonesia. The major she took was computer and informatics engineering education. Currently, she is working at SMK IT Smart Informatika, Surakarta, Indonesia, as a teacher in computer and network engineering. Her research interests include vocational education and educational technology.

**Cucuk Wawan Budiyanto, ST., Ph.D** is an assistant professor at the Department of Informatics Education, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Indonesia. He also teaches at the Postgraduate of Vocational Teacher Education of the same faculty. His recent research is on Educational Robotics, Digital Transformation and Computational Thinking.

**Dr.Eng. Herman Saputro, M.Pd., MT.** is an associate professor at the Department of Mechanical Engineering Education, Universitas Sebelas Maret, Indonesia. He published significant articles at AIP Conference Proceedings (2019), Journal of Thermal Science and Technology (2019), Proceedings of Mechanical Engineering Research Days (2020), Journal of Advanced Research in Micro and Nano Engineering (2020), Open Engineering (2021), Journal of Physics: Conference Series (2021), Health Education and Health Promotion (2021), etc. His research focuses on engine design, spray combustion, and mechanical engineering education.