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Analysis of ICT Development Supporting the E-Learning Implementation on Nadhatul Ulama Universities in Indonesia

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Abstract

The purpose of the study was to determine E-learning in the development of ICT in the field of education at private universities under the auspices of Nadhatul Ulama Indonesia. The research is located at two well-known private Islamic universities, namely the Islamic University of Malang (UNISMA) and Nadhatul Ulama University Surabaya (UNUSA). The methodology used is qualitative research by exploring and understanding the role of e-learning and ICT development in the university. Sources of data come from observations and interviews with academics from two research locations written in field notes and relevant documents. Qualitative data analysis was carried out by conducting data reduction in the form of abstractions, arranging them in units which were then categorized while coding and checking the validity of the data. The results of the study after exploring the two best Nahdatul Ulama universities (PTNU), it turns out that UNISMA is better prepared as a pilot project leader for PTNU E-learning in Indonesian and international university networks in the future. Meanwhile, UNUSA continues to struggle to persuade teachers and students to engage in regular E-learning. Also, there is a lack of executive support for making flexibility in the teaching and learning process relevant to E-learning deployment. These findings suggest that the role of e-learning in Islamic universities under the leadership of Nadhatul Ulama Indonesia is still hampered by a number of challenging issues. Interestingly, the problem of internet data connection constraints is not found in the two Nadhatul Ualam Islamic Colleges which are generally found on other campuses, the main obstacle is the lack of support from human resources and decision-makers in terms of management support. The expected implication is for universities to evaluate and improve in terms of technology management. In addition, the Government supports facilities and policies in enhancing the development of ICT with more modern features in the future.

***Keywords**: E-Learning, Development ICT, Universities*

Introduction

In the Industrial Revolution, education was extremely important. Academics and creative young people benefit much from the 4.0 age. Not without reason, the use of digital technology is a golden path that is able to provide unique opportunities and bring new changes to the quality, methods, and quality of innovative and interactive learning. The study stated that engineering through distance education enhanced by digital technology contributed greatly to educating students in a

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number of developed countries such as the United States (Kocdar et al., 2021). The trend of E-learning as a form of implementing Information and Communication Technology (ICT) is an extraordinary and interesting choice in the digital era because there is no time and place limit for the course of the education and learning process (Gleason, 2018). In addition, mastering ICT is very useful for academics as a standard of competence in facing global challenges. The features offered by ICT can assist the administrative management of educational institutions in managing administrative problems by providing accurate and targeted information for policymaking. Students and teachers can utilize and process information as a source of learning and ability assessment through the latest technological devices (Agrawal & Mittal, 2018; Baez Zarabanda, 2019).

The study states that e-learning and ICT support motivation and learning methods that are not monotonous or become more interesting, and this encourages the advancement of the world of education. Unfortunately, academics and students do not all have the appropriate level of digital competence or are called digital natives, namely the adequate ability to use ICT in academia and the professional future (Martín et al., 2020). Another obstacle is the high cost of quality education in the 21st century and may be difficult to find for educational institutions in certain areas, making not all areas of education able to enjoy the advantages of ICT even in poor and developing countries which are still very limited (Ajit & Mete, 2012). Other influencing factors are the limitation of qualified IT personnel, minimal socialization or training, weak internet network, and inadequate infrastructure (Jegede et al., 2019). Although ICT has a positive effect on economic growth through primary school education to reduce educational inequality, ICT has no significant effect on inequality and economic growth through Universties in 48 African countries (Tchamyou et al., 2019).

The development and evaluation of ICT has provided universities in Indonesia with tremendous opportunity to enhance borderless learning. Several Indonesian universities have built E-learning systems in a variety of approaches. Some are confined to distributing lecture materials via the internet, while others already have an integrated framework for their E-learning system to be used on a larger scale, not just for ordinary students but also for distance students who can only study outside of campus (Titan et al., 2019). Meanwhile, Press Release No. 53/HM/KOMINFO/02/2018 states that since 2017 internet users have increased from 112 million to 262 million (34%) of the

total population in Indonesia, with 80 percent of whom are young people aged between 15–19 years (Kominfo, 2018).

Indonesia has expressed interest in implementing E-learning over the last ten years, according to previous studies, but still faces challenges in infrastructure, resources, access to information and personal characteristics, institutional support, technology and connectivity, instructional design, and trust. Technology, as well as culture and politics, are all factors to consider. For example, from the 2000s to the twenty-first century, Basuki (2007), performed research on the relevance of effective coordination in the case of e-learning in Indonesia. Furthermore, Indonesia, like other developing nations, faces more specific obstacles than industrialized countries, necessitating an understanding of what motivates students to adopt E-learning and other ICT applications. Different study groups, countries, and communities may respond to knowledge-oriented projects in different ways (Salehudin et al., 2021). As a result, it is critical to investigate the role of E-learning and the growth of ICT in Indonesia. Indeed, E-learning in the growth of ICT comprises several components, including students, lecturers, technology, and the environment, all of which must be prepared in order to construct a cohesive and feasible strategy. Most universities in Indonesia use blended E-learning, a combination of conventional classrooms and E-learning, both distance learning and the use of social media as an E-learning mediator. The Indonesian Islamic Universities Association has also started implementing E-learning as the first step towards a Moderate Islamic University(Sutiah & Supriyatno, 2020).What is interesting is that e-learning and ICT development are new things for Islamic universities under the auspices of Nadhatul Ulama because so far the majority have used traditional learning systems and unique characteristics (Satori, 2018).

Nahdlatul Ulama (meaning "Awakening Ulama," abbreviated as NU) is an Indonesian conservative Sunni Islamic movement that adheres to the four schools of fiqh, the Asyari and Maturidi schools of theology, and the al-Gazali and Junaidi Sufi schools. The noble value of *'Ahlu sunnah wa Jamaah,'* a feature of the Islamic heritage that has undergone interaction, contextualization, indigenization, interpretation, and vernacularization in conformity with socio-cultural conditions in Indonesia, is strongly held by Nahdlatul Ulama (Musaropah et al., 2020). Islamic traditions promote moderation, compassion, anti-radicalism, inclusivity, and tolerance (Abidin et al., 2020; Purwanto et al., 2019).

Based on the background of the problem, the novelty of the research is shown from the object of research where there is no recent research that examines the role of e-learning in the development of ICT in Islamic universities under the auspices of NU which has very strong Islamic characteristics and traditions compared to Islamic universities in the past. generally. In addition, because in general NU educational institutions are traditional pesantren (*salafiyah*) (Zarkasyi, 2019). Moderate Islamic studies such as the use of e-learning are an experience of new learning methods for NU Islamic educational institutions from *salaf* to modern (*khalaf*) (Setiawan, 2020). Will this change become an obstacle or not for most PTNU?.The study was conducted at two of the best NU Islamic universities, namely Nadhatul Ulama University Surabaya and Malang Islamic University because both of them have received positive attention for their internal and external quality assurance systems, as well as being role models for 253 universities. other best NU Islamic colleges such as Wahid Hasyim University Semarang, NU Islamic University Jepara, Universitas Nahdatul Ulama Lampung, University of Science Al Quran Wonosobo, Universitas Nahdatul Ulama Al Ghazali Cilacap, Universitas Nahdatul Ulama Sidoarjo and Universitas Nahdatul Ulama Surakarta.

Research Question

From the background of the problems that have been raised, there are two important themes that are the focus of research, namely e-learning in ICT development at Nahdatul Ulama Universtities in Indonesia. Based on the focus of the theme, the formulation of the research question is:

1. What is the importance about the development of ICT in supporting the implementation of e-learning at the Universities of Nadhatul Ulama in Indonesia?
2. How can the development of ICT support the development of e-learning at the Universitiesof Nadathul Ulama in Indonesia?
3. Why does the development of ICT need to support the implementation of e-learning at the Universities of Nadathul Ulama in Indonesia?

Literature Review

Theory of Acceptance and Use of Technology

The Theory of Acceptance and Use of Technology (UTAUT) proposed byVenkatesh, Morris, Davis, & Davis (2003)is a model of acceptance of technology that combines eight models at once,

namely the theory of reasoned action in the technology acceptance model (TAM) with two determinants. intention namely ease and usefulness; theory of motivation in the adoption of new technologies; The theory of diffusion of innovation that explains the acceptance or rejection of innovation is based on the beliefs that users form about the innovation; and social cognitive theory in the context of computer use. This theory adds subjective constructs of norms and voluntary as predictors of intention to use technology that can be used to measure the level of acceptance in education. The factors that influence a person to use technology in this theory are performance expectations, effort expectations, facilitating conditions, self-efficacy, anxiety levels (Nair, Ali, & Leong, 2015). Previous studies have stated that the development of ICT in education, especially in the adoption of e-learning systems, can be influenced by the theory of acceptance and use of technology (El-Masri & Tarhini, 2017). The use of ICT with different educational backgrounds can show different attitudes and tend to be higher towards the technology(Nistor et al, 2014).

All activities linked to technological equipment to process and transport information between media are referred to as information and communication technology (ICT). ICT has two components. To begin, information technology encompasses everything connected to the process, tool use, modification, and management of data. Second, communication technology refers to all technologies that are used to process and send data from one device to another (Shortis, 2001). In the context of learning, ICT includes everything related to the use of computers to process the information obtained and as a learning aid (Mansab, 2012). ICT is also used as a source of information for teachers and students. Previous studies mentioned the role of ICT in education, namely: 1) as a repository of knowledge and a source of digital-based learning materials, both core content and supplementary content (Tatnall, 2020); 2) as learning aids such as interactive videos, e-learning, and multimedia presentations; 3) as tools and facilities that complement the functions of educational institutions (Daguet, 2021; Livingstone, 2012); 4) as a standard of competence and skills; 5) as a supporter of education management and decision support systems in educational institutions; and 6) as the formation of ethical and axiological competence (Vladimirovich et al., 2021). It is deeper than the impact of ICT on education depending on the subject and the type of use of ICT (Mbodila et al., 2013). The use of ICT in education requires a very careful evaluation aimed at identifying in which areas, for what use, and what methods of use will be able to have a positive effect on educational outcomes (Fernández-Gutiérrez et al., 2020).

E-learning

E-Learning through the use of computer networks (intranet and extranet) for teaching materials, interaction, and/or facilitation is known as e-learning. E-learning is a great tool for increasing teaching and learning quality (Lim et al., 2018; Tsakeni, 2021). E-learning is also a cutting-edge method of delivering education via electronic forms of information that improves students' knowledge, talents, or other abilities (Tavangarian et al., 2004). Students benefit from E-learning because of enhanced information accessibility, better content delivery, tailored education, content standardization, accountability, on-demand availability, speed, interaction, confidence, and convenience. Faculty gain from e-learning because it lowers expenses, allows for constant content delivery, and improves tracking, among other things. E-learning lowers the costs of classrooms and facilities, training, travel, printed materials, labor, and information redundancy (Jethro et al., 2012; Tarman et al., 2019). In addition to hardware costs, software licensing, learning material development, equipment upkeep, and training, e-learning projects necessitate a significant investment in technology (Childs et al., 2005; Kalimullina et al., 2021). Meanwhile, infrastructure, money, access to information, personal qualities, and institutional support continue to be barriers to E-learning in developing nations (Aung & Khaing, 2016; Maatuk et al., 2021; Wolhuter & Jacobs, 2021).

Learner characteristics, teacher characteristics, E-learning environment, quality of institutions and services, quality of infrastructure and systems, quality of courses and material, and motivation are seven elements of E-learning success, according to Bhuasiri et al., (2012). Well-designed courses, curricula, and learning materials are the primary components that can influence learning success in developing nations based on these aspects. Computer skills, technical background, training programs, and computer literacy for faculties/schools are also key variables in implementing E-learning in underdeveloped nations, according to this study. (Kaisara & Bwalya, 2020).

Research Methodology

Research Design

This study uses a phenomenological research design adopted from Donalek (2004). The phenomenological design aims to critically, thoroughly, and systematically examine human experience through the description of the people involved in a phenomenon. Researchers utilize phenomenological study design to examine the phenomenon of participants in articulating their

experiences, opinions, attitudes, beliefs, and ways of thinking concerning the usage of e learning. Because research studies phenomena that include 'online habitats' and involve individual experiences in living life on campus, the researchers adopt the cyber ethnography theory Hallett &Barber (2014). According to Hallett & Barber (2014), cyber ethnographic theory studies how to integrate data from online spaces into physical communities and social interactions. Cyber ethnography is a theory used by researchers to explore the phenomena of uniqueness in the context of participants using ICT in a campus community. The researcher uses a qualitative approach with the aim of describing the meaning of the participants' experiences using ICT in supporting the implementation of e-learning at PTNU in Indonesia. This research model requires researchers to understand well the research process and the themes studied. According to Moleong (2013), qualitative research tries to collect in-depth knowledge on the circumstance encountered by research subjects, where the process underlying the occurrence of something is explored. Therefore, this study does not emphasize the generalization of the data but on the meaning contained in the research subjects. The research locations are two universities under PTNU, namely Nahdlatul Ulama University in Surabaya and Islamic University in Malang.

Participant

There were a total of 66 participants in this study, consisting of: (1) 33 UNUSA participants (28 lecturers and 5 PPPTIK managers); and (2) 33 UNISMA participants (53 teaching lecturers and 13 PPPTIK). The role of the participants (lecturers) is to provide information about their experiences and views on the use of ICT in supporting the implementation of e-learning in the subjects taught. The criteria for the lecturers selected as participants are lecturers who teach economics and digital technology courses, use e-learning for more than two semesters, and have attended e-learning training based on the moodle program. And the role of the participants (PPTIK manager) is to provide information about the development of ICT, especially those used in technology-based learning systems on campus. Researchers used a code of ethics by asking in advance about the participants' willingness to participate in this study. Next, the researcher conducted a formal licensing process for the participants. Participants have the right to keep their confidentiality, so the researcher uses initialization as a pseudonym.

Table 1
Participant Description

Variable	UNUSA	UNISMA
Partisipant	28 lecturer 5 PPPTIK manager	25 lecturer 8 PPPTIK manager
Gender	13 female 15 male	14 female 11 male
Age Group	age 28-35 year, 11 participant age >35 year, 17 participant	age 28-35, 10 participant age >35 year, 15 participant

Instruments

Observation and structured interviews with four indicators and eight study items were utilized as instruments. Structured interviews were utilized to collect data from study participants using a systematic technique in which the researcher asked a series of questions in a preset order and the responses were recorded in a standardized format. Face-to-face observations and interviews were carried out with the utmost care. The researcher created a left-grid design of the instrument in order to get valid study instruments. This grid aims to show the relationship between the research themes and the data sources that have been collected. In the study, each theme was given an explanation until it became a question item. Researchers formulate question items based on themes obtained from previous research studies which are then submitted to experts to select instruments that have good precision (see table 2)

Table 2
Interview Guidelines and Observation Guidelines

Observation	Interview
The observations made were observing the seriousness of the campus in developing ICT in supporting the implementation of e-learning, including: 1. Objective: to obtain good information and data regarding the physical and non-physical conditions of the implementation of ICT development 2. The aspects observed are the location of the campus, the physical environment of the campus in general, ICT rooms, development strategies and methods, ICT equipment/labs, atmosphere/climate in the process of developing ICT and e-learning, process activities and anyone who plays a role in the development of the ICT.	Interviews were conducted with PPPPTIK lecturers and managers 1. Lecturer – the goal is to find out how far the implementation of e-learning on campus is 2. PPPTIK Manager – the aim is to find out the extent of ICT development in supporting the implementation of e-learning

Researchers first prepare instruments by considering the factors that influence someone in the field of education to use technology, such as learning aids, competency and skill standards, educational management support, and decision support systems, before consulting with colleagues to ensure that the tools are truly appropriate.The interview consisted of one major theme, namely e-learning in the development of ICT and 7 aspects were arranged as a draft instrument, the following aspects were examined: a) characteristics of learning using e-learning; b) characteristics of the instructor; c) E-learning environment and ICT-based service development; d) quality of ICT institutions and services; e) the quality of infrastructure and ICT systems; f) the quality of courses and information obtained by the academic community; and g) motivation of lecturers and ICT managers. The purpose of the interview instrument is to generate questions that will allow the essential information to be gathered in a fashion that is appropriate for this study. Table 3.

Table 3

Instrument

RQ1: What is important about the development of ICT in supporting the implementation of e-learning at the Islamic Universities of Nadhatul Ulama in Indonesia?
1. State your identity? 2. How is your participation in ICT development? 3. To what extent is the development of ICT in supporting the implementation of e-learning on campus? 4. According to your experience, what is important about the development of ICT in supporting the implementation of e-learning on campus?
RQ2: How can the development of ICT support the development of e-learning at the Islamic Universities of Nadathul Ulama in Indonesia?
1. In your opinion, how can strategy-taking in ICT development support the implementation of e-learning? 2. According to your experience, what are the inhibiting and supporting factors for implementing e-learning on campus?
RQ3: Why does the development of ICT need to support the implementation of e-learning at the Islamic Universities of Nadathul Ulama in Indonesia?
1. Explain your motivation in using e-learning on campus? 2. In your opinion, why does the development of ICT need to support the implementation of e-learning on campus?

Data Collection Procedures

Data collection techniques were carried out by observation, interviews, and documentation studies. Observations and interviews were conducted with several lecturers and managers of PPPTIK at UNUSA and UNISMA.

a. Observation

Research observation is a data collection method that involves attentively observing or examining information at the research site to determine the conditions that exist and obtain the information data required for this study. Researchers came directly to the location to make observations related

to ICT development in supporting the implementation of e-learning on campus with complete health protocols to prevent the spread of Covid 19. Because the university allows only a few face-to-face interactions with special needs, observations can be made directly. Researchers pay close attention to the data sources obtained from participants on both campuses. Participants were invited to a room at the ICT building campus by researchers accompanied by PPPTIK staff. Observations were made during PPPTIK business hours, specifically Mondays. The primary goal of observation is to collect data and information on both the physical and non-physical aspects of ICT adoption and development. In addition, the researcher observes the ICT space as well as ICT development methodologies or equipment.

b. Interview

Before the interview, the researcher has established a timetable for participants on both campuses, including distinct sessions and days. The interview was place at UNISMA on the first day, with 33 participants, and at UNUSA on the second day, with the same number of participants. Schedule the first session (morning) at 08:00-12:00 WIB for participants (lecturers) and the second session (afternoon) at 13:00-15:00 WIB for participants (lecturers) (PPTIK manager). According to the researchers, the average interview time per participant was around 30-45 minutes. A lecturer assisted the researcher in recording the discourse during the interview. While tracking the subject of the questions, which covered performance expectations, business expectations, facilitation settings, and self-efficacy, the researcher took field notes and transcript notes. The interview began with a tour question and then moved on to a substantive topic about the necessity of ICT development and ICT assistance for implementation. The researcher summarizes what is seen, heard, felt, and questioned during the tour question stage in order to acquire a general picture of the situation and conditions that are the subject of research.

c. Document analysis

The researcher collected several official documents in the form of PPPTIK manuals and reports on ICT implementation programs reports which contain the availability of ICT-based services, implementation of e-learning, and their impacts. A public document from PTNU in the form of reports on PPPTIK operations, strategic plans, and ICT advances best meets the study question. Personal papers, such as assignment notes and participant posts/blogs on campus ICT, as well as documents containing physical evidence objects, such as training materials, handbooks, and the

PPPTIK agenda Other sources come from a variety of historical research, as well as ICT NU and PTNU Indonesia's track records and ideology.

Data Analysis Techniques

The research design of this study is based on Donalek (2004) phenomenological theory and Hallett &Barber (2014) cyber ethography theory. Describe participants' experiences with the phenomenon being studied, list important questions according to topics, take questions and group them into meaningful units, write textural descriptions of participants' experiences, and describe structural descriptions, according to Donelek's theory (2004). Setting a participant as a key informant, conducting interviews, researchers' attention to the object of research, and starting to ask descriptive questions are the first steps in Hallet & Barber's (2014) theory, which are followed by interview analysis, conducting domain analysis, determining focus using taxonomic analysis, asking contrast questions using componential analysis, and finally writing down the results. As a result, data analysis entails going over the sequence of data, organizing it into patterns, categorization, and basic description units, as well as identifying themes and working hypotheses. Because the goal of this study is to descriptively describe the phenomena of ICT development in ICT implementation in order to make conclusions. Furthermore, data analysis was conducted by building actual phenomena in the study object, with the goal of providing a unique image of ICT development in the two Nadhatul Ulama campuses. The process of data analysis begins with collecting data from previous studies to create a theme so that the research theme is obtained, namely the development of ICT and e-learning. After the theme is determined, the selection of the unit of analysis is carried out according to the research objectives. Selection of the unit of analysis related to the participants as research subjects. Thus, the unit of analysis in this study is the intention to develop ICT in supporting the implementation of e-learning for PPPTIK lecturers and managers.

The data that has been studied and analyzed is reduced by making abstractions that summarize the essence, processes and statements of participants. The next step is to organize the data in categorization units and code them. The coding focused on five dimensions of the problem, namely performance expectations, effort expectations, facilitation conditions, self-efficacy, anxiety levels. The last step of data analysis is to check the trustworthiness of data using triangulation of the data with the aim of increasing the degree of confidence in the data so that the data can be accounted for. Checks with peer-debriefers with colleagues/colleagues take the form of discussions regarding

the research process and results in order to obtain feedback on methodology and action implementation. After this stage, the next step is the process of interpreting the data in processing temporary results to answer research questions in substantive form to then draw conclusions and suggestions. The data interpretation process was carried out by the researcher by describing the meaning of the participants' experiences and organizing the data by focusing it to answer the research problem formulation. Researchers provide a critical view of the results of data analysis that has been carried out and relate them to theories and previous research studies that are relevant to the problems faced in this phenomenon.

Results and Discussion

RQ1: What is important about the development of ICT in supporting the implementation of e-learning at the Universities of Nadhatul Ulama in Indonesia?

This research has investigated the role of ICT development in supporting the implementation of e-learning at two major Nadhatul Ulama campuses in Indonesia. The first finding reveals that the development of ICT as an independent e-learning medium can provide new experiences in learning that are not limited by space and time but are still within the scope of moderate Islamic religious values. Learning can be done anytime and anywhere as long as it is covered by the internet network. By increasing the development of ICT, internet facilities with various platforms become more accessible, especially on campus. Thus, campus residents can explore general science and moderate Islam. Facilities that have been developed by ICT and can be utilized by campus residents are e-books, e-libraries, interaction with experts, email, and others. The importance of ICT development in supporting the implementation of e-learning at universities has also been explained by several previous studies.

The literature states that the use of ICT in education can improve the quality of student learning, expand access to education, and help visualize more innovative and creative learning ideas (Bandyopadhyay, Bardhan, Dey, & Bhattacharyya, 2021). Other findings reveal that ICT development can support more effective e-learning in terms of communication and administration(Bukar & Mustafa, 2020). Thus, it is clear that the development of ICT is very important in supporting the implementation of e-learning in order to increase the competence of lecturers and students, especially in absorbing religious knowledge. Improving ICT as a pedagogical tool provides cognitive and affective benefits in education. This is the main driving force in supporting the implementation of more advanced e-learning (Foutsitzi & Caridakis, 2019;

Cener et al., 2015). Higher ICT development has a positive effect on the implementation of e-learning so that student learning outcomes can be maximized. Although there are other supporting factors that depend on the subject and the type of technology used(Fernández-Gutiérrez et al., 2020; Ige, 2019).

Based on the results of the research, it is known that UNUSA and UNISMA have started to be strict in implementing e-learning since the Covid 19 pandemic but only UNISMA has strengthened ICT. UNISMA Malang has the best server network equipment or devices where the wifi internet network is fast, easy, convenient, and free for all UNISMA members. This is a major progress in efforts to improve the quality and quality of PTNU towards the Moderate Islamic Campus and World Class University. Interviews with participants, considering data 1.

(1) "UNISMA already has a Center for Management and Development of Information and Communication Technology (P3TIK) which is in charge of providing services and complaints related to ICT. The services are; 1) Mikrotik Network Management service, which is a service that manages and manages client connections in the internal network and towards the external; 2) Linux Web Hosting, which is a service for storing data and displaying internet information; 3) Web Service, namely web design or web creation services with a collection of online content including documents and applications; 4) data center, namely a centralized repository, both physical and virtual for storage management, dissemination of organized data and information; 4) now-Unisma- Wifi hotspot, which is an internet service that can be used directly to support the teaching and learning process; 5) Academic Information System (SISFO-Kampus) which is an application intended for the entire campus community; 6) online learning is a learning tool used by lecturers and students; 7) Open Journal Systems (OJS), namely suggestions provided as a place to accommodate and publish journals; 8) Open Conference Systems (OCS), which is a place to accommodate and publish regional, national, and international seminars; 9) Gmail.com Email account, which is a means to send and receive letters in digital format; 10) Nextcloud (Letter Warehouse) which is a centralized mail archive storage place; 11) Agenda Information System (SIAGA), namely the agenda list service with Scheduled and Ongoing status; and 12) Electronic Kits (E-LA), namely application letter services to P3TIK with various statuses."

Based on the results of these interviews, it is known that there are at least 12 ICT-based services that have been developed. So not only improving e-learning features that are more sophisticated in addition to the simplest form of a website but also e-learning in the form of learning software or LMS that can be accessed anywhere as long as access to the internet is available. In addition, recent literature explains that in the mission of education to meet the needs of the labor market it is necessary to improve and update the development of education, training programs, and methods

(Tri et al., 2021). More precisely the renewal in the field of digital technology. In fact, several well-known universities in Indonesia such as Padang State University have developed blended learning based on integrated learning for more innovative learning and able to improve cognitive, affective, and 4C abilities (communication, collaboration, collaboration, and creativity) as well as psychomotor students and lecturers (Jalinus et al., 2021). This is the reason the development of e-learning which is part of ICT is very important to open up opportunities and take advantage of the benefits of this revolution. Considering data 2.

(2) "Complete e-learning facilities are available in the form of an LMS. The state-of-the-art LMS has been running for almost a year and has been further improved since the implementation of the Covid 19 emergency PPKM. The facilities provided include student attendance management, learning material management, learning process management, and evaluation as well as communication management with the facilitators. E-learning facilities have provided many conveniences for learning activities without face-to-face meetings."

Various applications and academic management facilities can be accessed by the entire academic community. UNISMA's email account has been integrated with google apps, and even SIAGA has a data sorting feature based on units or institutions that input data for various activities. What is more interesting is that E-LA is in the form of an application letter service to P3TIK which is useful for monitoring the results of application letters with various statuses such as waiting, process status, finished status, and cancel status. One of the main advantages of P3TIK is that there is an academic Management Information System (MIS) service application available with the Windows operating system and an online learning information center. Meanwhile, UNUSA uses a simpler management information system called 'eSorogan'. Not many ICT-based features or services have been found, such as those of UNISMA. This finding is different from the findings in a previous study conducted by Tchamyou et al. (2019). The findings of Tchamyou et al. (2019) states that ICT has no significant effect on inequality and economic growth. It is important to note that the impact of ICT on education depends on the subject and the type of use of ICT (Daguet, 2021).

However, both campuses have made progress in terms of information technology because they use the concept of multi-application to ensure the continuity of online lecture activities where lecturers can choose applications and learning management systems (LMS) such as Google Meet, Zoom, Google Classroom, and Edmodo. This is considered more flexible because it allows lecturers and students to get the latest features and the best experience from each application. Thus the purpose

of the campus to reduce educational inequality with e-learning is getting clearer in front of the eyes.

RQ2: How the development of ICT can support the implementation of e-learning at the Universities of Nadathul Ulama in Indonesia?

The second finding reveals that the development of ICT can support the implementation of e-learning optimally with adequate ICT infrastructure and facilities so as to enable lecturers and students to be in an e-learning system which is expected to minimize the possible negative impact of the use of ICT. Although indeed to provide facilities and infrastructure will require investment because the development of more sophisticated ICT will require a large budget. Previous literature revealed that without adequate infrastructure for ICT development it could affect students' academic achievement because the e-learning method was not optimal in the teaching and learning process (Ainon & Rosmaizura, 2019). Inadequate ICT infrastructure and budgetary constraints are the main causes of weak success in the implementation and provision of e-learning(Kibuku et al., 2020). Although e-learning is only applied to compulsory subjects, this step is quite advanced when compared to PTNU owned by pesantren under LPTNU and PTNU based on other Universities foundations which are still massive. Interviews with participants, considering data 3.

(3) "Since the pandemic took place last year, UNISMA has accelerated the implementation of ICT strengthening. Currently, some of the benefits of using ICT have been felt. We have broad access to various information related to academic activities. The quality of learning, although initially experienced many obstacles in the process of adapting technology, has now undergone many improvements including the quality and quality of learning between lecturers and students. We learned a lot in developing digital technology-based learning materials such as making interactive learning videos, participating in international conferences, and using e-learning."

It is understood that ICT has become a source of curriculum and content that has unlimited capacity for better access to knowledge. ICT has offered enormous advantages and benefits in supporting a higher-quality learning system at PTNU. As previously said, student characteristics, teacher characteristics, the E-learning environment, the quality of institutions and services, the quality of infrastructure and systems, the quality of courses and material, and motivation all play a role in the success of E-learning. E-learning literacy, as well as digital media skills, training programs, and e-learning literacy, are significant variables to consider while implementing E-learning

(Kaisara & Bwalya, 2020). For example, participants explained that students can easily access learning materials. Considering data 4.

(4) As educators, the use of e-learning makes it easier for us to assess student competencies and abilities. A computerized basis can provide test results as they should. Thus reducing the risk of cheating. This is also the standard of education obtained after the existence of ICT."

Therefore, ICT is a priority that must be understood by all lecturers as the current standard of competence. The study states that ICT has improved the quality and quality of learning, increased the professionalism of lecturers, and increased the effectiveness and efficiency of management, management, and administration of educational institutions (Tatnall, 2020). Considering data 5.

(5) "The obstacle we feel while using e-learning is that the supporting facilities and infrastructure are still limited. In addition, we still lack experts in the field of ICT. But in the future, plans and strategies will be made to strengthen ICT so that e-learning can become a more effective learning method. For internet availability, it is quite capable."

Based on interview and observation data, as well as several previous literature studies, it is clear that the problems that occur in these two campuses are not due to unstable network problems as is generally reported in previous studies investigating challenges and obstacles in e-learning-based learning methods in development. ICT in universities is rather a management problem and limited human resources who are experts and understand in the field of ICT. Studies conducted by Santosa & Devi (2021) and Branch et al. (2021) stated that Islamic Universities experienced technical problems with unstable networks and infrastructure during the use of e-learning which resulted in less effective learning activities. Thus, both UNISMA and UNUSA are quite successful in implementing the e-learning method development policy in the development of ICT.

RQ3: Why ICT development needs to support the implementation of e-learning at the Universities of Nadathul Ulama in Indonesia?

Based on the data analysis that has been done, the third finding reveals the reason for the development of ICT to support the implementation of e-learning at the Islamic University of Nadathul, namely because these two NU campuses have a vision, mission, and goal to become a moderate Islamic university in the international arena. Thus, the development of ICT is the main requirement in addition to the basis of religious education as a modern learning medium (*khalaf*). Previous studies explained that one of the main factors influencing Islamic universities to develop ICT, especially e-learning methods, was to become a moderate International Islamic University

(*wasatiyah*)(Abubakar & Hemay, 2020; Ademola, 2019). The success of the implementation of e-learning is influenced by the readiness of many factors, one of which is the support from educational institutions and its characteristics in upholding the noble values of *Ahlu Sunnah Wal Jamaah (Aswaja)* as a capital for character building and inculcating nationalism in the tri dharma of Universities which is strengthened by the existence of P3TIK from the aspect of LMS. Considering data 6.

(6) "The application of the concept of the e-learning method cannot be separated from learning about the values of *Ahlu Sunnah wal J*amaah, namely maintaining the congregation or the integrity of Muslims, being *tasamuh* and *tawassuth, tawazun* or balanced and *Ahlussunnah* always being *I'tidal*. This is an internalization of the noble values of character building that supports learning at PTKI which is characterized by the NU organization. The main thing is to cultivate nationalism and local wisdom."

UNISMA and UNUSA focus on e-learning in the development of ICT while still upholding Islamic values. This study also found that UNUSA and UNISMA have their own characteristics which are advantages in terms of e-learning learning methods compared to Islamic universities in general. Both are able to adapt from salaf to modern by adopting ICT developments. This is different from the findings in previous research studies which revealed that in general NU educational institutions are traditional pesantren (*salafiyah*) (Zarkasyi, 2019). So that the majority of NU campuses develop traditional learning systems. This finding reveals that there are NU campuses that have developed ICT as the first step towards an international moderate Islamic University. So it can be understood that the NU campus not only adheres to Islamic Traditions to promote moderation, compassion, anti-radicalism, inclusiveness and tolerance (Abidin et al., 2020; Purwanto et al., 2019) but also develops modern learning methods to improve the competence of students in the face of global competition. This finding has demonstrated the novelty of ICT strengthening that affects e-learning readiness at PTNU in Indonesia, where university policies aimed at increasing ICT development support more effective e-learning with careful and accurate evaluation so that it can have a positive impact on educational outcomes.

Conclusion

The purpose of this study is to explore the two best PTNU universities related to the development of ICT in supporting the implementation of e learning in the era of the industrial revolution 4.0. From the results of research and discussion, it can be concluded that there are three main points.

First, that the development of ICT contributes greatly in maximizing the use of e-learning based on moderate Islamic education, especially on campuses that have a strong internet network. The results of the first study also found that UNISMA is better prepared for E-learning because a number of ICT services managed by P3TIK have been developed and continue to undergo renewal that facilitates better access to e-learning. Meanwhile, UNUSA is still struggling to attract teachers and students to use E-learning on a regular basis. Also the lack of support from the executive level to make flexibility in the teaching and learning process relevant to the implementation of E-learning. The second conclusion is that the development of ICT can support the implementation of e-learning by improving the ICT infrastructure even better. In the development of ICT in Universities under Nadhatul Ulama Indonesia, ICT has progressed which is superior in supporting the implementation of ICT. Although there are still various problems of complexity due to the lack of support from human resources and decision makers in terms of management support. But the positive thing is, the entire academic community can experience new and modern experiences and knowledge. The third conclusion is that both campuses carry out ICT development in supporting the implementation of e-learning to strengthen moderate Islam. Future research needs to consider quantitative research methods and use a wider coverage area. Other factors that influence e-learning and the development of ICT need to be included in the material for further research studies. This study revealed something new about the importance of ICT in enhancing the preparedness of efficient e-learning learning approaches. This is one of PTNU's endeavors toward becoming an international moderate Islamic university, which is intended to have a good impact on student competency in the modern period.The researcher recommends the need for campus and government policies in increasing the strength of ICT not only in academic services but also in the development of quality and quality in order to achieve moderate Islamic campuses and go international campuses.

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