Jurnal Pendidikan Progresif

Human Resource Development of Islamic Boarding Schools in Mastering Information Technology in Pringsewu Regency

Abdul Hamid*, Muhtarom, Mohammad Masrur, & Salamun

Department of Islamic Education Management, Sekolah Tinggi Ilmu Tarbiyah Pringsewu, Indonesia

*Corresponding email: abdulhamidpring@gmail.com

Abstract: Human Resource Development of Islamic Boarding Schools in Mastering Information Technology in Pringsewu Regency. Objective: This study aims to analyze the development of human resources in Islamic boarding schools in Pringsewu Regency in mastering information technology as a response to the Industrial 4.0 era. **Methods:** The study uses a mixed method research approach with a case study design, involving operators, managers, administrators, and ustadz/ustadzah selected through purposive sampling. Data collection methods include interviews, observations, and documentation, with data analyzed descriptively through data reduction, presentation, and conclusion drawing. **Findings:** The findings indicate that mastery of information technology in Islamic boarding schools remains suboptimal due to limited infrastructure, inadequate internet access, and a lack of technological devices. Additionally, most teaching staff and managers lack IT-related educational backgrounds, hindering the effective integration of technology in both learning and administrative systems. While some Islamic boarding schools have started using digital platforms such as e-learning and social media, their usage remains limited. **Conclusion:** The study concludes that enhancing HR capacity requires improved infrastructure, IT training for educators and managers, and better utilization of digital technology. These efforts will help Islamic boarding schools in Pringsewu adapt to the digital era, enhance educational quality, and strengthen their competitiveness in the education and technology sectors.

Keywords: islamic boarding school, human resources, information technology.

To cite this article:

■ INTRODUCTION

At the Hannover Fair, April 4-8, 2011, the term Industry 4.0 was first coined. This term is used by the German government to advance the industrial field to the next level, with the help of technology (Fonna, 2019). Industry 4.0 is an industrial revolution concept that combines information and communication technology with production and automation technology to create a smart and connected production system. The term refers to the use of digital technologies, such as the Internet of Things (IoT), big data, artificial intelligence (AI), and robotics to accelerate production processes, improve efficiency, and provide better adaptability for companies in the face of changing markets and consumer needs.

The term Industry 4.0 itself refers to an industrial evolution that has undergone several phases before. The first industry (Industry 1.0) was a mechanical era with the use of steam power, the second industry (Industry 2.0) involved electricity-based mass production, and the third industry (Industry 3.0) was related to automation and computerization. Industry 4.0 represents a

new era that marks the connectivity and integration of smarter production systems.

In Indonesia, the development of Industry 4.0 is strongly encouraged by the Ministry of Industry, because it is a transformation towards improvement by integrating the online world and production lines in industry, where all production processes run with the internet as the main support today (Purba et al., 2021). The role of the Ministry of Industry in encouraging the development of Industry 4.0 in Indonesia is quite relevant to the government's efforts to face an increasingly digital and connected industrial era. This is influenced by industrial transformation directed towards Industry 4.0 which is a strategic step for the country, to increase competitiveness and efficiency in the manufacturing sector and other industries. Industry 4.0 offers the potential to accelerate economic growth, increase productivity, and create new jobs through the application of advanced technologies.

In facing the challenges and opportunities of Industry 4.0, Indonesia's Ministry of Industry acts as a prime mover in encouraging the adoption of digital technology and industrial revolution in the manufacturing sector. One of the efforts made is to build awareness and understanding of Industry 4.0 among industry players through various seminars, workshops, and training programs. This step aims to provide insight into the potential of technology that can be applied in the production process, so that the industry is better prepared to face digital changes.

In addition, the Ministry of Industry also collaborates with various stakeholders, academics, and industry experts in formulating roadmaps and policies that support the adoption of Industry 4.0. These policies are designed to create a conducive environment for the development of digital technology in the industrial sector, so as to encourage innovation and increase competitiveness. On the other hand, the development of technology infrastructure is also a major concern, including the improvement of wider and faster internet access to support connectivity between devices and companies.

As a concrete form of support, the government also provides funding and various incentives for companies that adopt Industry 4.0 technologies. This financial support aims to encourage more companies to invest in technologies that can improve their operational efficiency and competitiveness in the global market. With these strategic steps, the Ministry of Industry hopes to accelerate digital transformation in the manufacturing sector and ensure Indonesia is ready to compete in the era of the industrial revolution 4.0.

Then Indonesia's seriousness in facing Industry 4.0 was also revealed by the launch of a road map and strategy towards the fourth volume of the industrial revolution era on April 4, 2018. It contains the direction of movement of the national industry in the future which Joko Widodo - President of the Republic of Indonesia - called "Making Indonesia 4.0" (Adha, 2020).

The emergence of the industrial era 4.0 is not an event that suddenly appears, but stage by stage until the current level is sourced from a strict technological embryo. Then at the beginning of the 21st century in the 2010s began to emerge society 4.0 which was characterized by the emergence of various high technologies, such as cloning, global communication networks, nano-technology (Alfin, 1992). The rapid development of technology has penetrated almost all aspects of life, including in the financial sector, education, and social life, both in the formal and informal spheres (Rokhmawati, 2022). The impact of this advancement in digital technology is very significant, especially in various sectors that affect human daily activities.

In finance, technology has changed the way individuals interact with financial institutions, such as banking and payment systems. The advent of digital banking services, including internet banking

and mobile banking apps, has made access to financial services easier, enabling transactions to be conducted more quickly and efficiently. In addition, the development of blockchain technology and cryptocurrencies has also changed the way people conduct transactions and investments, providing a more transparent and decentralized financial system (Schwab, 2017).

In education, technology has revolutionized learning methods with the advent of online learning systems, e-learning platforms and various digital resources. These innovations allow access to knowledge from any location and give students the flexibility to learn at their own time and pace. In addition, the application of augmented reality (AR) and virtual reality (VR) further enriches the learning experience, creating a more interactive and immersive atmosphere for learners (Hatammimi & Krisnawati, 2018).

Meanwhile, in social life, technological developments have changed the way people communicate and interact with each other. Social media is now the main platform for individuals to share information, communicate and build relationships with people from different parts of the world. In addition, technological advances also affect the way people access news and information, creating greater openness in information dissemination and accelerating the flow of global communication (Nugroho et al., 2020).

Inseparable from this is the demand for the world of Islamic boarding Schools to be able to adjust and adapt to the development of information technology (Muali et al., 2020). Pondok Pesantren is a traditional Islamic educational institution that has existed in Indonesia since colonial times (Syafe'i, 2017). The term "pondok" comes from the Javanese language which means a place to stay, while "Islamic boarding Schools" comes from the Arabic "fashâtrah" which means a place to stay or camp (Alwi, 2013).

Islamic boarding Schools functions as an Islamic educational institution that provides religious education and Islamic sciences to santri (students). Santri live in dormitories or huts during their study period, so the term "pondok" also refers to the residence or dormitory of the students (Hasyim, 2015). Education in Islamic boarding Schools has its own characteristics, where Islamic religious education is the main focus, especially in learning the Koran, hadith, tafsir, fiqh (Islamic law), and morals (ethics). In addition, students also learn Arabic as the main language in understanding Islamic teachings.

Nowadays, Islamic boarding Schools have undergone development and transformation in accordance with the demands of the times. Some modern Islamic boarding Schools have combined religious curriculum with general learning such as natural and social sciences, mathematics, and Indonesian language. This is done to provide a balance between religious education and general knowledge that is relevant in facing global challenges.

Islamic boarding Schools have an important role in Islamic culture and education in Indonesia, and many of them have become centers of learning, religious understanding, and social development in the community. Some Islamic boarding Schools also have links with certain Islamic organizations and are places of higher study for aspiring ulama (religious leaders).

In general, Islamic boarding Schools can be considered as one of the important pillars in the Indonesian education system that focuses on religious and moral education for students, as well as passing on Islamic values and local wisdom to the younger generation. Pondok Pesantren in facing the rapid development of information technology, must be able and able to adapt and be able to make changes in order to have broad capabilities so that the sustainability of the world of Islamic boarding Schools will continue to be able to compete with contemporary educational institutions (Arif, 2013). The government is

aware of the importance of the continuity of Islamic boarding Schools education to remain, as a place for the development of human resources, especially in the religious sociocultural field. Therefore, Law Number 20 of 2003 concerning the National Education System (Sisdiknas) was issued which provides ample opportunities for the development of Islamic boarding Schools. The law has removed the discrimination against religious education that took place so far. Concretely, diniyah education and Islamic islamic boarding schools have been recognized as a form of religious education as stated in Article 30 paragraph 4 of the National Education System Law.

Chris Rowley and Keith Jackson (2012) state that human resource development is a process that aims to improve workers' knowledge, skills, and abilities. This process also includes developing various competencies through training and development, organizational learning, leadership management, and knowledge management to improve work performance. Therefore, developers and managers of Islamic islamic boarding schools are required to be able to understand the basics of using the internet, such as the World Wide Web (www), electronic mail (e-mail), telnet, file transfer protocol (FTP), gopher, chat groups/internet relay chat (IRC), and newsgroups. Not only that, they must also be able to master various supporting applications so as not to be left far behind with educational institutions outside the Islamic Boarding School. This needs to be done because with the existence of information technology, the relationship between the boarding school and the community will be more harmonious, efficient and delivered precisely and quickly.

Information technology has an important role in strengthening the relationship between Islamic boarding Schools and the community. One way that this can be done is by utilizing social media and websites as an effective means of communication. By using platforms such as Facebook, Twitter, Instagram, and official websites, Islamic islamic boarding schools can share real time information about activities, events, and other important announcements. This activeness in managing digital media allows the community to more easily access information and stay connected to developments at Islamic boarding Schools (Syifa'Nurdi, 2023).

In addition, the development of a special mobile application for Islamic boarding Schools is also an innovative step in bringing the community closer to the world of Islamic boarding Schools. This application can contain various features, such as activity schedules, important announcements, and religious teaching materials that can be accessed anytime and anywhere. Not only that, the establishment of online discussion groups through platforms such as WhatsApp or Telegram further facilitates interaction and information exchange between students, teachers, and the general public. With this discussion group, the community can get faster access to information and discuss directly about various matters related to life in Pondok Pesantren.

The use of technology can also be realized through live streaming services for various important activities, such as recitation or big events organized by Islamic boarding Schools. By using platforms such as YouTube or Facebook Live, people who are far away or unable to attend in person can still follow these activities online. On the other hand, digital-based education such as e-learning and online training also opens up opportunities for Islamic boarding Schools to provide wider access to learning. This allows the spread of religious knowledge and local wisdom to reach more people, including those who cannot attend face-to-face learning.

In addition to supporting education and communication aspects, information technology also plays a role in social activities, such as fundraising and online donations. By providing

an easily accessible donation platform, people can contribute in supporting the sustainability of Islamic boarding Schools more practically. More than that, information technology is a very useful tool in the dissemination of crisis information, especially in emergency situations or natural disasters. Through social media or short message applications, the Islamic boarding Schools can provide fast and accurate information regarding emergency steps that need to be taken by the community.

The utilization of information technology in the Islamic boarding Schools environment not only increases connectivity with the community, but also expands the reach of da'wah, improves communication efficiency, and provides wider access to learning and religious activities.

By utilizing information technology wisely, Islamic boarding Schools can strengthen relationships with the community, improve accessibility, and expand the reach of their religious messages and educational programs. It is important to ensure that this technology is used ethically, transparently, and responsibly to achieve positive goals in building harmonious relationships with the community. Therefore, the researcher formulated the research flow as follows:
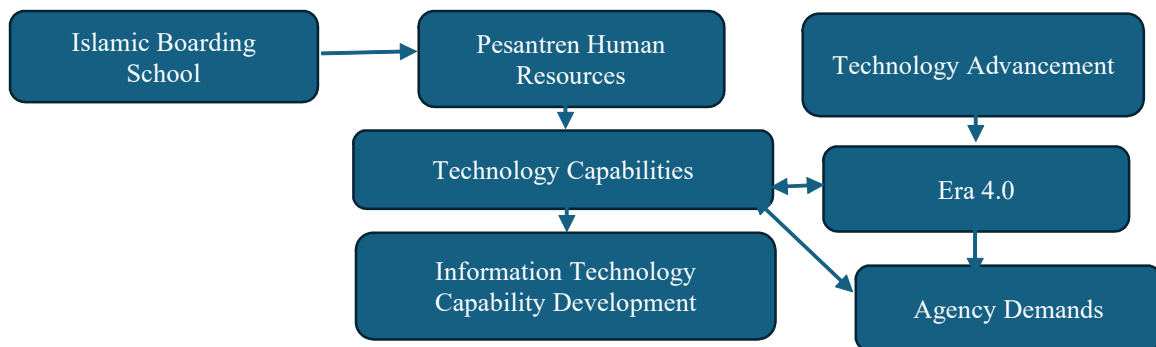
Figure 1. Fremework research

Although digital technology is growing, the development of human resources in the environment Islamic boarding Schools still faces various challenges in its utilization. One of the main obstacles is the limited knowledge and skills in technology. Many teachers in Pondok Pesantren do not have sufficient understanding and expertise in operating and utilizing technology effectively. This makes the integration of technology in the learning and administrative processes of Islamic boarding Schools less than optimal.

In addition, the absence of a curriculum that includes technology material is also a factor that hinders the development of digital literacy in Islamic boarding Schools. Some Islamic boarding Schools still consider that the use of technology is contrary to their values, so information technology knowledge is not a priority in the curriculum, except for Islamic boarding Schools that have formal education. As a result, many santri do not realize the importance of technology in modern life and focus more on the compulsory materials of Islamic boarding Schools. In fact, many Pondok Pesantren alumni, after leaving the Islamic boarding Schools environment, realize that they desperately need skills in information technology management, but do not have sufficient provision in this field.

Lack of support and motivation from the Islamic boarding Schools environment is also a challenge in developing technology skills. Some Islamic boarding Schools do not encourage the use of technology, either due to a lack of awareness of the benefits that can be obtained

or due to concerns that technology can threaten the existing traditions of Islamic boarding Schools. In addition, the lack of adequate facilities and infrastructure is also a factor that hinders the development of information technology skills among students and teaching staff. As a result, Pondok Pesantren still face major obstacles in adjusting to the rapid development of the digital era.

Based on the results of initial observations, the activeness of Islamic boarding Schools on social media in Pringsewu Regency with a total of 53 Islamic boarding Schools, the following data were obtained.

Table 1. Number of islamic islamic boarding schools in pringsewu regency

No	District	Number
1.	Pringsewu	17
2.	Ambarawa	8
3.	Gadingrejo	3
4.	Pardasuka	2
5.	Sukoharjo	1
6.	Adiluwih	12
7.	Pagelaran	7
8.	Banyumas	1
9.	Pagelaran Utara	2
	Total	53

Based on the diagram above, it shows that there are still many Islamic boarding Schools in Pringsewu Regency that are not familiar and closely related to information technology. There are still 57% of Islamic Islamic boarding schools that have not been able to utilize information technology. So that various daily, weekly, monthly and even annual cottage activities are still carried out manually. Both related to financial administration, financing to the distribution of information that still uses paper (letters, invitations etc.). Whereas in formal schools, matters related to these issues have implemented the concept of digitization (online). Even from the beginning of registration to the graduation stage, it has been digitized with a systematic system. The existence of formal schools has not been able to produce human resources of Pondok Pesantren who are truly capable of operating information technology properly.

To answer these challenges, stakeholders, managers, or caregivers of Islamic Boarding Schools must change the mindset regarding the benefits of information technology so as not to be left behind compared to formal education institutions in facing the current digital era. In addition, Islamic boarding Schools managers must be able to think ahead regarding the intensity of increasingly fierce global competition, where Islamic boarding Schools alumni are required to be able to compete, keep up, and even be superior to formal school graduates, especially in terms of mastery of information technology. This research will explore the extent of mastery of information technology among santri and teachers, identify the main obstacles faced by Islamic boarding Schools in integrating technology into their education system, and look for strategies that can be applied to improve digital literacy and information technology skills in Pondok Pesantren. Therefore, this research aims to examine the problem of mastery of information technology in Islamic boarding Schools with a focus on human resource development in the Pondok Pesantren environment in Pringsewu Regency.

■ METHOD

Participants

This research involved 53 Islamic boarding Schools in Pringsewu Regency as the object of research. The research participants consisted of Islamic boarding Schools operators, caregivers, and administrators or ustadz and ustadzah who were responsible for the management of Pondok Pesantren. A total of 10 caregivers and 25 administrators or ustadz ustadzah participated in this study. The sample selection was conducted using purposive sampling technique, where participants were selected based on their relevance to the management and utilization of information technology in Islamic boarding Schools.

Research Design

This research uses a Mix Method Research approach with a case study design to gain an in-depth understanding of the planning, implementation, and evaluation of human resource development in mastering information technology in Islamic islamic boarding schools. The research was conducted in several stages. The first stage is preparation, which includes the identification of the Islamic Boarding School as the object of research, licensing to the Islamic Boarding School, and preparation of research instruments. The second stage is data collection, which is carried out through interviews with Islamic boarding Schools operators, caregivers, and administrators, as well as observation of the use of information technology in the Pondok Pesantren environment. The third stage is data analysis, where the data that has been collected is processed using a qualitative descriptive analysis approach. The last stage is reporting the results of the research, which includes the main findings, discussion, and conclusions. The entire research process lasted for three months, starting from May to July 2024.

Research Instruments

The research instruments used in this study consisted of interviews, observation, and documentation. The interview instrument included 30 questions designed to explore in-depth information from Islamic boarding Schools operators, caregivers, and administrators regarding the utilization of information technology in Islamic boarding Schools. This interview covered several main aspects, namely the ownership of the social media platform of the Boarding School, the intensity of the use of the platform, the human resources who manage the platform, and the policies of the Boarding School regarding the development of human resources in the field of information technology. Instrument validity was tested using content validity by involving experts in the field of Islamic boarding school education and information technology. To ensure data consistency, reliability was tested by comparing the results of interviews and observations with official documents owned by the Islamic boarding Schools.

Data Analysis

The data analysis technique in this study used a qualitative descriptive analysis approach. The analysis model used refers to the concept of Miles and Huberman (1994) which consists of three main stages, namely data reduction, data presentation, and conclusion drawing and verification. Data obtained from interviews, observations, and documentation were reduced to filter out information that was most relevant to the research objectives. After that, the data were presented in the form of descriptive narratives to provide a clearer picture of the condition of mastery of information technology in Islamic islamic boarding schools. To ensure the validity of qualitative data, this study used data triangulation techniques by comparing the results of interviews, observations, and documentation.

In addition, validity was also tested with the member checking method, which is asking participants to review the interview results to ensure the accuracy of the data.

■ **RESULT AND DISCUSSION**

Overview and Condition of Social Media of Islamic boarding schools in Pringsewu

Regency Islamic boarding Schools as a place of religious education in Pringsewu Regency grows over time. The need for Islamic boarding Schools for the community is a supporting force for the existence of Islamic boarding Schools. Pringsewu Regency, as one of the regencies that has many long-established Islamic boarding Schools, has a significant influence for parents who want their children to gain knowledge in the religious field.

Based on data from the Pringsewu Ministry of Religious Affairs, there are 53 Pondok Pesantren in Pringsewu Regency, which are spread in almost every sub-district. Here are the details of the number of Islamic Islamic boarding schools in each sub-district, see the graph below:

Table 2. Number of islamic islamic boarding schools in pringsewu regency

No	District	Number
1.	Pringsewu	17
2.	Ambarawa	8
3.	Gadingrejo	3
4.	Pardasuka	2
5.	Sukoharjo	1
6.	Adiluwih	12
7.	Pagelaran	7
8.	Banyumas	1
9.	Pagelaran Utara	2
	Total	53

The graph shows that Pringsewu sub-district has the highest number of Islamic boarding schools with a total of 17, while Sukoharjo and North Pagelaran sub-districts have the least number of Islamic islamic boarding schools, with only 1 each. The large number of Islamic islamic boarding schools in Pringsewu Regency reflects the high interest of the community in providing in-depth religious education to their children. These Islamic islamic boarding schools not only function as educational institutions, but also as centers for moral and character development of the younger generation, which in turn contribute to the social and spiritual development of the people of Pringsewu Regency.

In the era of globalization and rapid digitalization, the development of information and communication technology has penetrated into various aspects of life, including education.

Islamic islamic boarding schools, as traditional educational institutions that play an important role in shaping the character and intellectuals of the younger generation of Muslims in Indonesia, have not escaped the influence of the development of digital technology. Pringsewu Regency, which has a number of Islamic Islamic boarding schools with diverse backgrounds and capacities, faces significant challenges and opportunities in developing human resources (HR) of Islamic Islamic boarding schools to be able to adapt and utilize digital technology effectively.

Digital transformation in the education sector of Islamic boarding Schools is not only limited to the introduction of technological tools, but also involves fundamental changes in teaching methods, curriculum, and management of educational institutions. Human resource development in Islamic boarding Schools includes

improving the digital competencies of teachers, students, and administrative personnel to be able to integrate technology in the learning process and management of Islamic boarding Schools. This is important to ensure that graduates of Islamic boarding Schools not only have in-depth religious knowledge, but also skills that are relevant to the needs of modern times.

This is in line with one of the SDGs Programs echoed by the government, which is related to SDG 4, namely increasing access to digital-based quality education. Through the integration of technology in learning, pesantren can provide e-learning platforms, online classes, and access to wider digital learning resources. This allows santri to acquire more comprehensive knowledge, develop 21st century skills, and reach quality education without being limited by geographical or economic factors. In addition, the utilization of technology in pesantren education can also strengthen inclusivity and ensure that all students, including those with limited access, still have equal learning rights. Thus, pesantren is not only a center of education based on Islamic values, but also an agent of digital transformation in the world of education.

Pringsewu Regency, with its strategic geographical location in Lampung Province, has great potential to develop digital technology-based Islamic Islamic boarding schools. However, this effort requires a comprehensive analysis of the needs, readiness, and appropriate strategies to implement digital technology in Islamic boarding Schools. This analysis includes an assessment of technological infrastructure, human resource readiness, policy support, and collaboration with various parties including the government, private sector, and the community.

Analysis of Ownership, Readiness, and HR Development Strategy of Pesantren *Social Media Platform Ownership Analysis*

Islamic islamic boarding schools are expected to give birth to Muslim intellectuals who always act or act in accordance with the provisions of the Qur'an and hadith by developing human resources, so that their alumni can always place themselves as a choir of ummah who can be a role model for the surrounding community. Fear Allah SWT and do not be afraid of His creation, create prosperity and peace on earth. Not easy to make Hoak and spread slander, dare to uphold truth and justice. Furthermore, in doing anything only to seek the pleasure of Allah SWT, because it is fully aware of the eternal happiness in the hereafter, has the characteristics of siddîq, amânah, tablîqh, fathânah, and always tawâdlu and tafakkur, has a high curiosity so that it can find new things that are beneficial to humans.

Based on the researchers' findings in Islamic Islamic boarding schools in Pringsewu Regency, 92% of Islamic Islamic boarding schools already have a mass media platform, while 8% of Islamic Islamic boarding schools do not yet have a mass media platform.

Table 3. Ownership of mass media platforms of islamic islamic boarding schools in pringsewu regency

Ownership Status	Percentage (%)
Owned	93.30
Not Owned	7.70

The diagram above shows that the awareness of ownership of mass media platforms of Islamic boarding Schools in Pringsewu Regency is very good. Only a small number of Islamic boarding Schools do not yet have a mass media platform. This shows that the awareness of the importance of mass media as a support for the running of Pondok Pesantren activities has been mutually understood by Islamic boarding Schools, especially managers and caregivers.

Islamic boarding Schools in general in Pringsewu Regency are also not conservative with the advancement of Technology (IT) in supporting various Pondok Pesantren activities.

The openness of Islamic boarding Schools in the world of technology was also conveyed by the chairman of Robithoh Ma'had Islami (RMI) Nahdlatul Ulama, KH. Abdul Hamid, Al Hafidz ((interview, May 18, 2024). He said that:

"The progress of Islamic islamic boarding schools today is strongly supported by the ability of human resources in managing and mastering IT, without a mass media platform, Islamic islamic boarding schools will experience difficulties in developing Islamic boarding schools."

Based on the results of these interviews, it can be concluded that the existence of IT is very influential on the development of the Islamic Boarding School itself. Especially Islamic Islamic boarding schools that are labeled as semi-modern or modern Islamic Boarding Schools (Islamic Islamic boarding schools with ownership of formal education (schools/madrasas) and non-formal education (Diniyah Islamic Islamic boarding schools). Slightly different from Salafi Islamic Islamic boarding schools (Islamic Islamic boarding schools that only focus on non-formal early childhood education). According to Marsum & Syahroni (2020) stated that the existence of Digital Information technology is able to support in various activities, including formal and non-formal learning, daily needs of santri, payment of obligations, and visits from santri guardians.

In addition to the social media ownership of the Boarding School, we also know what social media platforms the Boarding School has in supporting the activities of the Boarding School. Based on the results of data processing, it can be explained in the following diagram.

Table 4. Types of social media platforms ownership

Platform	Percentage (%)
Others	6.7
TikTok	20.0
Facebook	66.7
Twitter	6.7
Instagram	73.3
YouTube	66.7
E-mail	66.7
WhatsApp	86.7

The bar chart above illustrates that the most social media owned by Islamic boarding schools in Pringsewu Regency is WhatsApp, which is 86.7%. Furthermore, the second social media platform owned by Islamic Islamic boarding schools in Pringsewu Regency is Instagram, which is 73.3%. Meanwhile, Facebook, Email, and Youtube are in 66.7% of Islamic Islamic boarding schools that have these platforms. While Tiktok and others are at 6.7%.

This shows that Islamic boarding Schools in Pringsewu generally have WhatsApp as a social media platform compared to other social media. The Instagram platform is the second choice of various existing platforms, outperforming the social media platforms Facebook, Email and Youtube which have been around longer as social media platforms. Meanwhile, Tiktok social media is not the preferred platform by Islamic Islamic boarding schools in Pringsewu Regency.

This is in line with the results of an interview (May 15, 2024) with one of the operators of Islamic boarding Schools Madinatul Ilmi Ustadz Arifin, he said: "Generally, Islamic Islamic boarding schools have WhatsApp social media

because it is simpler and easier to use so that it is more effective in coordinating both among fellow managers in WhatsApp groups and with santri guardians. However, Pondok Pesantren also has groups on several other social media platforms such as Instagram, Facebook, sometimes Tiktok but only a few"

Based on the results of the interview, it can be explained that the condition of platform ownership at the Islamic Boarding School is more about the ease of use of social media platforms. Ownership of social media platforms has not yet led to a broader purpose and essence, namely the delivery of information related to various Islamic Boarding School activities that can be accessed by the entire community. Therefore, it is necessary to consider the manager of the Islamic Boarding School or the caregiver of the human resources of the Islamic Boarding School in increasing the effectiveness in building a wider

network not only among students, alumni and guardians of students.

This is in accordance with research conducted by Dini Meilinda (2023). Her research reveals the utilization of social media, especially Facebook and WhatsApp, as a means of communication to build public awareness and trust in Islamic boarding schools, with the main reason being that it is easier and many parents of students' guardians use these media platforms.

Utilization and use of Social Media platforms

The importance of utilizing and using social media is not only felt by formal institutions. However, the world of Islamic islamic boarding schools must be able to utilize social media properly. None other than because the ability to use and utilize social media will be easier to reach and disseminate information.

Table 5. Use of social media types of islamic boarding schools

Types of Social Media Platform	Percentage (%)
Others	6.7
TikTok	6.7
Facebook	66.7
Twitter	0.0
Instagram	66.7
YouTube	53.3
E-mail	33.0
WhatsApp	80.0

The bar graph above illustrates that the WhasApp social media platform still dominates or is most often used by Islamic Islamic boarding schools. The dominant use of the WhatsApp social media platform is due to its ease of use as explained by Ustadz Arifin, the social media operator of Madinatul Ilmi Islamic Boarding School.

Furthermore, social media platforms that are often used in Islamic Boarding Schools after WhatsApp are Instagram and Facebook, namely 66.7% of Islamic boarding schools in Pringsewu Regency actively use these two Social Media Platforms. These two platforms are the second

most popular choice, besides being easy, they are also able to provide more nuances, especially in disseminating information in the form of news and live streaming videos. In addition, these two platforms are the choice of the Islamic Boarding School because they are the platforms with the most users in the world. So that the information conveyed more quickly extends to the general public.

Based on data from we are social published by Yonatan, (2024) in GoodStats, revealed that Facebook, YouTube, WhatsApp, and Instagram are still the kings of social media globally, with more than 9 billion users in total.

Table 6. Data on the number of users of social media platforms

Social Media Platforms	Number of Users (Billion)
Facebook	3.05
YouTube	2.49
WhatsApp	2.00
Instagram	2.00
TikTok	1.56

This is in line with the explanation of Ustadz Nurhadi Kusuma, M.M., (interview, May 12, 2024) the administrative head of Insan Mulia Islamic Boarding School (IMBOS), he said that:

"The media platforms that we often use here to share news and information related to various activities at the Islamic Boarding School are Facebook and Instagram. Because they are able to upload pictures and videos of activities well. In addition, there are many users"

Based on these interviews, it can be explained that Facebook and Instagram have the ability to provide effectiveness in disseminating information to the general public. Ease of access and also able to be a data storage tool for various photos and videos of activities that can be downloaded anytime and anywhere.

As for the Youtube media platform, it ranks 3rd in its use, which is 53% of all Islamic Islamic boarding schools in Pringsewu Regency. This platform is not often utilized by Islamic boarding schools because there is a lot of expertise in making videos with good quality. Because there are many supporting applications in making quality videos.

This is in line with the supporting application of social media of the Boarding School that can be mastered by the Boarding School operator. Based on the results of the processed data, it can be explained as follows:

Table 7. Social media activity supporting application in boarding school

Social Media Activity Supporting Apps	Percentage (%)
Movie Maker	40.0
Corel Draw	53.3
Photoshop	73.3
Word	73.3
Excel	73.3
Canva	20.0
Others	10.0

Based on the graph above, it can be explained that the software and applications supporting social media that are often used by Islamic Islamic boarding schools are Word, Exel and Photoshop. The three software and applications were originally more often used for administrative activities of the Islamic Boarding School, but in various ways influenced by the lack of ability of social media operators so that the software and applications became the main choice. However, the results obtained from the support of these three things have not been able to provide maximum results on social media.

For social media activities both on Facebook, Instagram and Youtube, it will be maximized if using Corel Draw, Canva and Movie Maker or the like. However, the difficulty and lack of human resources of the Boarding School in using this application is an obstacle for the Boarding School in maximizing social media through Facebook, Instagram and Youtube. Especially for photo editing and video making, it

also requires the support of other equipment, which sometimes the procurement cost is still an obstacle for Islamic Islamic boarding schools.

Human Resources Readiness

The readiness of Islamic boarding Schools in utilizing technology varies greatly depending on many factors such as location, resources, and support from managers, caregivers, or board members. The readiness of the Islamic boarding Schools can be seen from the condition of the social media platforms owned by the Islamic boarding Schools. Based on the results of data processing, it can be described as follows:

Table 8. Boarding school activeness level in social media

Category	Percentage (%)
Very High	57%
High	20%
Medium	13%
Low	10%

The graph above illustrates the level of activity of Islamic boarding Schools in using social media in Pringsewu Regency. This graph consists of four categories of activeness levels: Very High, High, Medium, and Low. Most of the Islamic Islamic boarding schools in Pringsewu Regency, namely 57%, have a low level of activeness in using social media. This shows that the majority of Islamic islamic boarding schools have not utilized social media optimally. The reasons vary, ranging from limited digital knowledge and skills among teachers and students, to the lack of adequate technological infrastructure.

Furthermore, in the medium category, only 10% of Islamic Islamic boarding schools in Pringsewu district are active on social media. This shows that many Islamic Boarding Schools have not utilized social media regularly. In the next category, Islamic Boarding Schools with a high level of involvement in social media are 13%. Although the number is not as large as the very high category, it shows that there are Islamic Islamic boarding schools that are quite active and are in the process of improving their digital capabilities. Meanwhile, the very high category reached 20%. Islamic islamic boarding schools that are recorded as having a very high level of active use of social media have understood the importance of social media as a communication and da'wah tool, and have human resources who are able to manage social media accounts well.

This data shows significant challenges in terms of social media adoption and utilization among Islamic boarding Schools in Pringsewu Regency. The majority of Pondok Pesantren are still in the low-activity category, indicating the need for efforts to increase digital competence, provide adequate infrastructure, and socialize the benefits of social media. On the other hand, Islamic boarding Schools that are already active can become role models and mentors for other Islamic boarding Schools to increase their digital presence, which in turn can strengthen the role of Islamic boarding Schools in education and da'wah in the digital era.

Policy

Islamic islamic boarding schools, as traditional Islamic educational institutions, have faced various challenges and opportunities in this digital era. Mastery of technology in Pondok Pesantren is a very important effort to ensure that students not only understand religious knowledge but also have skills that are relevant to the times. Some of the policies and strategies implemented by Islamic boarding Schools in Pringsewu district by managers /caregivers to improve mastery of technology are integrating technology lessons in

the boarding school curriculum. The integration of technology lessons in the curriculum of Islamic boarding Schools in Pringsewu Regency is still limited. The limitations of Islamic boarding Schools in integrating the curriculum are influenced by several factors, as has been revealed by the manager of Islamic boarding Schools Tahfidzul Qur'an AL Husna, Mr. Solihin, S.Pd., he revealed that; First, budget constraints. Many Islamic Islamic boarding schools have limited budgets in Pringsewu Regency, making it difficult to purchase the technology devices needed, such as computers, tablets, or other hardware. Second, the lack of competent human resources. Limited teachers or staff who have knowledge and skills in the field of information and communication technology. Third, infrastructure limitations. lack of technological infrastructure such as a stable internet network and adequate hardware. Fourth, resistance to change. There is resistance from some managers or teachers who feel that technology integration can disrupt the educational traditions of Islamic islamic boarding schools. Fifth, the lack of technology-based Islamic learning content. The lack of technology-based learning content that is in accordance with the values and curriculum of Islamic boarding Schools. Sixth, limited access to technology for santri. Some santri may not have access to technological devices outside of Islamic boarding Schools learning hours. Seventh, time constraints in the curriculum. The strict curriculum of Islamic boarding Schools that focuses on religious learning makes it difficult to include technology lessons.

This is in line with the statement of Mashur et al., (2021), he revealed that the main inhibiting factors include time constraints, lack of competent human resources, complexity of ICT integration, infrastructure limitations, lack of training, limited access, and lack of technical support. Another study by Zaenal et al., (2023) focused on challenges such as infrastructure limitations and resistance to change among teachers and students. In addition, research by Kinansyah & Pujianto, (2023) emphasized the importance of digitizing education in pesantren as well as challenges in managing and maintaining digital systems. These findings are in line with the problems mentioned, such as budget limitations, lack of competent human resources, infrastructure limitations, resistance to change, lack of technology-based Islamic learning content, limited access to technology for santri, and time constraints in the curriculum.

Furthermore, the policy of the Islamic boarding Schools management/caretaker to improve the utilization of information technology for administrators and students is to conduct training, or courses.

Table 9. Resource of learning technology operator boarding school

Learning Method	Percentage (%)
Autodidact	68%
Course	11%
School/College	21%

Based on the graph above, it shows that most of the Islamic boarding Schools operators in Pringsewu district in processing social media are done by self-learning or self-taught. The data shows a very significant number, reaching (86.7%) This shows that many pondok operators in Pringsewu Regency tend to rely on themselves to learn new skills or knowledge.

A high percentage of self-taught may indicate extensive access to self-learning resources such as books, the internet and online tutorials. It may also reflect limited access to formal education or professional training. This high percentage is due to several factors, as conveyed by ustadz Rijal, the operator of PPTQ Miftahussalam, he said that:

"First; Limited access to formal courses or structured technology education. Second; The desire to learn flexibly according to one's own time and ability. Third; The availability of online learning resources and books that facilitate selflearning."

Furthermore, the course method applied by Islamic boarding Schools operators in supporting Islamic boarding Schools social media is only 13.3%. Courses were considered less interesting or less affordable for many operators. In addition, operators felt that the available courses were irrelevant or inadequate for their specific needs as well as the lack of information about the available courses or the incompatibility of the course schedule with their free time were obstacles for Islamic boarding Schools operators to join the courses.

Some operators acquired their technological knowledge through formal education at school or college, which amounted to 26.7%. Although the percentage is higher than courses, it is still far below the percentage of self-taught.

This indicates that there are a number of operators who have a formal educational background in technology. Based on the results of data processing related to the education level of the Islamic boarding Schools managers, it shows that most of the Islamic boarding Schools managers have basically reached the undergraduate level. However, the bachelor's degree owned by the operators is only a small part that is technology based, but most of them are education graduates.

Based on the results of the explanation above, it can be concluded that the majority of

Table 10. Percentage of education level of boarding school operators

Operator's Education Level	Percentage
Junior High School	6.7%
Senior High School	33.3%
Bachelor's Degree	60.0%
Master's Degree	0.0%

Islamic boarding Schools managers in Pringsewu Regency prefer self-learning methods to acquire technological knowledge. This shows a high spirit of independence and perhaps also easier accessibility compared to other methods.

Formal education and courses are still used by some operators, but in smaller proportions. This suggests that there is still room for improvement in the provision and accessibility of more structured and affordable technology training programs for Islamic boarding Schools operators.

Islamic Islamic boarding schools, as traditional Islamic educational institutions in Pringsewu Regency, do need to face and adapt to the rapid development of information technology. In facing these challenges, there are several steps that can be taken so that Islamic

Boarding Schools still have broad capabilities and compete with contemporary educational institutions.

Islamic boarding Schools can integrate information technology into the curriculum by utilizing e learning and digital resources. Online learning platforms can help santri to gain access to various subject matter, online discussions, and interact with teachers virtually.

This is important to do in Islamic boarding Schools in Pringsewu Regency. The results of an interview (May 21, 2024) with Gus Naim, the eldest son of Mrs. Hj. Hamdanah, the caretaker of Islamic boarding Schools Nurul Huda Complex AL Aziziyah, he said that:

"Students today must be able to use e-learning. Because this is an urgent need for the current generation. Santri should not be left

behind in terms of digitalization, so that they can compete with children from outside the Islamic boarding Schools."

In addition to developing human resources for students, pesantren need to develop human resources for teachers or employees of pesantren. Skills in the use of information technology are important for teachers and employees of Islamic boarding Schools. Through training and competency development, they can better understand and integrate information technology in the learning process and management of Islamic islamic boarding schools.

As stated by Ky. Muhyidin (interview, May 22, 2024), the caretaker of Pondok Pondok Pesantren Miftahussalam Jatirejo Qur'an Tahfidzul. He gave an explanation that:

"Pondok managers and Ustadz must be technology literate. One way to do this is through training or courses. Moreover, several Islamic Islamic boarding schools in Pringsewu district already have computer laboratories. We can't just rely on schools alone"

Based on the interview above, it is reasonable for the caregiver to want every teacher and employee of the boarding school to be able to operate technology well. Because social media can be an effective tool to promote the boarding school and become a means of interaction with the wider community. By utilizing social media, the Boarding School can convey the latest information, introduce activities, and expand the network of relationships.

The utilization of social media in the promotion and interaction of Islamic boarding Schools is in line with the research findings by Zaenal et al., (2023), which highlighted the importance of digitalization in pesantren education and the challenges faced in its implementation. In the study, it was mentioned that social media can be a bridge to connect pesantren with the wider community, increase transparency, and strengthen pesantren branding in the digital era. In addition, social media also plays a role in supporting two-way communication, allowing pesantren to not only disseminate information, but also receive input from the community and alumni. Thus, the utilization of social media can help pesantren be more adaptive to the times and support information disclosure in the world of Islamic education.

This has been done in most Islamic islamic boarding schools, but most Islamic islamic boarding schools are still not optimal in utilizing social media to provide information related to Islamic boarding school activities and events. This is in accordance with the results of data processing that has been obtained by researchers.

Table 11. Boarding school promotion methods

Promotion Method	Percentage
Offline	56%
Online	44%

Based on the graph above, it shows that offline promotion methods are more dominantly used by Islamic Islamic boarding schools, with 56% of the total promotion methods. Offline promotion includes various activities such as putting up banners, distributing brochures, participating in educational exhibitions, holding seminars or workshops, and making visits to schools or communities.

Islamic islamic boarding schools that prioritise offline because they consider offline promotion can interact directly which is more personalised and able to build closer relationships with prospective students and parents. This is in line with what was expressed by the caregiver of Islamic boarding Schools Mambaul Hisan Margakaya KH. Nasihuddin, S.Pd.I. (interview, 25 May 2024), although he also revealed that

this method has disadvantages, namely requiring higher costs and limited reach compared to online promotion.

Furthermore, online promotion methods were used by 44% of islamic boarding schools. This shows that almost half of the overall promotion is done through online media. Online promotion can include the use of social media, official websites, digital advertising, email marketing, and video content on platforms such as YouTube.

As expressed by Dr. Moh Masrur, (interview, May 12, 2024), who serves as Mudir of IMBOS (Pondok Islamic boarding Schools Insan Mulia) Pringsewu. He said that:

"Currently, if the promotion is still offline, it is troublesome. In addition, it is expensive and does not reach the younger generation who are the subjects who will enter the Islamic boarding Schools."

He went on to say that the advantages of online promotion are wider reach, relatively lower costs, and the ability to reach a younger and more tech-savvy audience. The advantages of online promotion, such as wider reach, relatively lower costs, and effectiveness in reaching younger and more tech-savvy audiences, are in line with research findings by Kinansyah & Pujianto, (2023). In their research, it was mentioned that the digitalization of education, including the use of online media, allows pesantren to more easily connect with the younger generation who are already familiar with technology. In addition, digital-based promotional strategies are proven to be more cost-efficient than conventional promotional methods such as print or direct marketing. By utilizing social media and digital platforms, pesantren can reach prospective students, parents, and the wider community without geographical limitations, thus strengthening the existence of pesantren in the digital era.

In detail, the researchers attached data on the methods of Islamic boarding Schools in socializing santri admissions in Pringsewu Regency, as follows:

Table 12. Methods of socialisation of santri admission in Islamic boarding schools

Santri Admission Socialization Method in Pringsewu Regency	Percentage
Brochure/Calendar	85.7%
Via Internet	5.7%
News	7.0%
Print Media	7.0%
Website	7.0%
WhatsApp	7.0%
Instagram	7.0%
Oral	5.0%

Based on the questionnaire data, the most dominant socialization method is through brochures or calendars with a percentage of 85.7%. While the use through the internet is only 5.7%. Furthermore, news, print media, websites, WA, Instagram are only around (7.0%). In conducting promotions there are still those through oral, which is around 5%.

It can be concluded that Brochures and calendars are the main methods to socialize the admission of students with a very high percentage. This shows that traditional approaches are still highly relied upon and may be more effective in the local context. Despite the overwhelming dominance of brochures and calendars, Islamic boarding Schools in Pringsewu also utilize various

other methods such as news, print media, websites, WA, and Instagram for socialization.

To fulfill the socialization activities, the Boarding School needs to ensure that the required technological infrastructure, such as stable internet access and computer devices, are well available to support the learning and operational activities of the Boarding School. Based on an interview with the head of RMI Pringsewu district, Dr. KH Abdul Hamid, M.pd.I, (interview, 23 May 2024), he stated that:

"There are still many Islamic boarding Schools in Pringsewu district that do not have adequate technology facilities and infrastructure. There are even Islamic islamic boarding schools that do not have computers or laptops at all. Their social media activities are only supported by cell phones or smartphones"

Based on the interviews above, it can be concluded that Islamic boarding Schools in Pringsewu Regency generally still experience limitations in terms of technological facilities and infrastructure. From this analysis, it can be seen that there is an urgent need to improve the technology infrastructure in these Islamic boarding Schools in order to support education and other social activities more effectively.

In addition to internal elements, in developing human resources in the field of information technology, Islamic islamic boarding schools must establish partnerships with other parties / institutions. Especially through partnerships with educational and technological institutions. Mashur et al. (2021) revealed that one of the main challenges in technology integration in pesantren is the limited human resources who are competent in the field of information technology. Therefore, collaboration with higher education institutions, technology companies, and training institutions is a strategic solution to improve the digital skills of santri and teaching staff. This partnership can take the form of training, certification programs, and technical assistance that support the strengthening of pesantren capacity in facing digital transformation. With this partnership, Islamic boarding Schools can access new resources and knowledge about information technology. This partnership can also help in curriculum development that is relevant to the demands of the times.

As is the case with Islamic Islamic boarding schools in Pringsewu Regency. There are already Islamic islamic boarding schools that have partnerships with private institutions and educational institutions. An example is PPTQ Mathlau'ul Huda which has a partnership with STIT Pringsewu. The form of partnership is the opening of STIT Pringsewu distance classes at PPTQ Mathlau'ul Huda. In addition, Islamic boarding Schools Nurul Huda Pringsewu also has a partnership with Institut Bakni Nusantara, related to the admission of students affiliated with the pesantren.

With this partnership, it is hoped that high school graduates can continue to the college level so that they can improve their abilities both in the field of teaching and information technology and even develop applications that can support the needs of Islamic boarding schools.

This is important for Islamic islamic boarding schools, because the development of technology based educational applications can help improve the quality of learning in Islamic boarding schools. This application can include religious materials, tajweed, memorizing the Quran, and so on. In this case, some islamic boarding schools have implemented it. Based on the results of observations, it was found that the IMBOS Islamic Boarding School has implemented an evaluation of tahfidz learning using the E-Tahfidz application. As has been revealed by Nurunisa & Shodiq (2024), states that using learning applications in Islamic boarding Schools can have a positive impact. Technology-based learning significantly impacts student skills at islamic boarding schools.

In addition, the use of information technology can also help in the administrative and management activities of islamic boarding schools, such as financial management, inventory, and student data. Related to this, based on the results of researchers' observations at the PPTQ Al Husna Islamic Boarding School, it was found that PPTQ AL Husna applied or implemented the Islamic boarding Schools Application, namely the PSD Application (Pesantren Smart Digital). This application is able to assist in the administrative management of the Islamic Boarding School. In fact, this application is designed to improve the efficiency and quality of education in Islamic boarding Schools through digital technology. This application has various uses, such as providing access to digital-based learning materials, allowing interaction between students and teachers through discussion forums, and supporting online-based evaluation systems to improve learning effectiveness. In addition, PSD also functions as an administrative platform that facilitates the management of santri data, activity schedules, and pesantren financial management in a more structured manner.

■ CONCLUSION

The research findings indicate that the ability of Islamic boarding school human resources in mastering information technology in Pringsewu Regency remains suboptimal. This is evident from the limited activeness and skills of Islamic boarding Schools HR in using application technology and managing their websites. Most HR personnel still have low levels of proficiency, and although many graduates hold bachelor's degrees, they are not in the fields of technology or informatics. Additionally, the digital platforms of Islamic islamic boarding schools in Pringsewu Regency are still underutilized, with many institutions relying on conventional methods for student admissions and administrative processes. Only a few pesantren have implemented websites or digital applications

for learning and financial management. Moreover, IT development among pesantren HR is still largely individual-based or through self-learning, with minimal structured technology training provided to students.

This research positively impacts education in Islamic boarding Schools by promoting digitalization and the use of information technology to enhance learning quality and administrative efficiency. The implementation of digital tools such as the Pesantren Smart Digital (PSD) application can facilitate student access to teaching materials, improve teacher-student interaction, and support a more structured management system. Additionally, the study can serve as a reference for other pesantren in adopting digital innovations to remain competitive in the modern era. However, some limitations exist, such as the lack of analysis on technological infrastructure readiness and the influence of cultural and social factors on technology adoption. Furthermore, the study primarily focuses on technology implementation without thoroughly evaluating the long-term effectiveness of educational applications in pesantren, highlighting the need for further research on the impact of digitalization on student learning outcomes.

■ RECOMMENDATIONS

To develop human resources and enhance the mastery of information technology in Islamic boarding Schools, it is essential to implement initiatives that offer technology training courses or programs tailored to the needs of Pesantren operators in both online and offline formats. Additionally, improving accessibility to information on human resource development through technology education programs is crucial to ensuring that Islamic islamic boarding schools can effectively benefit from these opportunities. Furthermore, fostering cooperation between educational institutions, the government, and Islamic islamic boarding schools is necessary to provide relevant and affordable training programs

that support the advancement of technology education within Pesantren.

■ REFERENCES

Adha, L. A. (2020). *Digitalisasi industri dan pengaruhnyaterhadap ketenagakerjaan dan hubungan kerja di indonesia. Jurnal Kompilasi Hukum*, *5*(2), 267–298.

Alfin, T. S. (1992). *Transformasi sosial budaya dalam pembangunan nasional*. Jakarta: Universitas Indonesia Press.

Alwi, B. M. (2013). Islamic boarding Schools: ciri khas, perkembangan, dan Sistem Pendidikannya. *Lentera Pendidikan: Jurnal Ilmu Tarbiyah Dan Keguruan*, *16*(2), 205–219.

ANDI, P. (n.d.). *Revolusi industri 4.0*.

Arif, M. (2013). *Perkembangan pesantren di era teknologi. Jurnal Pendidikan Islam*, *28*(2), 307–322.

Dalenogare, L. S., Benitez, G. B., Ayala, N. F., & Frank, A. G. (2018). The expected contribution of Industry 4.0 technologies for industrial performance. *International Journal of Production Economics*, *204*, 383–394.

Fonna, N. (2019). *Pengembangan revolusi industri 4.0 dalam berbagai bidang*. Guepedia.

Georgios, L., Kerstin, S., & Theofylaktos, A. (2019). Internet of things in the context of industry 4.0: An overview.

Hardyanthi, T., Al Ghozali, F., & Wahyu, M. A. (2019). Facing the industrial revolution 4.0: taiwanese and indonesian perspective. *Indonesian Comparative Law Review*, *1*(2), 93–102.

Hasyim, H. (2015). *Transformasi pendidikan Islam (Konteks pendidikan islamic boarding Schools)*. *Jurnal Pendidikan Agama Islam-Ta'lim*, *13*(1), 57–77.

Hatammimi, J., & Krisnawati, A. (2018). Financial literacy for entrepreneur in the industry 4.0 era: A conceptual framework in Indonesia. *Proceedings of the 2018 10th International Conference on Information Management and Engineering*, 183–187.

Kadarisman, M., Wijayanto, A. W., & Sakti, A. D. (2022). Government agencies' readiness evaluation towards industry 4.0 and society 5.0 in Indonesia. *Social Sciences*, *11*(8), 331.

Kinansyah, D. H., & Pujianto, W. E. (2023). *Peluang dan tantangan santri di era digital* (Studi Kasus Pada Islamic boarding Schools Al Amin Sidoarjo). *Journal of Management and Social Sciences*, *2*(3), 194–205.

Marsum, M., & Syahroni, A. W. (2020). *Efektifitas penggunaan teknologi pada pesantren modern dalam menghadapi revolusi industri 4.0. Kariman: Jurnal Pendidikan Keislaman*, *8*(02), 233–242.

Mashur, M., Iswandi, T., & Yaqin, L. N. (2021). *Faktor yang mempengaruhi integrasi tik dalam proses pembelajaran pada islamic boarding schools di lombok timur. Edumatic: Jurnal Pendidikan Informatika*, *5*(2), 278–287.

Muali, C., Wibowo, A., Hambali, H., Gunawan, Z., & Hamimah, I. (2020). *Pesantren dan millennial behaviour: tantangan pendidikan pesantren dalam membina karakter santri milenial. At-Tarbiyat: Jurnal Pendidikan Islam*, *3*(2), 131–146.

Nugroho, C., Sos, S., & Kom, M. I. (2020). *Cyber society: teknologi, media baru, dan disrupsi informasi*. Prenada Media.

Purba, N., Yahya, M., & Nurbaiti, N. (2021). *Revolusi industri 4.0: Peran teknologi dalam eksistensi penguasaan bisnis dan implementasinya. Jurnal Perilaku Dan Strategi Bisnis*, *9*(2), 91–98.

Purboseno, S. (2022). *Peran generasi millenial mendorong percepatan transformasi digital di industri perkebunan.*

Prosiding Seminar Nasional Instiper, *1*(1), 37–45.

Rivest, M. C. (1995). Perspectives for energy service companies. Massachusetts Institute of Technology.

Schwab, K. (2017). The fourth industrial revolution. Currency.

Syafe'i, I. (2017). *Islamic boarding Schools: Lembaga pendidikan pembentukan karakter. Al-Tadzkiyyah: Jurnal Pendidikan Islam*, *8*(1), 61–82.

Syifa'Nurdi, M. (2023). *Manajemen hubungan masyarakat berbasis digital untuk peningkatkan publikasi dan pencitraan islamic boarding schools sabilurrosyad gasek. Ulul Amri: Jurnal Manajemen Pendidikan Islam*, *2*(2), 141–153.

Tirtowalujo, I., Suryani, A., & Masalam, H. (2020). Preparing youth for Indonesia 4.0: challenges and prospects. *Preparing Indonesian Youth*, 1–18.

Wollschlaeger, M., Sauter, T., & Jasperneite, J. (2017). The future of industrial communication: Automation networks in the era of the internet of things and industry 4.0. *IEEE Industrial Electronics Magazine*, *11*(1), 17–27.

Yonatan, A. Z. (2024). *10 Media sosial dengan pengguna terbanyak 2024*. GoodStats. https://data.goodstats.id/statistic/10-media-sosial-dengan-pengguna-terbanyak-2024-CaJT1?utm_source=chatgpt.com

Zaenal, Z. M., Hermansyah, Y., Rusyani, E., Juang, F. D., & Takiah, S. (2023). *Transformasi pendidikan pesantren melalui integrasi teknologi informasi dan komunikasi. Jurnal Penelitian Pendidikan Sosial Humaniora*, *8*(2), 208–213.