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E-CERTIFICATES IN SCHOOLS TO IMPROVE ADMINISTRATIVE EFFECIENCY IN THE SOCIETY 5.0 ERA

Arista Nur Azizah Muhtar*[1]
[1]UIN Sunan Ampel Surabaya

Corresponding author: Arista25@gmail.com
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Abstract

The era of Society 5.0 has brought many changes in various aspects of life, including in the management of educational administration, namely certificate. E-certificate or electronic certificate are digital documents that serve as proof of graduation. This study uses a literature review method, where the researcher collects information from sources such as books, articles, the internet, and other sources related to the title. Through his study, it can be seen that the use of technology in e-certificate management is supported by several technologies, such as blockchain, QR codes, the web, electronic signatures, and cloud storage. E-ijazah as a form of administrative digitization presents several important benefits, including, 1) operational efficiency, 2) security and accountability, and 3) accountability. In addition, the implementation of e-certificates has advantages as well as challenges that must be faced. The advantages are security and authenticity, transparency and accountability, and process efficiency. Meanwhile, the challenges faced are a) infrastructure readiness, b) compliance with regulations, and c) adoption by stakeholders.
Keywords: E-certificate; Administrative Efficiency; Society 5.0

Abstrak

Era Society 5.0 membawa banyak perubahan dalam berbagai aspek kehidupan termasuk dalam pengelolaan administrasi pendidikan yaitu ijazah. E-ijazah atau ijazah elektronik merupakan dokumen bukti kelulusan yang disajikan secara digital. Penelitian ini menggunakan metode studi kepustakaan dimana peneliti mengumpulkan informasi dari sumber bacaan seperti buku, artikel, internet, maupun sumber informasi lainnya yang berkaitan dengan judul. Melalui penelitian ini dapat diketahui bahwa, pemanfaatan teknologi dalam pengelolaan e-ijazah didukung oleh beberapa teknologi seperti blockchain, QR code, web, tanda tangan

elektronik, maupun penyimpanan cloud. E-ijazah sebagai bentuk digitalisasi administrasi menawarkan beberapa manfaat penting, yaitu 1) efisiensi operasional, 2) keamanan dan akuntabilitas, dan 3) akuntabilitas. Selain itu, implementasi e-ijazah memiliki keunggulan sekaligus tantangan yang harus dihadapi. Keunggulan tersebut yaitu, keamanan dan keaslian, transparansi dan akuntabilitas, serta efisiensi proses. Sedangkan tantangan yang dihadapi yaitu, a) kesiapan infrastruktur, b) kepatuhan terhadap regulasi, dan c) adopsi dari stakeholder.
Keywords: E-ijazah; Efisiensi Administrasi; Society 5.0

A. INTRODUCTION

The world has now entered a new era known as Society 5.0. Society 5.0 is a human-centered and technology-based era (Rahmawan & Effendi, 2022). Society 5.0 offers a practical and automated lifestyle that is enjoyable and comfortable for humans (Sukmawati, Zayyina, Mozamb, & Zulfa, 2023). The advent of Society 5.0 has impacted all aspects of life, including education. Conventional education systems inevitably must transform towards digitalization. This change is necessary because education is required to continuously develop and innovate in line with the times, so that it can produce graduates who are ready to face future challenges.

One form of this transformation is in the educational administration process. The progress of the times requires educational institutions to be able to provide information efficiently, for example in the management of certificate. Certificate themselves play an important role as formal proof that a person has completed their education at the primary, secondary, or higher education levels. Moreover, certificate serve as a requirement for individuals to continue their education, obtain employment, and as an identity that demonstrates an individual's academic abilities. Even though the world of education has evolved, certificate remain a document that has a significant impact both socially and professionally.

The conventional certificate administration process often faces obstacles. These include a lengthy issuance process, the potential for loss, the risk of forgery, and limited access to certificate. Especially in the era of society 5.0, the certificate administration process is considered increasingly inefficient. Therefore, the government has innovated by developing electronic certificates or e-certificates as a solution. This step was taken not only to achieve efficiency but also to maintain data security and validity.

This statement is in line with research by Akshay Karale and Harmeet Khanuja in their article entitled "Implementation of Blockchain Technology in Education System". The research states that the use of blockchain technology to store certificates and academic degrees can prevent fraud and data manipulation. In addition, blockchain also provides decentralization, tamper-proof data storage,

easy data scalability, and data permanence, so it can be used effectively in education systems (Karale & Khanuja, 2019).

Furthermore, research by Abdul Kodir in his article entitled "Implementation of Web-Based E-Certificate Evaluation System (Case Study: SIPDAR-PQ in Educational Institutions)". The study states that the implementation of a web-based e-certificate system through the SIPDAR-PQ application at PAUDQ Azzahra has had a significant impact. These impacts include increasing the efficiency and transparency of academic document management by reducing administrative errors and speeding up the verification and issuance of certificate. Overall, the use of technology in educational administration has proven to be an innovation that supports the modernization of educational administration, improves data security, and improves the quality of academic services (Kodir, 2025).

Based on the above research, it can be understood that the use of technology in educational administration, namely certificate, has made a significant contribution to improving the quality of educational governance. Overall, the use of technology not only strengthens security and transparency, but also serves as a strategic innovation in facing the modernization of educational administration in this era of Society 5.0.

B. RESEARCH METHOD

This research was conducted using a literature study, which involved collecting data through references from several sources such as books, articles, the internet, and other information related to "E-Certificates in Schools to Improve Administrative Efficiency in the Society 5.0 Era." The literature study was conducted by researchers to find a basis for obtaining and developing a theoretical foundation, a framework for thinking, and determining research hypotheses, so that researchers could understand, allocate, and organize their research fields (Magdalena, Endayana, Pulungan, Maimunah, & Dalimunthe, 2021).

C. RESULTS AND DISCUSSION

The Society 5.0 Era

Society 5.0 is an era that has evolved from the previous era, Society 4.0. The concept of Society 5.0 emerged in anticipation of the disruptions caused by the Industrial Revolution 4.0. These disruptions refer to the emergence of digital technology that has changed human habits from the real world to the virtual world (Eliwatis, Aprison, Maimori, Herawati, & Putri, 2022). The Society 5.0 era focuses on how humans utilize existing technology. Society 5.0 itself is supported by several technologies, namely: 1) Internet of Things (IoT), where every person and event will be connected and recorded via the internet, enabling this process to be carried out quickly. 2) Artificial Intelligence (AI), a concept first discovered in the 1960s and continuously developed to this day (Burhanuddin & Pharmacista, 2023).

The 5.0 society era has the following features and characteristics (Hamu et al., 2023):

1. Human-Centered Approach

   The era of Society 5.0 emphasizes human welfare and empowerment. It aims to create a harmonious society that balances economic development and social progress with a focus on human needs and values. The human-centered approach shows that the development and application of technology has a primary focus on human welfare and needs.

   In the era of Society 5.0, technology is a tool for improving the lives of individuals and society as a whole. The main goal is to meet human needs, improve quality of life, and address existing social problems. Technology is geared toward providing human-centered solutions, optimizing user experience, and strengthening community engagement. Overall, the human-centered approach in the 5.0 era emphasizes that technology should be used to improve human welfare, strengthen community engagement, and create a better society as a whole

2. Integration of Physical and Cyberspace

   In the era of Society 5.0, there is integration between physical and digital spaces. Increasingly sophisticated technology enables the collection, analysis, and utilization of large amounts of data from various sources, which can be used to optimize decision-making and improve the overall efficiency of society. There are several technological developments that are being utilized, such as Artificial Intelligence (AI), the Internet of Things (IoT), big data, cloud computing, Augmented Reality (AR), and Virtual Reality (VR) Some of these technological developments can be used to collect and process data and expand human experiences and interactions through technology.

   The integration of physical and digital spaces creates effectiveness and efficiency in accessing information and services through digital devices. The advantages of integrating physical and cyber spaces provide accessibility and community participation in various aspects of life. However, ethics and privacy in the use of technology must be considered because they relate to personal data and information security.

3. Utilization of Advanced Technology

   The Society 5.0 era utilizes cutting-edge technology to overcome social challenges. Al, IoT, big data analytics, robotics, and other new technologies are used to develop innovative solutions in the health, transportation, energy, urban planning, and other sectors.

   The following are examples of the use of advanced technology in the era of society 5.0:

   a. Healthcare the use of technology to create healthcare service applications so that patients do not need to wait in line for health checkups.

b. Transportation: the use of technology to create applications that can be used to order online transportation such as Grab and Gojek
c. Education the use of technology to develop fun learning methods through Quizizz Kahoot, and Socrative.
d. Energy: Creating solar panels with IoT monitoring systems to maximize energy production through sensor-based monitoring
e. Urban Planning: Utilizing technology to identify patterns of land use, population mobility, and infrastructure.

4. Sustainable Development

In the era of Society 5.0, technology is utilized to achieve sustainable development, which includes efforts to strike a balance between economic, social, and environmental development in order to meet the needs of present generations without compromising the ability of future generations to meet their own needs.

Sustainable development through technology can be achieved in the following ways:

a. Using resources more efficiently through the use of IoT and big data to monitor and manage the use of resources such as energy, water, and raw materials.
b. The application of renewable energy is realized through the use of solar panels, wind turbines, and hydropower. Smart grid systems connected to the IoT enable better integration between renewable energy sources and traditional electricity network infrastructure The development of smart cities that utilize IoT, AI, and big data to connect various aspects of urban life to optimize resource use improve efficiency, and create a sustainable environment.
c. Reducing carbon emissions through the use of renewable energy, environmentally friendly transformation, energy efficiency, and monitoring and management of carbon emissions across various economic sectors.

5. Collaborative Governance

Collaborative governance reflects an approach that involves collaboration and participation from various stakeholders in the decision-making process and implementation of solutions. In the era of society 5.0, collaborative governance encompasses the following aspects:

a. Collaboration between stakeholders, including the government, private sector, civil society, academic institutions, and individuals, to work together in designing, implementing, and evaluating policies, programs, and solutions related to social and technological development.
b. Public participation that allows the community to provide input, convey criticism, and contribute to formulating inclusive and sustainable solutions.

c. Exchange of knowledge and information among various stakeholders. This enables understanding of challenges and opportunities, as well as the ability to learn from one another in creating better solutions.
d. The formation of strategic partnerships that enable collaboration and strong synergy in overcoming social challenges and accelerating sustainable technological progress.
e. Transparency and accountability in decision-making processes and resource management.
f. Identifying problems, developing innovative solutions, and implementing sustainable actions by stakeholders. This is intended to make inclusive decisions, reduce disparities, increase acceptase of solutions, and create a fair and sustainable society.

6. Inclusive and Diverse Society

An inclusive and diverse society emphasizes that technological advances and social developments are accessible to all members of society. This is intended to overcome social inequality, create equal opportunities, and strengthen diversity. The following are some key aspects of an inclusive and diverse society in the era of Society 5.0:

a. Equal access, which means ensuring that every individual has the right and access to use technology.
b. Overcoming the digital divide. The Society 5.0 era is committed to overcoming social inequality. This is done to ensure that the necessary technological and educational infrastructure is available to everyone.
c. Equal opportunities in developing talents, accessing education, finding employment, and contributing to social, gender, and economic development.
d. Respect for diversity, which includes recognition of cultural, linguistic, religious, and ethnic differences, as well as sexual orientation, and respect for fellow individuals to create an inclusive environment.
e. Community participation, inclusive communities are involved in dialog, consultation and collaboration to ensure that their interests and opinions are respected and considered.

7. Ethical Considerations

In developing and implementing technology, attention must be paid to ethical issues. These may include privacy, fairness, freedom, security, and possible social impacts The following are some ethical considerations that need to be taken into account in the era of Society 5.0:

a. Data privacy and security. The technology used must ensure data security and protect individual privacy from misuse or unauthorized access. Therefore, data collection, use, and storage must be carried out with clear consent and transparency.

b. Technology bias, algorithms, and Al systems must be designed to be unbiased, non-discriminatory, and free from unfair errors in decision-making that could affect individuals or specific groups.
c. Transparency and accountability. Due to the use of personal data, technology development organizations must be responsible and accountable for the decisions they make. Information regarding how the technology works and its impact must be made available to the public.
b. Social impact Consideration must be given to how technology can affect employment, the economy, social justice, inequality, and social relations. Steps must be taken to minimize negative impacts and ensure that technology has a positive social impact.
c. Freedom and ethics of Al, it is important to consider ethics in autonomous decision-making Questions related to responsibility, value selection, and protection of individual safety must be carefully considered

Based on the features and characteristics of the Society 5.0 era, it can be concluded that the use of technology at this time is aimed at meeting human needs and improving human welfare. This concept shows that technology is not only present to bring convenience, but also as a human-centered tool. Thus, technology in Society 5.0 is expected to have a positive impact on various aspects of life, including education, economy, and socio-culture.

Implementation of E-Certificates in School

Ministry of Education Regulation No. 56 of 2024 states that a certificate is a document recognizing the graduation of students from educational institutions in formal or non-formal education. Certificate management has traditionally been carried out conventionally using paper and manual processes. With the development of the times, conventional certificates are considered inefficient because they require a lengthy process. In addition, the use of paper as a document can be risky in terms of damage, loss, and high production and distribution costs.

Because conventional certificates are considered inefficient, an innovation in the form of e-certificates or electronic certificates has been developed. E-certificates are documents that serve as proof of student graduation and are presented digitally. Peruri in Abdul Kodir states that e- certificates are official documents published electronically with a security and digital verification system to ensure the authenticity and validity of the data (Kodir, 2025). The government has begun issuing circulars for the use of e- certificates, effective from 2025. The regulation on diploma management is stipulated in Permendikbudristek Number 58 of 2024.

In Permendikbudristek No. 58 of 2024 Article 2, it is stated that the issuance of diplomas is based on the principles of validity, accuracy, and legality ("Peraturan Menteri Pendidikan, Kebudayaan, Riset, Dan Teknologi Republik Indonesia Nomor 58 Tahun 2024 Tentang Ijazah Jenjang Pendidikan Dasar Dan Pendidikan Menengah," 2024). Xarisman Wijaya Simanjuntak as the compiler of legal and legislative materials highlighted that the principle of issuing e-ijazah needs to be realized to ensure that the diploma issued has legal validity and prevent administrative errors (Menengah, 2025). Quoting from tirto id, the following is the process stages involved in the issuance of digital diplomas (Tirto.id, 2025):

a. Schools ensure that final student data is valid, including identity, NISN, and demographic data.
b. The Education Office or Ministry ensures that the school is accredited. If it is not yet accredited, a parent school will be designated for the issuance of diplomas.
c. Pusdatin determines the Provisional Nomination List (DNS) based on valid data.
d. The principal determines graduation through a decree in accordance with applicable regulations.
e. Schools download, sign, and upload the Absolute Accountability Letter (SPTJM) as proof of student data validation as recipients of diplomas.
f. The education office, ministry work unit (for SPK), or Education Attache (for SILN and overseas) approves the SPTJM
g. The school accesses the system to obtain the National Diploma Number for each student.
h. The school downloads the digital diploma format and adds the student's photo as the diploma holder.
i. The school principal signs the diploma either physically or electronically with a certified signature and stamp.
j. Schools issue digital diplomas to students. For diplomas with electronic signatures, schools must also include a copy of the digital document

E-certificates or electronic certificates are created using supporting technologies that play an important role in ensuring that documents can be managed, verified, and distributed securely and efficiently. The following are some of the supporting technologies in the implementation of electronic certificates or e-certificates

a. Blockchain

   Blockchain is a collection of blocks containing transaction data that are linked together (chain) so that it can be considered a digital data storage

system (Utomo, 2021). Blockchain has a strong encryption system, because the data stored in it can only be accessed by authorized parties, thereby significantly improving data security, Blockchain technology also has a high level of transparency in data processing. Each transaction or block in the blockchain is connected to the previous and subsequent blocks, making the data difficult to manipulate and thereby reducing the tuk of fraud, resulting in transparency and trust within the network (Suryawijaya, 2023).

b. QR Code

The use of QR codes in diploma documents consists of a QR reader and a biometric fingerprint reader that are used to verify the authenticity of certificates in order to prevent counterfeit certificates. In this system, the focus is on converting the image of the certificate into a QR code and the fingerprint of the person concerned during the verification process. QR codes are used to help students check the validity of certificates, thereby speeding up the verification process (Mayowa, Adedayo, Olamide, Awokola, & Sodipo, 2021).

c. Web

The web is a service for accessing information via the internet. The web-based e-certificate system integrates information technology and the internet to enable the digital issuance, storage, and verification of academic documents. The e-certificate system supports transparency and accuracy in academic data recording (Kodir, 2025).

d. Electronic Signature

According to Law No. 11 of 2008 of the Republic of Indonesia, the electronic signature process refers to a signature consisting of electronic information that is attached to, related to, or associated with other electronic data used for validation or authentication ("Undang-Undang Republik Indonesia Nomor 11 Tahun 2008 Tentang Informasi Dan Transaksi Elektronik," 2008). The electronic signature available on the e-certificate is used to guarantee the validity and security of the certificate.

e. Cloud Storage

Cloud storage is a service used to store files based on the internet network that can be stored and managed anywhere and anytime as long as users can connect to cloud storage via the internet. Cloud storage can be used to store digital archives, one which is diplomas. Cloud storage provides ease of access for users in the form of easy installation, data synchronization via PC or smartphone, and configuration processes (Tantowi & Wijayanti, 2023). Examples of cloud storage services include Google Drive, Microsoft OneDrive, Dropbox, and Apple iCloud.

Administrative Efficiency Through E-Diplomas

Administrative digitization is essentially the process of converting manual management systems to digital technology-based systems, so that data and documents can be managed more quickly, accurately, and easily accessed. In the context of education, one concrete form of administrative digitization is the implementation of e-certificates. E-certificates are an innovative electronic certificate service that replaces physical documents with digital formats that have better security systems through the use of barcodes, QR codes, or electronic signatures. (Raharjo, 2025) said that the digitization of school administration brings benefits to the entire school community, including:

a. Operational Efficiency and Time Savings
   The use of digital devices in administrative processes can reduce the burden of manual administration.
b. Financial Transparency and Accountability
   School financial applications can be accessed transparently, thereby preventing misuse and improving financial accountability.
c. Quick and Easy Access to Information
   Teachers, students, and parents can easily access school-related information through a digital platform. Principals can also make decisions based on real-time data
d. Improved Communication and Collaboration
   Digitization of school administration facilitates more efficient communication between teachers, students, parents and staff through digital communication platforms such as email, messaging apps or other platforms. Digital platforms also allow teachers to work together in developing curriculum from various teaching resources online.
e. More Secure and Integrated Data Management
   According to UNESCO, the use of cloud computing in the digitization of school administration enables more secure and integrated data storage, thereby reducing the risk of data loss due to physical device damage. Digitally stored data is also more easily accessible and manageable by authorized parties.

The various benefits of administrative digitization in schools show that digital transformation brings efficiency to educational services, one of which is through the implementation of e-certificates. E-certificates, as a form of administrative digitization, offer a number of important benefits. First, operational efficiency due to reduced paper usage for printing certificates, as well as digital access to the issuance and verification processes. Second, security and accountability achieved through QR codes or electronic signatures included on the

certificates. Third is accessibility, as the ease of accessing certificates makes it easier for students to store and share their certificates anywhere and anytime without relying on physical documents. Thus, e-certificates are not merely a technical innovation, but part of a strategy to modernize educational administration that provides tangible benefits for schools, students, and the wider community.

The Advantages of E-Certificates in Education Administration

The use of e-certificates in education administration has the following advantages:

a. Security and Authenticity

E-certificates have a higher level of security than conventional certificates. Digital certificates are equipped with QR codes or electronic signatures, which prevent data falsification. This is done to ensure that data can be verified quickly and accurately.

b. Transparency and Accountability

The implementation of e-certificates supports the realization of transparent and accountable education governance. The process of issuing and distributing certificates can be monitored digitally, thereby reducing the risk of document misuse. Educational institutions can also access certificates according to their authority.

c. Process Efficiency

The use of electronic certificates creates efficiency from the manual procedures that were previously carried out in terms of labor, time, and costs. Through a digital system, the process of issuing certificate can be done quickly and students can access documents easily.

Challenges in Implementing E- Certificate

Despite the advantages of using e-certificates, there are challenges that must be addressed in their implementation.

a. Infrastructure Readiness

One of the main challenges in implementing electronic certificates is the gap in infrastructure. This can occur due to gaps in terms of hardware, software, and inadequate networks. These gaps can affect the process of managing electronic certificates. Therefore, government support is needed to ensure equitable infrastructure so that all schools can manage certificates electronically.

b. Regulatory Compliance

The implementation of e-certificates requires a clear legal basis and regulations to ensure the validity of the documents in the eyes of the Without

strong regulations, e-certificates may be misused or their authenticity questioned. Therefore, clear regulations are needed to govern technical standards, issuance procedures, and e-certificate verification mechanisms, so that this system has nationally and internationally recognized legitimacy.

c. Adoption by Stakeholders

Another challenge stems from the level of acceptance. Some parties may doubt electronic certificates because they are accustomed to conventional certificates. Therefore, cooperation from various parties is needed in conducting socialization, training, and assistance to increase understanding and trust in e-certificates

D. CONCLUSION

The Society 5.0 era is an evolution of the Society 4.0 era. The Society 5.0 era focuses on how humans utilize existing technology. The use of technology in this era is focused on meeting human needs while improving human welfare. In the development of technology in the Society 5.0 era, education is required to continue to evolve and adapt to the times, including in the management of education administration. One form of education administration management carried out in the Society 5.0 era is e-certificates or electronic certificate. E-certificate are documents that serve as proof of student graduation presented in digital form. The use of electronic certificates is supported by technologies that encourage their implementation, including: a) blockchain, b) QR codes, c) the web, d) electronic signatures, and e) cloud storage. The presence of e-certificates facilitates the management of educational administration by increasing operational efficiency, security, accountability, and accessibility. The use of e-certificates in educational administration has several advantages, including: a0 security and authenticity, b) transparency and accountability, and c) process efficiency. In addition to these advantages, the implementation of e-certificate also faces challenges. These challenges include: a) infrastructure readiness, b) regulatory compliance, and c) stakeholder adoption.

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