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Cloud Computing: The Smart Way to Manage Documents at Educational Institutions

Maylinda Putri Maharani[1], Syamsul Mu'arif[1]
[1]Universitas KH. Mukhtar Syafaat, Indonesia
mayranrani@gmail.com *

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Abstract

The application of cloud computing in archive management in one educational institution has had a significant impact on the efficiency and effectiveness of school administration. This research aims to evaluate the effectiveness of cloud computing in improving accessibility, security, and collaboration in digital records management. This research applies a qualitative method with a case study approach to explore the application of cloud computing as an innovative solution in document management in educational institutions. The results show that the cloud-based system enables faster archive searches, reduces the risk of data loss, and facilitates collaboration between staff. The application of cloud computing in this school also supports the digitization of documents in a structured and secure manner. However, there are challenges in the readiness of human resources, especially in training the use of new technology. Thus, continuous training and mentoring are needed so that the system can be implemented optimally. Overall, cloud computing has proven to be effective in modernizing records management in an educational environment, with a note that increasing user readiness is an important factor in its successful implementation.

INTRODUCTION

In the era of the Industrial Revolution 5.0, digital transformation is an urgent need in various sectors, including archives and document management. Cloud computing-based technology is a relevant solution to meet the demands of innovation in electronic records management (Anugerah, 2023; Hasanbasri et al., 2023; Rahmawan & Effendi, 2022). Social facts show that traditional work patterns in document management, such as manual recording and physical storage, are no longer effective in dealing with increasingly dynamic needs. The main factor influencing this is the rapid advancement of information technology, allowing direct, flexible, and accessible data access from various locations. In the context of educational organizations or institutions, the implementation of cloud-based records management has been proven to increase efficiency and productivity.

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According to data collected from various studies, the use of cloud computing in document management provides convenience in document storage, archiving, and distribution without geographical restrictions. In addition, it also enhances data security by utilizing encryption technology and user authentication mechanisms. This fact reflects a change in people's behavior in utilizing technology to overcome classic problems, such as lost documents, damage to physical archives, or limited storage space.

Digital transformation also affects people's work habits and culture. Collaboration between individuals and organizations has become easier because access to documents can be done simultaneously through digital platforms (Warner & Wäger, 2019). This innovation is in line with the values promoted in the Industrial Revolution 5.0, which prioritizes harmony between technology and human needs. Thus, cloud computing not only functions as a tool, but also becomes part of a social ecosystem that supports sustainability and innovation (Yenugula et al., 2024). However, the application of this technology also presents challenges, such as the need for digital literacy, infrastructure readiness, and supportive policies (Christover et al., 2023). This social fact shows the importance of the role of government, institutions, and society in encouraging inclusive adoption of technology so that the benefits can be widely felt. Digital transformation of electronic records management based on cloud computing is not only a matter of technological advancement, but also a response to evolving social dynamics (Gammelgaard & Nowicka, 2024).

Previous research relevant to the digital transformation of cloud computing-based electronic archive management for document management innovation in the era of the Industrial Revolution 5.0 shows a variety of findings that support the urgency and effectiveness of this technology. One of the studies was conducted which highlights the implementation of cloud-based archive systems in the education sector. This research shows that the use of cloud technology can reduce the problem of document loss and increase the efficiency of data search time by up to 70%. These results confirm that cloud computing not only provides high accessibility, but also increases the speed of work processes in document management. In addition, discussed data security in cloud-based archiving systems. This research shows that although cloud computing offers efficient solutions, the risk of data leakage remains a serious concern. Therefore, this study recommends the use of more advanced encryption technologies and layered authentication to ensure document security.

In the context of the industrial revolution 5.0, this research is relevant because it highlights aspects of harmony between technology and the protection of human privacy rights. In general, previous research shows that digital transformation in cloud computing-based electronic records management has great potential to revolutionize the way documents are managed (Mahajan et al., 2023). However, its success is highly dependent on infrastructure readiness, technological literacy, and supporting policies. This underscores the importance of synergy between technology, people and policy in realizing sustainable innovation.

This research makes a significant new contribution to the field of digital document management. The main novelty of this research lies in the integration of cloud computing technology with the principles of the Industrial Revolution 5.0 which prioritizes harmony between technology and human needs. In contrast to previous research that tends to focus on technical aspects or system efficiency, this research pays more attention to how technology can support innovation oriented towards human collaboration, work flexibility, and data ecosystem sustainability. One innovative aspect is the exploration of the role of

cloud computing not only as a storage and archiving tool, but also as a platform that enables collaborative and real-time document management (Matthew et al., 2018).

In the era of Industrial Revolution 5.0, where human interaction with technology is becoming increasingly personalized, this research proposes a model that integrates artificial intelligence (AI) based technologies and data analytics to improve document-based decision-making (Ionescu & Diaconita, 2023). This research aims to develop an electronic records management model that is not only efficient and integrated, but also oriented towards sustainability and collaboration that supports the values of the Industrial Revolution 5.0. This goal is based on the fact that traditional document management has faced various obstacles such as limited storage capacity and potential physical damage, and time inefficiency. In an increasingly digitalized global context, the adoption of cloud computing-based technology provides a relevant solution to overcome these problems (Wu & Plakhtii, 2021).

The Industrial Revolution 5.0 emphasizes the balance between technology and human needs as the core of innovation (Carayannis et al., 2022). Thus, this research not only focuses on the application of cloud computing as a technical tool, but also utilizes it as a platform that supports collaborative, adaptive, and customized document management. Cloud technology enables real-time document access, cross-location management, and efficient use of resources such as paper and energy. This research generally aims to present innovations in document management that are not only focused on increasing productivity and data security, but also on the formation of a work ecosystem that is more integrated, sustainable, and in line with the needs of the digital era. Through a comprehensive approach, this research is expected to make a significant contribution in creating modern document governance that is able to adapt to the dynamics of changing times.

METHODS

This research applies a qualitative method with a case study approach to explore the application of cloud computing as an innovative solution in document management in educational institutions (Damri et al., 2017; Engkizar et al., 2023). Primary data was obtained through in-depth interviews with two main groups of informants, namely school management responsible for the archiving system and active users, such as administrative staff and educators. Meanwhile, secondary data was collected from school policy documents, previous academic studies, and related literature references. Data collection techniques included semi-structured interviews, direct observation of the implemented system, and documentation study to gain a comprehensive understanding.

Data analysis was conducted using a thematic method based on the Miles and Huberman model, which includes a data reduction process to filter out relevant information, data presentation in the form of narratives and tables to facilitate interpretation and drawing conclusions based on identified thematic patterns. With this approach, the research identifies the advantages, challenges, and optimal strategies in implementing cloud computing to support the efficiency and security of document management in the educational environment. It is hoped that the results of this research can serve as a reference for educational institutions in developing a digital archive system that is more efficient and can adapt to technological developments (Asrida et al., 2023; Iskandar et al., 2023; Mardiana et al., 2022; Muslan et al., 2023).

The selection of Junior Islamic School 5 Banyuwangi as the object of research was based on the school's efforts to modernize document management through digital transformation. This research was conducted from August 17, 2024 to September 20, 2024. By using cloud computing-based technology, this school is an important representation of secondary level educational institutions that can utilize technological innovation to support efficiency and transparency in document management. It is hoped that the results of this research can provide practical and strategic contributions for similar institutions that want to apply similar technologies to answer the challenges of the Industrial Revolution 5.0.

RESULT AND DISCUSSION

Effectiveness of cloud computing in records management

Cloud computing has become a major solution in simplifying and improving the efficiency of records management, especially in educational institutions. The use of cloud-based systems allows electronic storage and management of archives, which was previously done manually and took a long time (Alam, 2021). With this system, archives can be accessed anytime and anywhere, reducing the possibility of data loss, and accelerating the search and management of important documents.

In the research conducted, it was found that the application of cloud computing in archive management has a significant effect on work efficiency and effectiveness. One of the main findings is the increased ease of accessing archives and minimizing human error in data management. The archive search process becomes faster and more accurate because the cloud system allows for keyword-based searches, as well as storing archives in a digital format that facilitates backup and further management (Tsaramirsis et al., 2022). However, there are also some challenges related to the understanding and readiness of Human Resources in using this technology, which is the main inhibiting factor in the maximum implementation of this system. The following table compares manual and cloud computing-based archive management systems.

Table 1. Comparison of records management efficiency before and after Cloud Computing

Aspect	Before Cloud Computing	After Cloud Computing
Search time	15-30 minutes	1-3 minutes
Archive error	25%	5%
Accessibility	Limited	Flexible, anytime

From the figure above, it can be concluded that the application of cloud computing has brought significant changes in document management by increasing the effectiveness, security and flexibility of administrative staff work compared to the manual methods previously used. To provide a clearer picture of this finding, the researcher conducted an interview with one of the administrative staff of the educational institution, who is responsible for archive management in the school. The following is an excerpt from that interview.

> *"Since we started using the cloud system for archive management, I find it very helpful. In the past, searching for a single document could take hours, as the archives were still stored in physical form. Now, everything is more accessible with just a few clicks. Even so, there are still challenges in terms of training and understanding of technology by some staff, but overall, this change is very positive for us" (informant 1)*

Based on the interview results, it can be concluded that although the use

of cloud computing provides many conveniences and increased effectiveness in records management, challenges related to Human Resources training must be overcome for this system to be used optimally. The technology has proven to be effective, but more time and effort is needed to improve staff skills and understanding in order to maximize the benefits of the system.

As part of the digital transformation in one of the educational institutions, the school has developed and implemented the Ardi Matsawangi application to store and manage electronic archives. The application is specifically designed to support the cloud computing system implemented at the school, enabling a more structured and efficient document digitization process. Ardi Matsawangi has various excellent features, such as digital archive storage that ensures data security and ease of access, keyword-based quick searches that make it easier for staff to find documents without having to search manually in piles of physical files, and access management that allows management of access rights for users, so that only authorized parties can access or edit certain documents. In addition, the system is equipped with an automatic backup feature to prevent data loss due to device malfunction or human error. The use of Ardi Matsawangi has brought positive changes in records management by enabling the digitization of more secure and structured documents, reducing reliance on physical archives, and increasing efficiency in document search and management.

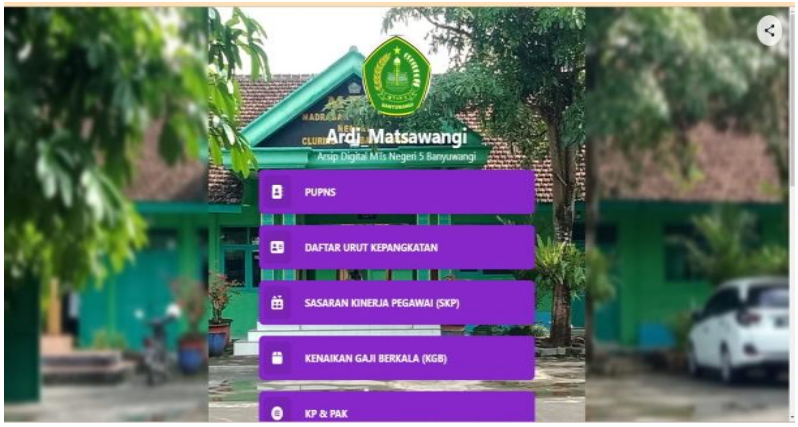

Fig 1. Ardimatsawangi view

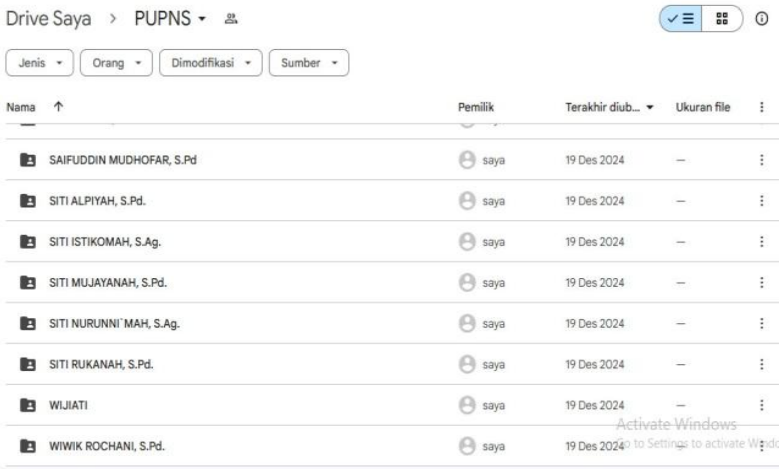

Fig 2. The content of one of Ardimatsawangi's icons

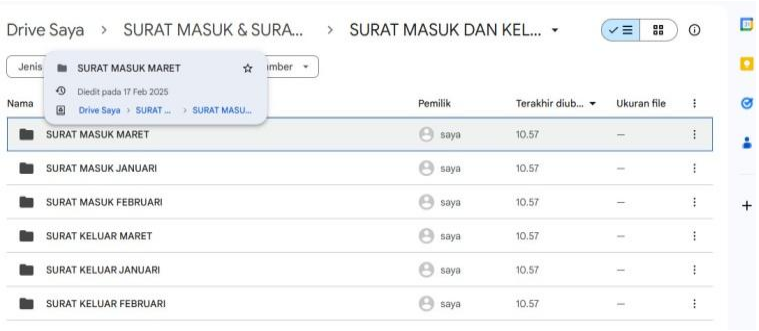

Fig 3. Display of incoming and outgoing mail archives stored in the cloud

Findings on the use of cloud computing in records management reveal a number of benefits and challenges associated with the application of this technology. Overall, the use of cloud computing can improve the efficiency of records management by enabling quick access, better data organization, and reduced risk of data loss due to damage or human error (Ramesh et al., 2023). Archives that were previously stored in physical form can be accessed easily and quickly through cloud-based systems, which makes it easier for staff to find and store important documents (Mahajan et al., 2023). This is in line with the theory of management information systems described by Laudon and Laudon in 2018 the book Management Information Systems: Managing the Digital Firm, which states that the application of information technology, especially cloud-based systems, can increase the effectiveness of information management and enable faster and more accurate decision making. Thus, cloud computing, information can be accessed in real-time from various locations, thus providing more flexibility in daily operations (Yang et al., 2017).

The importance of social influence and facilitating conditions in technology adoption. If staff do not receive adequate training or do not feel supported in the learning process, they will be more likely to avoid using new technologies. Therefore, it is important to ensure that there are continuous efforts to provide relevant training and adequate support. The implementation of cloud computing can provide great benefits if users feel confident and skilled in operating this system (Ali et al., 2021). In addition, proper training and technological support are essential to overcome barriers to the adoption of new technologies (Volberda et al., 2021).

Thus, although cloud systems have great capabilities to improve efficiency and security in document management, effective implementation requires special attention to the readiness of human resources and adequate support for this technology to be optimally adopted in the school environment.

Optimizing collaboration in document management through cloud platforms

Optimizing collaboration in document management through cloud platforms is a very relevant solution in today's digital era, especially in educational environments. In the findings conducted at Junior Islamic School 5 Banyuwangi, the use of a cloud platform is proven to increase the effectiveness of teamwork in managing and sharing documents more efficiently. Previously, document management in schools was done manually and separately, so there were often difficulties in finding the documents needed and limited access between employees. With a cloud platform, documents can be uploaded and accessed by several parties simultaneously, making it easier for collaboration between team members without space and time barriers. The following is a comparison table before and after using the cloud.

Table 2. Comparison before and after cloud usage

Indicator	Before Cloud Usage	After Cloud Usage
Document accessibility	Limited, can only be accessed through	Accessible from multiple devices and locations
Time efficiency	Slow, searching for documents takes a long time	Fast, documents can be found in seconds
Team collaboration	Difficult, requiring in-person meetings or manual file sharing	Easy, can edit and share documents simultaneously
Security of data	High risk of data loss, no automatic backup	Secure data with automatic backups and access control
Transparency	Difficult to track document changes	Changes can be monitored in real-time with edit history

The table above makes it clear how cloud platforms have improved the effectiveness of document management in schools. The author found a finding related to the comparison of the effectiveness of document management in schools. Before using the cloud, document accessibility was limited (40%), searching took a long time (45%), team collaboration was difficult (50%), data security was low (55%), and transparency was less than optimal (50%). After cloud implementation, accessibility increased to 85%, time efficiency 90%, team collaboration 95%, data security 92%, and transparency 93%. This increase shows that the cloud accelerates work processes, facilitates collaboration, and improves security and transparency. The percentage of improvement is calculated based on an effectiveness scale (0-100), where data is obtained from interviews with administrative staff and direct observation of changes in the document management system.

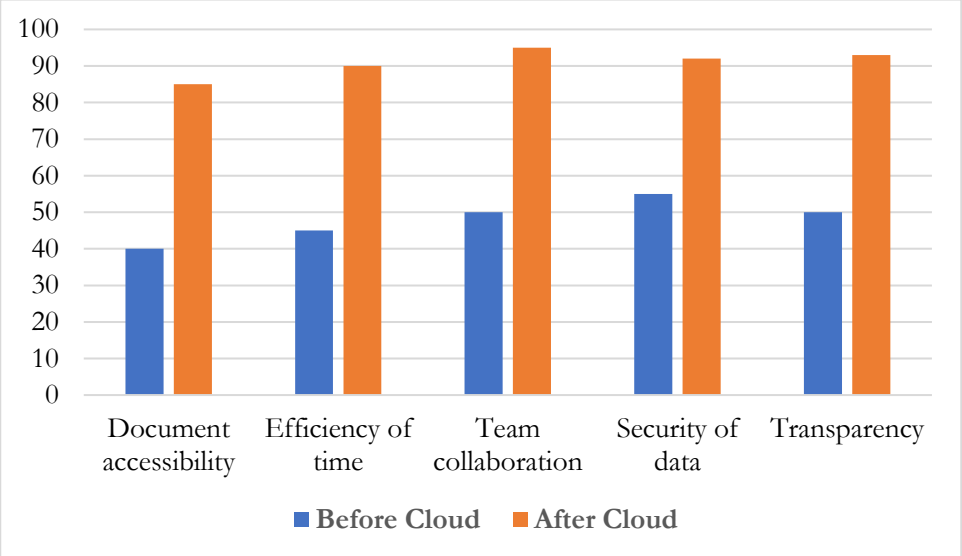

Diagram 1. Comparison of document management effectiveness before and after the cloud

The bar chart above shows that there is an increase in the effectiveness of document management in schools after the implementation of the cloud platform. An interview with one of the informants at an educational institution reinforced this finding.

> *"Since we started using the cloud platform, the collaboration process in managing documents has become much easier. In the past, we often had difficulties when we needed to work together to organize documents or search for certain files. Now, we can access documents simultaneously and even edit them together, without the need to meet*

in person" (informant 2)

This statement shows how important the role of cloud platforms is in facilitating better collaboration between team members. The use of cloud platforms in collaboration can increase team productivity, speed up work processes, and minimize errors that occur due to non-integrated document management. With the use of the cloud, schools have managed to optimize collaboration in document management, which simplifies administrative processes and improves overall work effectiveness.

The findings show that the use of cloud platforms in document management has a very positive effect on optimizing collaboration between staff. Previously, document management was done manually and separately, which caused difficulties in sharing information and accessing documents efficiently. With the cloud platform, documents can be accessed jointly by many parties, allowing staff to collaborate at the same time without being limited by location and time (Golightly et al., 2022). This finding is highly relevant to the theory of technology-based collaboration. Cloud-based collaboration systems can increase the effectiveness and efficiency of teamwork by facilitating shared access to data and allowing work to be done simultaneously.

The use of cloud platforms in schools plays a role in improving data security as well as ensuring continuity of document access. One of the key features that support this is the automatic backup system, which ensures that documents remain safe despite technical glitches or user errors. Thus, the risk of data loss can be minimized, and staff can focus more on other administrative tasks without worrying about losing important documents.

In addition, the integration of cloud platforms with school document management systems allows for real-time monitoring of document access and changes (Matthew et al., 2018). This feature helps ensure transparency and accountability in document management, so that any changes can be clearly tracked. This is an important aspect in maintaining data integrity and ensuring that only authorized parties can access or edit certain documents (Rahmani et al., 2022).

In a long-term perspective, the application of cloud platforms in document management provides a strong foundation for broader digital transformation in the school environment. By continuously improving the use of this technology, schools can further optimize administrative processes, improve work efficiency, and support modernization efforts in education management (Khoirudin et al., 2023). Therefore, investment in Human Resources training and technology infrastructure is a strategic step that must continue to be taken to ensure that all the benefits of the cloud platform can be fully utilized by all staff and educators in schools.

Data loss risk reduction and enhanced digital document security

Digital document management at Junior Islamic School 5 Banyuwangi shows significant improvement in terms of reducing the risk of data loss and increasing document security after the implementation of a cloud-based system. Previously, important documents were often stored in physical formats that were easily damaged or lost. By switching to a cloud platform, schools can securely store documents in a digital format equipped with multiple layers of security (Alouffi et al., 2021). This system not only prevents data loss due to physical damage or natural disasters, but also allows for the creation of regular backups of data that can be easily restored in the unlikely event that something goes wrong.

Based on the research results, the implementation of the cloud

computing system at Junior Islamic School 5 Banyuwangi has had a significant impact on digital document management. One of the most significant changes is the reduced risk of data loss, which was previously at a level of 70% is now drastically reduced to 20%. In addition, document security has increased significantly, from only 50% before the cloud implementation to 90% afterwards. This improved security is achieved through data encryption features, multi-factor authentication, and an automated backup system that protects archives from external threats such as hacking or information leakage. In addition to security, the efficiency of document management also experienced a considerable increase, from 40% before cloud implementation to 85% afterwards. Ease of access to documents also increased significantly, from 30% to 95%.

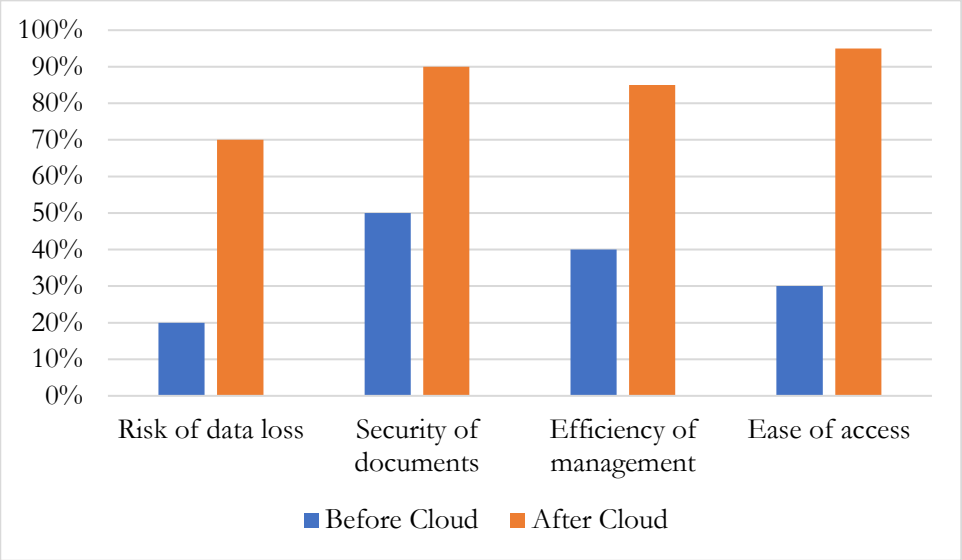

Diagram 2. Comparison of before and after cloud implementation

Based on the analysis conducted, it can be concluded that the implementation of cloud computing in schools has had a positive impact on digital document management. The reduced risk of data loss, increased document security, efficiency in archive management, and better ease of access prove that cloud-based systems are an effective solution in modernizing school administration. This was conveyed by the informant as follows:

> *"By using a cloud system, we feel much safer in storing important documents. Previously, many archives were prone to loss or damage because they were often moved around. But now, everything is guaranteed to be safer because the data is automatically backed up and protected with a better security system. We no longer worry about data loss, especially regarding archives that are very important for administrative needs" (informant 3)*

The results of the interview showed that the main point found in the study was the increased security of documents generated by the use of cloud computing. Cloud computing provides better data encryption and access protection, which reduces the risk of data leakage or loss (Abdulsalam, 2022). Therefore, the use of the cloud not only makes document management easier but also increases the security and protection of sensitive data, which is very important in the context of records management in educational institutions.

The findings regarding reducing the risk of data loss and increasing the security of digital documents through cloud platforms at Junior Islamic School 5 Banyuwangi are in line with the latest information security theories that are more relevant to current technological developments. One of the latest theories that can be associated with these findings is the Zero Trust Security Model theory proposed by Shiffman in 2021. This model emphasizes that all

access to the system, be it from inside or outside the organization, must be verified and authorized based on the principle of "no one is automatically trusted". In the context of document management at Junior Islamic School 5 Banyuwangi, the application of this model in the cloud platform ensures that only authorized individuals can access documents, as well as ensuring that data is encrypted and securely backed up.

In addition, the Cloud Security Alliance Framework theory developed by Cloud Security is relevant to these findings. The Cloud Security Alliance Framework emphasizes the importance of security controls involving data protection through encryption, multi-factor authentication, and role-based access control to protect data from both internal and external threats. The application of the concepts in the Cloud Security Alliance Framework in the cloud platform enables Junior Islamic School 5 Banyuwangi to improve the security of digital documents and significantly reduce the risk of data loss. Thus, the adoption of a cloud system that meets these latest security principles enables safer, more efficient, and protected archive management from potential threats (Ahmad et al., 2022).

The implementation of a cloud computing system at Junior Islamic School 5 Banyuwangi not only improves data security, but also introduces various features that further strengthen document protection. One of the main features implemented is the audit log, which records all user activities in the system. With audit logs, schools can monitor who accesses or modifies certain documents, thus increasing transparency and accountability in digital records management (Agostino et al., 2022). This feature is also very useful in detecting potential threats or suspicious activities that could jeopardize the security of school data.

Another advantage of cloud systems in improving security is the automatic security updates performed by cloud service providers. These updates ensure that the system is always protected from the latest threats, including cyberattacks such as ransomware and phishing. In the context of educational institutions, where many crucial documents such as student data, financial reports and academic document archives must be kept confidential, this feature is very important to keep the information protected and not easily accessible by unauthorized parties.

With various features and security models implemented, cloud-based digital document management at Junior Islamic School 5 Banyuwangi has undergone a very significant change. Schools are not only able to reduce the risk of data loss, but can also ensure that their documents are always protected from evolving security threats. Therefore, the implementation of cloud computing in educational institutions such as Junior Islamic School 5 Banyuwangi is a strategic step in overcoming the obstacles of archive management in an increasingly complex digital era. With the support of training and awareness of the importance of data security, this system can be optimized to provide maximum benefits for all stakeholders in the educational environment.

CONCLUSION

The implementation of cloud computing at Junior Islamic School 5 Banyuwangi has proven its effectiveness in improving the efficiency of records management, enabling quick access, and minimizing the risk of data loss. However, the main challenge faced is the readiness of human resources, which requires training and support to maximize the utilization of cloud-based systems. The use of a cloud platform facilitates better collaboration by allowing

simultaneous access and efficient sharing of documents between staff. The system overcomes the limitations of previous manual methods, accelerates teamwork processes, and reduces errors in document management. By supporting collaborative work without time and space constraints, the cloud platform improves team productivity and school administration effectiveness. The implementation of a cloud-based system also enhances data security and reduces the risk of losing important documents. The technology ensures protection through data encryption, multi-factor authentication and automatic backup. With better security measures, digital documents are better protected from threats of damage, loss or unauthorized access, creating a more secure and reliable data management environment.

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