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STIPRAM e-Library *Conformity Analysis* Based on *Six-ware Standardization*

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ABSTRACT

This study evaluates the digital collection management at the STiPRAM e-library using the Six-Ware framework, which includes software, hardware, netware, dataware, brainware, and environmentware. The e-library utilizes software like e-print, Vufind, and Slims for managing repositories, e-journals, and e-books, supported by a large-capacity server for efficient storage and fast access. Networking is facilitated via intranet and internet, with access restrictions for certain collections. Digital collections are primarily in text (PDF format), with multimedia available only in physical formats. The library is managed by personnel skilled in information technology, and users receive training to independently access digital resources. Initially, the limited number of staff posed challenges in managing both conventional and digital libraries, but this issue was addressed by increasing staff and improving coordination. Overall, the STiPRAM e-library effectively integrates technology for managing digital collections, enhancing access for users, though further improvements in multimedia management and network capacity are needed.

ABSTRAK

Penelitian ini mengevaluasi pengelolaan koleksi digital di *e-library* STiPRAM menggunakan kerangka Six-Ware, yang meliputi *software*, *hardware*, *netware*, *dataware*, *brainware*, dan *environmentware*. *E-library* ini menggunakan perangkat lunak seperti ehard-print, Vufind, dan Slims untuk mengelola repository, e-jurnal, dan e-book, didukung oleh server berkapasitas besar untuk penyimpanan yang efisien dan akses yang cepat. Jaringan menggunakan intranet dan internet, dengan pembatasan akses pada beberapa koleksi. Koleksi digital umumnya dalam bentuk teks (format PDF), sementara multimedia hanya tersedia dalam format fisik. Perpustakaan ini dikelola oleh tenaga terampil di bidang teknologi informasi, dan pengguna diberikan pelatihan untuk mengakses sumber daya digital secara mandiri. Pada awalnya, jumlah staf yang terbatas menjadi kendala dalam mengelola perpustakaan konvensional dan digital secara bersamaan, namun masalah ini dapat diatasi dengan penambahan staf dan koordinasi yang lebih baik. Secara keseluruhan, *e-library* STiPRAM berhasil mengintegrasikan teknologi untuk pengelolaan koleksi digital, meningkatkan akses bagi pengguna, meskipun masih diperlukan perbaikan dalam pengelolaan multimedia dan kapasitas jaringan.

1. INTRODUCTION

The library is the heart of an educational institution. Its existence must function as an information center and source of knowledge to support the teaching and learning process both at the school and university levels. Libraries have the task of providing wide access for users to seek information, conduct research, broaden their horizons and as a place to study

independently (Nabila et al., 2024). Currently, developments in the world of libraries are inseparable from the development of information technology (Putra et al., 2023) The use of information technology in libraries has the goal of facilitating access and improving the efficiency of work and the quality of work served to users (Kurniawan, 2009). This makes libraries begin to enter the process of building digital libraries, so that various preparations are needed to design and realize it according to the capabilities of each library (Irkhamiyati, 2017).

Getting to know more about digital libraries, the term was first introduced in 1994 on the NSF/DARPA/NASA project: *Digital Libraries Initiative* in the field of document digitization and system development for digital documents (Sahril, 2022). A digital library is a place to store digital reference collections such as electronic journals and information databases (Romadhona et al., 2022). Supriyanto said that the digital library as a system that has various forms of services and information objects (Supriyanto & Muhsin, 2008). A digital library is a system consisting of hardware and software, electronic collections, and various services by utilizing various types of information technology (Marti et al., 2020). A digital library is a collection of information that is managed along with its services, where information is stored in digital format and can be accessed through the network (Arms, 2001).

Junaedi et al. (2021), digital library as a system by utilizing electronic devices and internet networks in conveying their information. This system also combines library materials, services, and human resources in order to fully support the storage and utilization of information and knowledge data in digital form (Safri, 2020). The information has previously been regulated, archived, evaluated, and stored through computers, intranets, and the internet. In addition, this system will also make it easier for someone to collect information. The digital library has a series of menus contained in a programmed application from a server computer, which can be accessed locally by short or long distance, and can be accessed using electronic devices that have been connected to the network (Armiady, 2021).

The presence of this digital-based library will certainly provide many benefits, as well as for universities. The rapid development of digital libraries today is used as one of the capital used to gain knowledge and learn (Singh, 2017). In universities, libraries are an institution that has an important role in obtaining and disseminating information needed for academic activities and research (Vartharajan & AMP; Chandrasekhar, 2007). It is the digital library that will provide information both from the university itself and access information from all over the world, which is intended for students, campuses, and others for learning and research activities.

The application of digital libraries in Indonesia is usually found in public libraries such as Ipusnas (National Library), Biblio (Indonesian Library Room), iSantri (Ministry of Religious Affairs of the Republic of Indonesia), Ijakarta (DKI Jakarta Library and Archives Office), and so on (Arif, 2023). However, it is not uncommon to find digital libraries managed by universities. One of the Higher Education Libraries that already has a digital library is the Ambarukmo Yogyakarta Tourism College (STiPRAM).

In response to these developments, libraries in each university began to gradually improve their libraries to go digital. However, to get to this is not an easy matter, of course there are many challenges that must be faced (Noprianto, 2018). In addition, in designing a digital library, it is necessary to pay attention to several main components contained in standardization *six-ware* introduced by Suwartono (2011), which includes *software, hardware, netware, brainware, datawareand enviromentware*. This model aims to provide a comprehensive framework in designing and managing a digital library system, taking into account all necessary aspects, from hardware and software, network infrastructure, managed data, human resource competence, to the environment that supports its operations.

Research conducted by Noprianto (2018) discussed the challenges in building a digital library and became a response to the development of information and communication technology that affects various aspects of people's lives, including libraries. The purpose of the construction of the digital library is to facilitate the dissemination, storage, and access of information. However, the process of digitizing library collections is not easy, with major challenges such as intellectual property rights and limited human resources (HR) in the field of information technology. Nonetheless, libraries in Indonesia have begun to transform by gradually developing digital libraries, with a focus on local content, and some libraries are now functioning as hybrid libraries that combine physical and digital collections. The basic concepts that need to be considered in realizing a digital library include content, users, functionality, quality, policies, and architecture.

Further research by Prastiwi et al. (2018) which aims to evaluate the implementation of digital libraries at the Veteran National Development University of East Java. The results of the study show that the implementation of digital libraries has gone well, with appropriate analysis and fulfillment of user needs. Although there has been further development, it needs to be improved by adding a medium of interaction between users and librarians. Annual evaluations are carried out to ensure the development of the system, although the server still needs further improvement. Type *Six-Ware* used for the specification of needs and selection of supporting features for digital library users.

Based on some of the previous research, it can be seen that in the research conducted by Noprianto (2018) focuses more on the common challenges in the development of digital libraries in Indonesia, with an emphasis on the transition from traditional libraries to digital. However, this study has not provided an in-depth picture of the application of standardization *Six-Ware* in the management of *e-library*, mainly related to the integration of various technical and non-technical components in the digital library system. Meanwhile, research by Prastiwi (2018) already entered *Six-Ware* In the evaluation of digital libraries, the focus of the research is still limited to technical implementation and evaluation of user needs, without discussing in detail how the components are compatible *Six-Ware* in supporting the smooth management of *e-library* Overall.

The next research that will be conducted by the author will provide an understanding of how the *Six-Ware* model can be applied specifically to *the STiPRAM e-library*, which may have different characteristics and challenges compared to digital libraries at other universities. Focusing on the specific context of STiPRAM will provide new insights that

are more relevant for the management of e-libraries in universities with specific needs. STiPRAM *e-library* is a digital library under the conventional library of STiPRAM under the auspices of the Ambarukmo Tourism College. This *e-library* began to be presented around 2018 and was developed gradually by library managers. Initially, this *e-library* only contained a collection of scientific works developed from the repository of its parent university. Over time, this *e-library* has added to its collection with *e-jounals* and *e-books* as a complement to the availability of its printed collection.

Based on this background, this study wants to find out how the STiPRAM *e-library* is suitable based on the Six-ware standardization? and how and the efforts faced by library managers in building the digital library and the efforts made? This library was chosen by *STiPRAM* e-library using three separate *software* in managing its digital collection. The author is interested in further studying how the development of the *e-library* is based on several components in *six-ware*.

This research has a high urgency in the context of digital library management in universities, especially in the face of the era of rapid digitalization. With the development of information technology, digital management of library collections is very important to support the learning and research process. An efficient and effective *e-library* can expand access to information, accelerate knowledge distribution, and improve the quality of library services. This research provides valuable insights for library managers in universities in implementing digital library systems that are in accordance with technological standards, as well as providing an overview of relevant challenges and solutions in their management.

This research offers novelty in analyzing the suitability of e-library management with *Six-Ware standardization* which includes aspects of *software, hardware, netware, dataware, brainware,* and *environmentware*. Although many previous studies have discussed digital library management, few have examined *e-libraries* with a comprehensive *Six-Ware approach*. This study also provides a perspective on how human resource constraints and task division can be overcome in the management of digital libraries, as well as how increasing the capacity of managers can affect the performance of e-libraries. These findings are relevant in the development of *e-libraries* in other educational institutions, especially in improving the quality of services and digital information management systems.

2. METHOD

The method used is a descriptive qualitative type. Jane Richie defines qualitative research as an effort to present the social world and its viewpoint in the world, both in terms of behavior, concepts, perceptions, as well as problems regarding something being researched with the aim of understanding a phenomenon experienced by the research subject (Moleong, 2011). The qualitative type was chosen because the author wanted to get a comprehensive picture of how *e-library* STiPRAM was analyzed using standardization *six-ware*.

Subjects in this study specified using *pusposive sampling,* That is, the subject is chosen based on his or her competency background because of his characteristics and character that are considered capable of providing information (Suggestion, 2020). In this case, the subjects

in this study namely the librarian of the STiPRAM Library, while the object is *e-library* STiPRAM. The data collection method uses observation, interviews, and documentation. Observations were made on *website e-library* STiPRAM, interviews were conducted with librarians, and the documentation used included previous literature and photographs during the research process. Data analysis was carried out using models from Miles and Huberman, namely *data consendation*, *data display*and *conslusion/verification drawing* (Miles et al., 2014).

The author will observe the STiPRAM *e-library* website, then the author will conduct an interview related to the object with the informant who has been determined. Then, the author will document several tools used in the STiPRAM *e-library*. After conducting field research, the author will analyze the results of the data and then divide it into several sub-sub-subs. Next, the author will present data and draw conclusions.

3. RESULTS AND DISCUSSION

a. Six-ware *standardization*

Some of the main components that need to be considered in designing a digital library are contained in six-ware which include: *software, hardware, netware, dataware, brainware, environmentware.*

1) *Software*

Software is a part of a computer system that has no form. *Software* It can also have the meaning of data that is in digital format and stored digitally that can only be read by a computer. (Julian, 2020). In this case, *software* What is meant is software used in digital libraries, both in the internet and intranet. *Software* must accommodate the automation of collection procurement, collection processing, library membership, services, and library administration. Computers used in carrying out digital services must also be equipped *software* which is good so that it can display a good digital collection as well (Setya eddy, 2010).

> *"Initially, this library's digital collection was only in the form of research results, namely by utilizing a repository that uses e-print software. Then, several e-journals were added which were sourced from journals managed by the University which were contained in the Vufind software. Furthermore, it is managed e-books that are served locally and are contained in the Slims software"* (informant, 2024)
> *"This software is also used to manage library collections"* (Informant, 2024)

Figure 1. *STiPRAM* e-print display

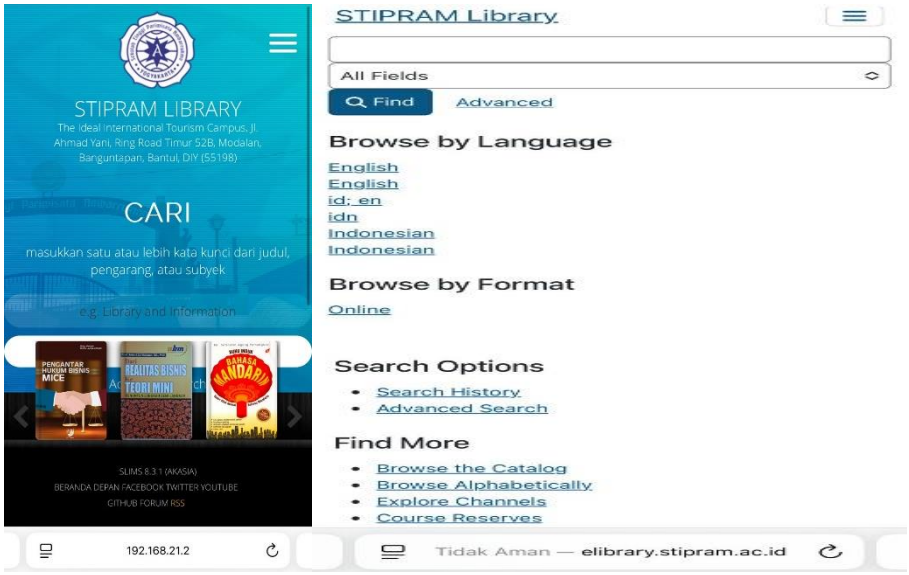

Figure 2. *Vufind* and *STiPRAM* Slims Display

STiPRAM e-library uses *software* in the form of *e-print, Vufind, and Slims* to store its digital collection. Initially, the library's digital collection was limited to research results stored in a repository using *e-print* software. This shows the initial efforts to utilize technology in managing and disseminating the results of academic research. This repository is a tool to document and archive research produced in the university environment.

Then, over time, the digital collection was expanded by adding several *e-journals* sourced from journals managed by the University. These *e-journals* are managed through *Vufind software*, which allows users to access and search journals more efficiently. With the existence of *e-journals*, libraries are able to provide wider and relevant access to scientific publications that are important for the development of academic knowledge in the university environment.

Furthermore, the digital collection is expanded again with the management *of e-books* intended for local access. This *e-book* is contained in *the Slims software* which allows users to access various e-books to support teaching and learning activities. Collection management using *Slims* also allows libraries to be more organized in digitizing and distributing books to users effectively.

The software used in the management of digital collections not only functions as a tool to store and organize information, but also as a medium to manage the entire library collection. This shows that technology is a key aspect in supporting the transformation of libraries towards more modern and efficient services. Overall, the management of digital collections in this library illustrates significant developments in improving the quality of library services by utilizing technology. The adoption of the right software, such as *e-print*, *Vufind*, and *Slims*, allows libraries to better digitize collections and provide easy access for users.

2) *Hardware*

According to Ali (in Nugroho & Ali, 2022), *hardware* or hardware is a computer system tool that can be touched and seen physically. This tool is divided into several components which include components *Input*, *processing*, *Output*and *storage*. In Setyo (2010), *hardware* must be in line with the design of the digital library. *Hardware* including personal computers as devices to input and process data in digital form. Of course, these digital files require a very large capacity (approximately 1 TB), so server computers are the top priority in increasing their capacity and speed.

Figure 3. Hardware to access *STiPRAM e-Library*

The image shows a piece of hardware used to access the STiPRAM e-Library. This library provides as many as 25 units of PCs to support users in accessing the STiPRAM e-Library. This shows the commitment of this library in providing facilities to make it easier for users in the process of retrieving information. Then, the statement from the informant stated:

> *"The digital collection in the STiPRAM e-library is stored in a server that has a large enough capacity. This is for the sake of effectiveness in storing collections for a large amount and large capacity"* (Informant, 2024)

Based on the results of the interview, it can be analyzed that the management of digital collections in the *STiPRAM e-library* has been well prepared in terms of storage infrastructure. The informant said that the digital collection is stored in a server that has a large enough capacity. This shows that the library has considered the importance of adequate storage capacity to accommodate various types of digital collections, such as research results, *e-journals*, and *e-books*.

The use of this large-capacity server is not only important for storing large amounts of digital files, but also ensures fast and stable access for users. Digital collections stored in sizable servers allow *e-libraries* to continue to grow, accommodate the addition of new collections, and minimize the risk of access disruption or data corruption. In addition, large in-server storage also supports the efficiency of managing and organizing digital collections.

In this context, the STiPRAM e-library can easily manage, update, and access various digital collections needed by its users, both students, lecturers, and other parties who need information. Overall, the use of large server capacity reflects STiPRAM's efforts to provide a reliable and ready infrastructure to support the needs of digital collections that continue to grow over time.

3) *Netware*

Netware is a device that is used to make connections from server computers to client machines (Setiawan, 2015). *Netware* must be improved in terms of *bandwidth* As well as the wide scope of the network, both those using fiber optics, cable and wireless. In order for data transfer activities to have good speed, it is necessary to pay attention to the quality of the type of fiber optic, cable, HUB, or wireless used, because the files to be transferred are not only in the form of text, but also images, sounds, and even videos (Setya eddy, 2010).

> *"In the STiPRAM e-library, digital collections in the form of e-books, can only be accessed with a local network, namely the intranet. The digital collection in the form of e-journals can be accessed by general users using the intranet or the internet. Then, for digital collections contained in the repository, it can be accessed by the public but not in full text or limited" (Informant, 2024)*

Based on this information, it can be seen that the digital collection in the form of e-books in the *STiPRAM e-library* can only be accessed through the local network, namely the intranet. This access restriction indicates an attempt to control the distribution and use of *e-book* collections that may have copyright restrictions or are reserved only for certain members of the STiPRAM academic community. Nonetheless, this restricted access can also be a way to keep data secure and ensure that the resource is used in a legitimate way.

Unlike *e-books*, digital collections in the form of *e-journals* can be accessed by general users through two channels: intranet and internet. This allows for a wider range of access, so that *e-journals* can be accessed not only by internal users (such as STiPRAM students and lecturers), but also by outsiders who need scientific information

published in these journals. The ability to access this collection via the internet shows that the STiPRAM *e-library* strives to provide more inclusive access to the public and support wider academic collaboration.

Meanwhile, the digital collections contained in the repository can be accessed by the public, but with certain limitations. This non-full-text or restricted access may be due to copyright policies, internal regulations, or other considerations related to the protection of the information contained in such repositories. These access restrictions may be intended to maintain the integrity of the content or to comply with applicable regulations at the relevant institution.

4) *Dataware*

Dataware or data devices that are ready to be served to users. *Dataware* have different sizes so that they affect the processing process and services. Usually, the data served is in the form of digital text because it makes it easier to handle. The text data is in PDF format, but it is more recommended to use the Optical Character Recognition (OCR) format which is more indexed in each word, so that it will provide convenience in retrieving information. In addition to data in the form of text, data in the form of voice, images, graphics, videos, and multimedia are also usually found (Setya eddy, 2010).

> *"The digital collections served in the STiPRAM e-library are in the form of text and image data. The text data is in the form of e-books, e-journals, and repository collections in PDF format. Meanwhile, collections such as video, audio, and others are only served in physical format, so they are not provided in the STiPRAM e-library"* (Informant, 2024).

Based on the results of this information, it can be seen the STiPRAM e-library has a certain policy in providing digital collections that are tailored to the type of format and media that can be accessed by users. Digital collections in the form of text data that include *e-books*, *e-journals*, and *repository collections* are provided in PDF format. The provision of this collection in PDF format indicates that the library chooses a format that is easily accessible and supported by a wide range of document reader devices. Meanwhile, video and audio collections are not provided in digital format in the *e-library*. These collections are only available in physical format.

Overall, the decision to manage digital collections in text and image formats, as well as limit video and audio collections to physical formats, reflects the pragmatic approach taken by STiPRAM *e-libraries* in providing resources. By focusing on textual materials in PDF format, *e-libraries* are able to provide easier, space-saving, and efficient access. Nonetheless, the absence of digital collections in the form of audio and video in *e-libraries* could be an important consideration for further development, given the importance of media diversity in supporting richer learning and research experiences in the future.

5) *Brainware*

In the book Management Information Systems written by Susanto (2016), *Brainware* is a resource that has a relationship in the activities of compiling, collecting, distributing, processing data and utilizing information that is the result of an information system. In Gultom et al. (2018), *brainware* or the human factor is a key aspect in the network security environment. The human factor plays a dominant role in improving or otherwise disrupting all information security efforts in an organization. In the world of libraries, *brainware* or knowledge resources in library managers. *Brainware* There are various types and are tailored to the needs of each field. In digital libraries, at least basic competencies are needed about the use of computers and digital data owned by each individual (Setya eddy, 2010).

> *"The management of the e-library is carried out by all library managers in turn. So, all library managers can be said to have competencies related to the use of computer devices and digital data devices"* (Informant, 2024).

The management of *the e-library* at STiPRAM is carried out collaboratively by all library managers in turn. This shows a team approach that involves many individuals in the management process, which of course requires effective coordination and division of tasks to ensure that digital library services run well. The statement from the informant also highlighted that all library managers in the STiPRAM *e-library* have sufficient competence in terms of the use of computer devices and digital data devices. This competency is very important, considering that the management of digital collections requires good technical skills, ranging from the operation of library *software*, digital file management, to solving problems that may arise in accessing or storing digital data.

6) *Environmentware*

In Setyo (2010) explained that *environmentware* or the condition of the place and the surrounding environment as well as the culture of its human resources. The environmental conditions of digital libraries must be conducive, both in terms of humidity, temperature, electricity and others because they use a lot of electronic devices. In addition to paying attention to the equipment used, it is also for the comfort of users. Furthermore, the cultural change of the community from the conventional era to information technology also helps various processes in digital libraries.

> *"The STiPRAM e-library is within the scope of its conventional library which is also under the auspices of its parent university, STiPRAM. Of course, various facilities have been provided, such as intranet and internet access, electricity, library rooms, computer devices, and others. This is to make it easier for users to get the information they need to support the learning and research process. In addition, users have also been given briefings on how to use the STiPRAM e-library, so that they can access it independently whenever they need it"* (Informant, 2024)

Figure 4. STiPRAM Library Rooms and Facilities

Does this information indicate the STiPRAM e-library operates within the framework of a conventional library under the auspices of the parent university, namely STiPRAM. This reflects that *the STiPRAM e-library* is part of a wider library system, which aims to support academic and research activities in the university environment. This *e-library* functions as a digital facility that complements the information resources in conventional libraries.

In terms of infrastructure, the STiPRAM e-library has been supported by various adequate facilities to support accessibility and user comfort. Some of the facilities mentioned include intranet and internet access, electricity, library rooms, and computer equipment. This facility shows that the library has prepared complete facilities to ensure that users can access digital collections smoothly and efficiently. With internet and intranet access, users can not only access digital collections from inside the library, but also from outside the campus, expanding the reach of *e-library services*.

In addition to physical and technical facilities, *e-library* managers also provide briefings to users on how to use *the e-library*. This shows that the STiPRAM library not only provides access, but also provides education on how to make effective use of *the e-library*. With this debriefing, users, such as students and lecturers, can access the *e-library* independently whenever needed to support their learning and research activities. This is important because the use of good technology and sufficient understanding of *the e-library* system will maximize the benefits that users get.

b. Obstacles and Efforts in Building a Digital Library

In building digital libraries, various obstacles are often encountered, which are also faced by the STiPRAM Library. The following is an informant's statement regarding these obstacles:

> *"The initial obstacle in building this digital library is related to the problem of human resources that are still small in number, so it is difficult to divide time to manage conventional and digital libraries. However, as time goes by and the library staff has increased, this problem has been solved because the division of time in managing the library has been coordinated"* (Informant, 2024)

Based on the results of the interview, it can be analyzed that the initial obstacle in the development *of the e-library* at STiPRAM lies in the limitation of human resources (HR). In the early stages, the small number of library management personnel is the main obstacle in managing conventional and digital libraries simultaneously. This creates difficulties in the division of time and assignment of tasks between the two types of library services, given the ever-evolving management needs for both physical and digital collections.

However, as time went by, the problem began to be resolved. Increasing the number of library management personnel is a solution to reduce the workload that is too heavy on the initial manager. With the increase in the workforce, coordination in the division of time and tasks becomes more structured and effective. This allows managers to focus more on managing both types of libraries, both conventional and digital, optimally.

4. CONCLUSION

Based on the results of research and analysis of the *STiPRAM e-library* using the Six-Ware standardization, it can be concluded that the STiPRAM *e-library* has made significant efforts in developing and managing digital collections by utilizing existing information technology. There are several components that need to be considered, all of which refer to *Six-Ware* (*software, hardware, netware, dataware, brainware, environmentware*).

a. ***Software***: STiPRAM *e-library* uses adequate software to manage digital collections, such as e-print, Vufind, and Slims, each of which has a function in managing research results, e-journals, and e-books. The software supports the management of digital collections well, although further development to accommodate multimedia collections (such as audio and video) is still needed.
b. ***Hardware***: The hardware infrastructure used is adequate, with the use of servers that have a large capacity to store large quantities of digital collections. This allows for fast and efficient access and supports the management of digital collections that are constantly evolving.
c. ***Netware****:* Network access in *STiPRAM e-library* is adequate with the use of intranet and internet, allowing users to access e-journals and repositories more flexibly. However, access restrictions on e-books that can only be accessed via the intranet and full access restrictions on repositories indicate copyright and data protection considerations.
d. ***Dataware***: STiPRAM *E-library* focuses on providing collections in text (PDF), which are easily accessible and used by a wide range of document reader devices. However, multimedia collections such as video and audio are still provided in physical formats, which limits their digital accessibility.
e. ***Brainware***: The management of *the e-library* is carried out collaboratively by managers who have competence in the use of computer devices and digital data. These skills are important to maintain the smooth operation of *e-libraries*, although increased training for managers and users on the use of *e-libraries* can be considered for further improvement.

f. ***Environmentware***: The physical infrastructure *of the STiPRAM e-library is adequate with facilities such as intranet and internet access, a comfortable library room, and briefings to users regarding the use of* the e-library. This supports the convenience and effectiveness of users in utilizing *e-libraries* for academic and research needs.

However, there are initial obstacles faced in the management *of the STiPRAM e-library*, especially related to the limitations of human resources (HR) which cause difficulties in the division of time between conventional and digital library management. Over time, with the increase in the number of managers, this problem can be overcome and the management of *the e-library* can run more effectively.

To improve the conformity of the STiPRAM e-library with Six-Ware standardization, further development is needed in several aspects, such as the management of multimedia collections in digital format, increasing network capacity to support wider access, and increasing the competence of managers in managing software and digital infrastructure. In addition, annual evaluations of hardware, software, and access policies need to be carried out to ensure that the STiPRAM *e-library* can continue to grow in line with the development of information technology and user needs.

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