

Original Research Paper

Design of Enterprise Architecture Using Zachman Framework at Private School in Center Jakarta

¹Keysia Aprilia, ¹Francka Sakti Lee, ¹Yemima Monica Geasela,
²Shierly Everlin and ³Felliks Feiters Tampinongkol

¹Department of Information Systems, University of Bunda Mulia, Jakarta, Indonesia

²Department of Visual Communication, University of Bunda Mulia, Jakarta, Indonesia

³Department of Informatics, University of Bunda Mulia, Jakarta, Indonesia

Article history

Received: 18-12-2023

Revised: 23-04-2024

Accepted: 06-05-2024

Corresponding Author:

Francka Sakti Lee

Department of Information
Systems, University of Bunda
Mulia, Jakarta, Indonesia

Email: flee@bundamulia.ac.id

Abstract: Technology is currently fundamental and necessary, including in the education sector, where information technology, such as enterprise architecture, can be applied to support and facilitate school business processes. Private schools in Central Jakarta are one of the schools that utilize information technology in running their business. However, currently, schools still need to use information technology optimally, so it is necessary to integrate school business processes with technology through enterprise architecture design. The design of this enterprise architecture blueprint will utilize the Ward and Peppard analysis method, which provides an overview of business processes and technology from the internal and external side through overall analysis, such as value chain, SWOT and CSF analysis, Porter 5 force analysis, PEST analysis and also technology analysis in schools, as well as the Zachman framework which will describe schools and their technology from various points of view and general aspects, such as Sope, business model, system model, technology model, detailed representation and also functioning enterprise, as well as providing a series of processes that produce IS and IT solutions. Research data was collected through interviews with school officials, observations, and literature studies. Zachman's framework and also Ward and Peppard's analysis are used to overcome problems such as lack of data integration, the need to improve data management, as well as the development of existing schools so that proposals are given that can be implemented by schools in the form of an enterprise architecture blueprint that can be used as a guide in assisting integration-of the school's business processes and technologies within them, as well as their development through the proposed system.

Keywords: School, Enterprise Architecture, Zachman Framework, Ward and Peppard Analysis, Blueprint

Introduction

Nowadays, with technology, implementing business processes (Andry *et al.*, 2021a; Lee *et al.*, 2023) and various other things within a company or organization is increasingly easier, such as making decisions more quickly and precisely (Nouri Hussein *et al.*, 2023; Andry *et al.*, 2021b). Using technology aligned with existing business strategies requires planning that can be implemented through enterprise architecture, which is a long-term strategy that describes organizational goals in achieving organizational or company goals through technology systems and architecture (Andry *et al.*, 2023; Geasela and

Legowo, 2022; Lee *et al.*, 2020). In the education sector, enterprise architecture planning can support and facilitate learning by providing learning resources, facilities, and systems that can assist learning activities and influence business processes in schools (Tresna and Hadiana, 2019). Therefore, using technology through planning aims to improve service quality (Talebi and Bardsiri, 2023; Ali *et al.*, 2021).

A private school in Central Jakarta is one of the educational institutions utilizing information technology in the academic domain. However, the education sector has not fully implemented the use of information technology where data recording and some of it is still

done manually or using simple tools such as Excel and others so that it is less integrated, such as in data recording and registration of students and extracurricular activities that still use excel and google form. Therefore, information strategy planning is needed through enterprise architecture, which is a hierarchical depiction of information systems, business processes, and the people involved in it as a whole (Dinata *et al.*, 2024; Aprilia, 2020) so that schools can be structured and have a clear vision and mission in improving technology for their parties (Sopian *et al.*, 2023). Therefore, it is expected that this enterprise architecture design can achieve the vision and mission of a private school in Jakarta city Centre, which is to form a whole Indonesian human being with cognitive, affective, and psychomotor qualities based on Christian faith.

The enterprise architecture design for the private school in Center Jakarta will apply the Zachman framework in conjunction with the Ward and Peppard analysis method. In 1980, which is a two-dimensional classification matrix with six rows and six columns (Madyatmadja *et al.*, 2021). The Ward and Peppard method is used to increase the school's business value from the internal and external side (Singgalen, 2023) through SWOT, PEST, CSF, Porter 5 forces model, value chain, and application portfolio analysis. This research uses the Zachman framework because this framework can describe the organization as a whole from various points of view and aspects (Aslam *et al.*, 2023; Andry *et al.*, 2021c) and the Ward and Peppard method is utilized to conduct a series of analytical processes to evaluate and comprehend the intersection of business and technology. This method also allows for the development of IS solutions for both the external and internal aspects of the organization (Agnes and Wijaya, 2021; Imbing and Andry, 2019; Jordan *et al.*, 2024). This enterprise architecture design is expected to produce an enterprise architecture blueprint that can fulfill the vision, mission, and goals of the school, as well as improve the smoothness of business processes and the use of technology for the school.

Materials and Methods

Research stages are the steps or actions taken to conduct research (Singh, 2021). The research stages carried out are explained in Fig. 1 research stages:

1. Literature studies help provide a general overview of a research issue or problem (Snyder, 2019). At this stage, the researcher will determine the problem, the research scope, and the research objectives
2. Data was collected by conducting qualitative interviews, namely collecting data by asking questions to the sources (Zahle, 2023). In this research, the sources were several parties from the school, such as the principal, administration department, librarian, Infrastructure sector, and other related parties. The data obtained from this interview is related to school business processes, school vision, mission, goals, technology available in schools today and of them. Then, data collection was also carried out by observing the school directly to see the school's condition and studying the documents needed for research in the form of related journals and school data such as current records.
3. Ward and Peppard's analysis method will analyze the school from the internal side of the business section with the value chain and Critical Success Factor (CSF) which will determine what are essential factors for the school and the Internal IT/IS section through the current IT portfolio This; then from the external side, the business section through PEST analysis and the five force model which describes the school from the outside in terms of politics, economics, social, technology, as well as its competitiveness in the environment and the IT/IS section through IT Trends; as well as IS/IT analysis for business, management and IT so that the school's business and technology can be understood as a whole.
4. Analysis carried out using the Zachman framework will focus on the proposed system along with points of view or perspectives originating from 36 cells in the Zachman framework, namely scope-planner, business model-owner, system model-designer, technology model-builder, detailed representation-sub-contractor and also functioning enterprise to be a reference for schools for technology development.
5. At the IT application portfolio stage, the results of the proposed system will be provided in the form of a McFarlan strategic grid or mapping of four quadrants (strategic, high potential, key operations, and support), which will divide the proposed system based on its contribution to the school.
6. The enterprise architecture blueprint provided is an entire report that can be used as a reference or guide for schools to implement so that the integration of business processes and technology can occur.



Fig. 1: Research stages (Andry *et al.*, 2021a)

Results and Discussion

Study Literature

The use of information technology still needs to be fully operational in private schools in Central Jakarta, so existing data still needs to be well integrated. Therefore, it is necessary to design an enterprise architecture that can align existing business processes with IT so that schools can have better and stronger data control and improve school performance. This research focuses on designing company architecture through analysis of the Zachman framework and Ward and Peppard, where analysis will be carried out in the business, data, application, and technology sections. The business part will be analyzed using the value chain to maintain existing competitive advantages and achieve new opportunities (Awan *et al.*, 2022), Critical Success Factor (CSF) to determine essential issues that must run well (Chau *et al.*, 2021), PEST and five force model to analyze business from the external side by providing an overview of the conditions surrounding the organization (Christianto *et al.*, 2023) or company and providing a view of how a company can achieve competitive advantage by using five essential forces within the industry or organization (Rathore *et al.*, 2023). Apart from that, the current IT portfolio and existing IT trends will be explained from a technology perspective. The results of the analysis from the internal and external sides will produce an IS/IT strategy for business, management, and IT.

After that, the design is also carried out using the Zachman framework, which can determine all aspects of the enterprise Architecture, namely the scope or aspects of the planner, business model or aspects of the owner, system model, which is an aspect of the designer, technology model which is an aspect of the builder, detailed representation or aspects of sub-contractors and Functioning Enterprises or Users (Madyatmadja *et al.*, 2021). Previous research that can be used as comparison material with this research is research conducted by Andry *et al.* (2021b) by depicting the Enterprise Architecture landscape which combines the same two methods, namely Ward and Peppard and also the Zachman Framework on electrical equipment import-export companies.

Data Collection

The data obtained in this research came from literature studies and qualitative interviews with related parties in the school, such as the principal, administrators, librarians, and bids. Infrastructure and other related parts are achieved through visits to private schools in Central Jakarta and online communication (Andry *et al.*, 2021c), namely via chat. The interviews were aimed at getting answers related to business processes in schools, questions related to obstacles in schools, and other data such as technology used in schools. Then, the data obtained from observations was in the form of business processes and other necessary data, such as activities in school business processes and other activities. Finally, data was obtained through document studies such as related journals and other documents.

Ward and Peppard Analysis

Internal analysis:

1. Business
2. Value chain

Based on Fig. 2 shows the value chain in the school as follows: The school's main activity is the acceptance of new students based on the registration or new student acceptance form that the school has promoted. Then, the operations that occur at school are learning activities, extracurricular activities and also recording grades for students so that all students can become the best graduates in terms of grades and attitudes. Then, at the output stage, grades and diplomas are produced, which show the students' learning outcomes while at school. The school's marketing activities are carried out using social media such as Instagram and Facebook, websites, promotions via banners, and spreading information by word of mouth as done by parents. The last part of the school's main activities is collecting data from alums, providing counseling for students so that students can share their feelings or situations with the

counseling teacher, then parent counseling, namely guidance for parents of students and also providing UKS to be able to overcome problems-health problems of students at school.

Then, in school support activities, the existing infrastructure to support school business is the school building, classrooms, library, administration room, and also the UKS room. In human resource management, this is related to recruiting teachers or staff by foundations and holding training and internship activities to improve the quality of teaching staff in schools. Technological developments used in schools today are applications provided by the government that can be used by schools such as RKAS and DAPODIK. There is a school website and LMS is used when taking exams. Apart from these technologies, there are also general technologies used, such as Microsoft Word and Excel, for writing letters or other purposes and making reports, as well as using g-forms for registration, such as registering new students and registering for extracurricular activities. Lastly, procurement is carried out to fulfill school business processes, namely procurement of benches and tables for learning activities, computers for administration, librarians, principals, teachers, computer rooms, and partly, procurement of school books both for learning and for the library. as well as office stationery (ATK) for teacher or class needs.

Weakness, Opportunity, Threat (SWOT)

The following is a SWOT that exists in schools in Table 1. SWOT Matric. Show current evaluation of competitiveness and develop strategic matric of school business.

Based on Table 1, the school has strengths in its educational facilities, discipline, and many exciting activities that can be carried out outside the classroom to improve the quality of students. However, the school still needs to improve due to the lack of website development. Then, the opportunity the school has is the school's vision and mission, which aims to develop all students. Threats to the school come from imperfections in the website, competition with surrounding schools, and a lack of teaching ability. The strategy that can take advantage of the opportunities and strengths of the school and reduce the weaknesses and threats to the school is by prioritizing

services in schools such as increasing the ability to teach teachers, improving school information facilities, and several others.

Critical Success Factors (CSF)

This factor is essential factors for the success of a company, product, or system. Since its appearance, CSF has been used in various fields, such as business, and is also used to identify critical factors for successful project implementation (Tuan, 2020). The following is a mapping of the CSF that currently exists in private schools in Central Jakarta.

Table 2 explains what factors determine school success along with the key indicators needed to achieve existing goals, such as achieving good quality products, where in the school context, products are students or graduates from the school, then service for customers who are parents of students and the students themselves, developing the school business, resources for the school and also the technology needed.

Information Technology/Information System (IT/IS)

The school is described as using the McFarlan strategic grid, where currently the school uses Microtik, which is included in the High Potential quadrant and Microsoft Office, DAPODIK, RKAS4, and LMS are included in the support quadrant.

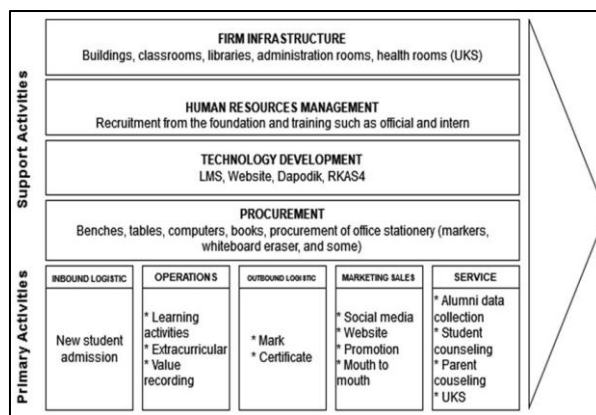


Fig. 2: Value chain private school in Jakarta

Table 1: SWOT matric

Matric	Strengths (S)	Weakness (W)
	Supportive educational facilities, emphasis on discipline and lots of intriguing activities outside the classroom	The school website is still being developed and improved
Opportunities (O) The school's vision and mission can improve student services from generation to generation	S-O Prioritize service and maintain good relationships between teachers, students and parents	W-O Building good relationships with teachers, students, staff, alums and parents
Threat (T) The school website still needs improvement; related many other high schools are in the area and the teaching staff needs to be more proficient	S-T Trying to become a better school by various other areas, using varied other on social media to promote the school	W-T Actively providing school- information on social media and strictly select teaching staff

Table 2: School's Critical Success Factor (CSF)

Main purpose	Critical success factor	Key performance indicator
Quality of product produced	It provides good quality education and service to produce the best graduates who excel in various things, such as those in the school's vision, mission and goals	The existing curriculum provides learning, namely the Independent Curriculum 2013 for classes 10, 11 and 12. We provide extracurricular activities and other activities to improve the quality of students
Service to customer students	It provides the information needed by students and parents through counseling	The administration and is open to and parents and the guidance and counseling section can be a forum for students to overcome problems in the school environment
Business development	The development of the school is in the midst of the current situation, where there are many other schools in the surrounding area	The school has many new students enrolled, improving grades and where student achievement
Organization resources	Availability of school support equipment and competent teachers	Equipment procurement is carried out regularly, training through school departments and internal and teacher selection
The technology used	Implementation of technology to support school business activities	Use of technology to support school activities in all ways

External Analysis:

1. Business
2. PEST analysis

Politic: The government is carrying out the development of priority programs for the independent learning program, such as the use of the independent curriculum, implementation of the national assessment, and the mobilizing teacher program, which will present school supervisors and future school principals as well as mentoring of mobilizing school principals in various regions. The education digitalization program and accessible technology platforms for teachers and school principals also exist. Then, there is also the provision of allowances and assistance for access to education, such as the smart Indonesia card and the smart Indonesia Program. The government also provides the DAPODIK application, which manages data collection by the Ministry of Education, culture, research, and technology.

Economy: This is influenced by government support through programs providing budgets so that children can attend school well, such as the smart Indonesia program, smart Indonesia card, and school operational costs. Studying at this school is one of the economic factors that need to be considered because this school is a private school.

Social: Influenced by things such as people's lifestyles, level of education, regional development, population distribution, and the condition of the community population. Due to several social factors, this school has become one of the schools chosen by the surrounding community, both from close and far away. The lifestyle adopted in the school environment is one that is aware of

the importance of education and the need for education for their children. Apart from that, the school's strategic location also determines the social factors that influence the choice of this school.

Technology implemented at this school can be seen using LMS, projectors, Wi-Fi, and technological facilities that support learning and other school operations. Developing a website that had been inactive for some time now becomes active again is also a sign that the school wants to develop further and keep up with existing technology. To support promotions for schools, schools also use social media as a promotional tool.

Five Force Model

1. Competitive rivalry: Private and public schools are nearby
2. The threat of substitution: The number of schools around the existing environment, developing new private schools
3. Buyer's power: School in center Jakarta students
4. Threats of new entrants: The construction of new high schools, both public and private schools in the area, and the development of new curricula in every school
5. Supplier's power: Government regulations, junior high school graduates from the same or different foundations, and parents' recommendations for sending their children to school

IT/IS (Trend IT)

The following is a mapping of the external IT Trend that currently exists at a private school in the center of Jakarta:

- a) Hardware technology. Selection, use, and maintenance of suitable hardware are needed to help schools carry out their operational activities. This is necessary to prevent undesirable things, such as damage to hardware and parts of it.
- b) Software technology. This technology is used to make work faster and more integrated. For example, there is DAPODIK from the government, which can be used to collect data and Microsoft Office can be used to create documents and other parts.
- c) Operating system technology. Microsoft Windows 7 and above is the operating system used in schools.
- d) Infrastructure technology. The technological infrastructure used in schools is MikroTik, where several local networks and the internet can be connected using this proxy. Apart from that, internet content accessed by clients or users can be regulated, making it suitable for school Wi-Fi use.

IS/IT Strategy

The following is the management required to carry out business processes to support the proposed system.

Business Strategy

Based on an analysis of the external and internal scope of the private school in Center Jakarta, several information system recommendations have been prepared that can help business processes at the school, as follows:

- a) Creation of a library system to help record and store school library data
- b) Creation of a procurement system to record the entry and exit of procurement for schools
- c) Creating a data collection system to record data on students, teachers, and staff
- d) Creation of an extracurricular system to collect data when registering for extracurricular activities and entering student grades from the extracurricular activities
- e) Creation of an assessment system that functions to record student grades, which can accumulate the final grades of students and students
- f) Increase the number of human resources who can develop technology and those related to school IS/IT.
- g) Providing training for human resources
- h) Currently, in schools, they can use technology such as SI/IT better
- i) Optimizing the existing school website and
- j) Increasing information system security by storing backups of school data and routine maintenance

Information Technology Strategy

Based on the analysis of the external and internal scope at the private school in the center of Jakarta, an IT strategy was prepared as follows:

- a) Technological development in schools, such as improving the hardware used in schools
- b) Increased ability to use IT/SI
- c) Procurement of IS/IT technology that is increasingly optimized
- d) Maintenance for servers
- e) They are increasing skills for existing human resources and increasing knowledge of IS/IT in schools.

IS/IT Management Strategy

The conditions obtained through recommendations for IS/IT strategic management based on analysis of the external and internal scope of the school are as follows:

- a) Making SOPs are guidelines or directions for implementing or using IT/IS
- b) Financial planning for the use and development of IT/IS

Zachman Framework

1. Scope: Through this matrix section, the Zachman framework will record the important parts of the school's business processes to achieve the school's goals, vision, and mission, as well as develop technology in the school. This can be done through recording and processing essential data such as student, teacher, and staff data, then value data, purchase and use data for school goods, extracurricular data, and library data, where this data is obtained from each a necessary process at private school in Center Jakarta with responsibility for the school, administrators, librarians, teachers, and admin, where every important event or activity will be recorded.
2. Business model: In this matrix section, essential business processes will be described and explained through the use of use cases; there is a description of the party responsible for building and developing system projects to control data for schools better and, in more detail, simplify data collection and improve service. This section also explains the current school network topology, as shown in Fig. 3 current school network.
3. System model: Physical modeling and the use of class diagrams to describe existing data classes will be provided in this section. This section will also display the mock-up design and incidents or events related to the proposed system. This section also defines the limitations of system design. Figure 4 The proposed school network shows that a cloud will be added to the school network to become server a backup storage server when something unwanted happens. In addition, there is also an additional computer for the library room that can be used to run or implement the proposed system given in the blueprint, namely the library system.

4. Technology model: Will be implemented is described in this section through the use of UNF tables for data, then the use of sequence diagrams to describe the relationship between actors and the system, reference construction times and room plans for implementing this proposed system, as well as time references and limitations in designing the proposed system
5. Detailed representation: This section will explain how the proposed system will be run, such as the data in the database, the new business flowchart, access to each actor in the system, coding time, and other essential things in developing the proposed system
6. Functioning enterprise: This last section explains system events that will occur if the proposed system is implemented. Such as the framework of the data in the database, report results, master schedule, access list, proposed architecture, and applicable SOPs

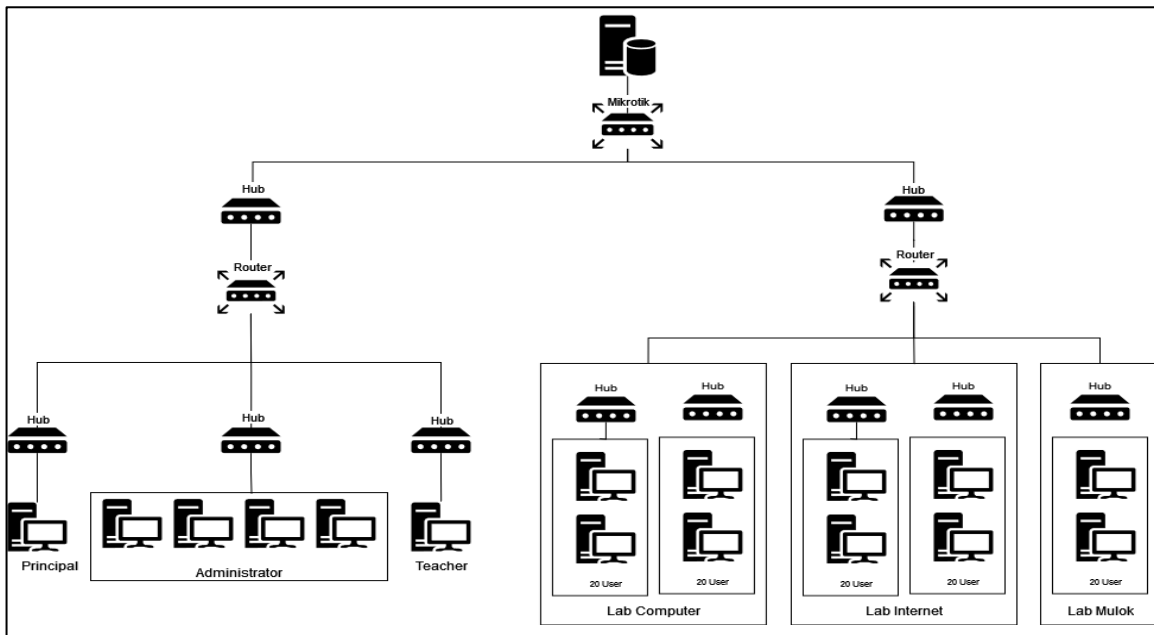


Fig. 3: Current school network

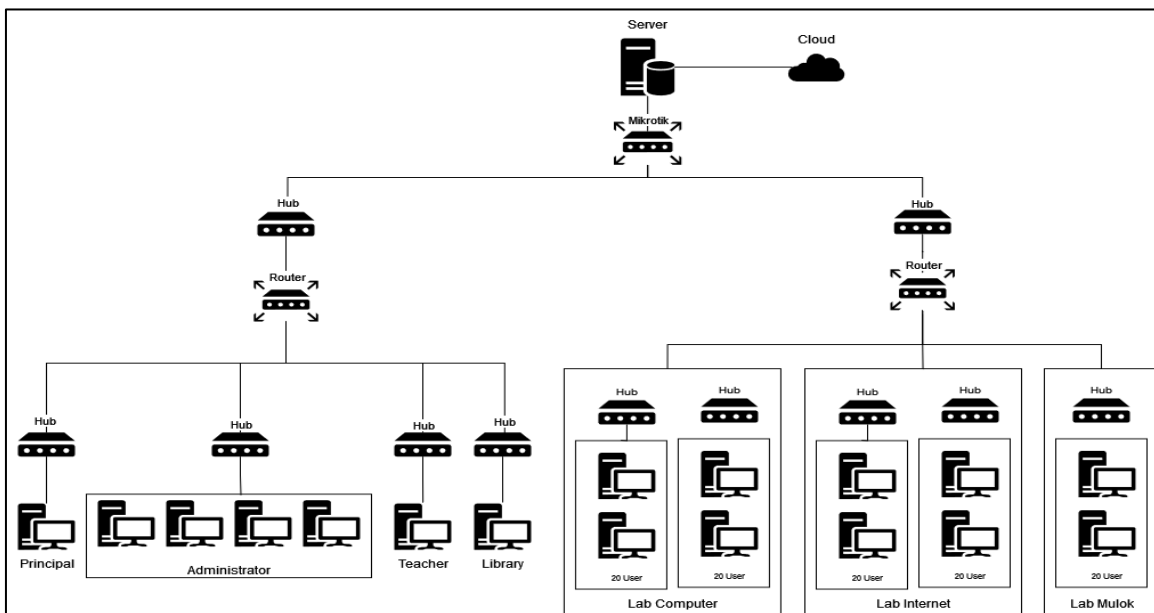


Fig. 4: Proposed school network

Table 3: IT portfolio proposal

	Key operational	Support
Strategic	Data Collection System	Library system
High-potential	Procurement system	Extracurricular system
	Assessment system	

IT Portfolio Proposal

The following section explains the results of the proposed system portfolio on application architecture using the McFarlan grid strategy.

Based on Table 3 of the proposed application Portfolio, the researcher determines that the data recording system will be in the key operational-strategic quadrant because recording this data will increasingly help school business processes to create better data control, where the data recording system will help store data. Existing data, such as student, teacher, and staff data, are better and can be used or integrated with other systems, such as grade recording systems, libraries, and rescue. Then, in the support-strategic quadrant, a library system will help the school's business processes manage the library so that book data and data on borrowing and returning books can be stored properly. In the key operational-high potential quadrant, there is a procurement system and a value recording system; these two systems can help the school's success in the future. The procurement system will help the school's business processes manage the equipment available at the school and the needs needed by the school. Then, the grade recording system will help teachers to manage students' grades more easily and quickly. Finally, there is an extracurricular system that will help control extracurricular activities at school. This system will help record students who will take extracurricular activities, take extracurricular attendance, and assess extracurricular activities.

Conclusion

Based on research that has been carried out using the Zachman framework and also Ward and peppard's analysis to overcome problems such as lack of data integration, the need to improve data management and development of existing schools, a proposal is given that can be implemented by schools in the form of an enterprise architecture blueprint which includes some strategies can be used and also five systems proposed, namely a data recording system to help the process of managing student, teacher and staff data; library systems for use in libraries; procurement system to manage school equipment and needs; a grade recording system to help teachers record grades more quickly and efficiently; and an extracurricular system to collect data on students who take part in extracurricular activities, attendance and also extracurricular assessments to serve as guidelines in

assisting school business processes and the technology within them and their development.

Acknowledgment

The author would like to thank the faculty of technology and design, at Bunda Mulia University, Jakarta, which has supported this research in the form of funds and other support, and also the private high school in Central Jakarta, which has become the object of this research so that this research can be carried out.

Funding Information

The researchers would like to thank to University of Bunda Mulia who has funded this research so that it can run well and as expected.

Author's Contributions

Keysia Aprilia: Defined the concept of research, gathered information and the requirements, analyzed the problem and data, interpreted the research results, and wrote the manuscript.

Francka Sakti Lee: Supervised the process, reviewed the result and article critically, and wrote the manuscript.

Yemima Monica Geasela: Formulated the findings obtained in the school and the conclusions obtained in this research.

Shierly Everlin: Identify and suggest the portfolio of the system.

Felliks Feiters Tampinongkol: Formulated findings and recommendations to increase the level of high school capability.

Ethics

This article does not deal with human or animal subjects. In addition, this article is original and has never been published. The corresponding author confirms that all other authors have read and agree that the manuscript does not involve ethical issues.

References

- Agnes, A., & Wijaya, A. F. (2021). Information System Strategic Planning Using Ward and Peppard Framework at the Regional Secretariat of Bengkayang Regency, the Organization Section. *Sebatik*, 25(1), 131–137.
<https://doi.org/10.46984/sebatik.v25i1.1283>
- Ali, B. J., Saleh, P. F., Akoi, S., Abdulrahman, A. A., Muhamed, A. S., Noori, H. N., & Anwar, G. (2021). Impact of Service Quality on the Customer Satisfaction: Case study at Online Meeting Platforms. *International Journal of Engineering, Business and Management*, 5(2), 65–77.
<https://doi.org/10.22161/ijebm.5.2.6>

- Andry, J. F., Bernanda, D. Y., Honni, H., Christianto, K., & Andriani, A. (2023). Analysis of information systems strategic planning using ward and peppard framework case e-commerce company. *International Journal of Advances in Applied Sciences*, 12(2), 179. <https://doi.org/10.11591/ijaas.v12.i2.pp179-187>
- Andry, J. F., Reynaldo, S. A., Christianto, K., Lee, F. S., Loisa, J., & Manduro, A. B. (2021a). Algorithm of Trending Videos on YouTube Analysis using Classification, Association and Clustering. *2021 International Conference on Data and Software Engineering (ICoDSE)*, 1–6. <https://doi.org/10.1109/icodse53690.2021.9648486>
- Andry, J. F., Lee, F. S., & Liliana, L. (2021b). Evaluation of The Human Resource Information System with COBIT 5 and ITIL V3 (Case Study: Pharmaceutical Company). *International Journal of Engineering and Information Systems (IJEAIS)*, 5(4), 123–129. <https://doi.org/www.ijeais.org/ijeais>
- Andry, J. F., Liliana, L., & Chakir, A. (2021c). Enterprise Architecture Landscape using Zachman Framework and Ward Peppard Analysis for Electrical Equipment Export Import Company. *Trends in Sciences*, 18(19), 23. <https://doi.org/10.48048/tis.2021.23>
- Aprilia, Z. Z. (2020). Rancangan Sistem Informasi Penilaian Kinerja Koordinator Proyek Pt Atrium Propugnatorum Teknika. *Jurnal Administrasi Bisnis*, 16(1), 86–102. <https://doi.org/10.26593/jab.v16i1.3761.86-102>
- Aslam, A. P., Rahayu, W., & Isma, A. (2023). Implementation of Enterprise Architecture Zachman Framework at PT. Shopee Internasional Indonesia (Shopee Application). *Indonesian Journal of Enterprise Architecture*, 1(1), 19–26. <https://doi.org/10.61220/ijea.v1i1.0233>
- Awan, U., Sroufe, R., & Bozan, K. (2022). Designing Value Chains for Industry 4.0 and a Circular Economy: A Review of the Literature. *Sustainability*, 14(12), 7084. <https://doi.org/10.3390/su14127084>
- Chau, K.-Y., Tang, Y. M., Liu, X., Ip, Y.-K., & Tao, Y. (2021). Investigation of critical success factors for improving supply chain quality management in manufacturing. *Enterprise Information Systems*, 15(10), 1418–1437. <https://doi.org/10.1080/17517575.2021.1880642>
- Christianto, K., Fendyanto, F., Bernanda, D. Y., Andry, J. F., & Lee, F. S. (2023). Employee's satisfaction index analysis and prediction using k-means clustering, decision tree, and association rules algorithm. *AIP Publishing*, 010001. <https://doi.org/10.1063/5.0119093>
- Dinata, D. F., Lee, F. S., Geasela, Y. M., Everlin, S., & Purnomo, Y. (2024). Website-Based Educational Application to Help MSMEs in Indonesia Develop. *Journal of Computer Science*, 20(7), 742–750. <https://doi.org/10.3844/jcssp.2024.742.750>
- Geasela, Y. M., & Legowo, N. (2022). Designing Information System Architecture Based on Education 4.0 Case Study: Senior High School Institutions of Indonesia. *Journal of Computer Science*, 18(7), 622–637. <https://doi.org/10.3844/jcssp.2022.622.637>
- Imbing, B., & Andry, J. F. (2019). Enterprise Architecture Planning for Cantata Music School Institute Using Zachman. *Journal of Systems Integration*, 10(3), 1804–2724. <https://doi.org/10.20470/jsi.v10i3.376>
- Jordan, Andry, J. F., Adikara, F., Geasela, Y. M., & Lee, F. S. (2024). Implementation of Information System Architecture Using TOGAF and Ward Peppard Analysis for High School. *Journal of Computer Science*, 20(6), 690–699. <https://doi.org/10.3844/jcssp.2024.690.699>
- Lee, F. S., Andry, J. F., Christianto, K., Honni, H., & Clara, M. (2023). Audit of Attendance Information System at Motorcycle Factory Using Cobit 5. *Jurnal Teknoinfo*, 17(1), 148–155. <https://doi.org/10.33365/jti.v17i1.2316>
- Lee, F. S., Chakir, A., Nathanael, R., & Andry, J. F. (2020). Architecture Information System in Electrical Distribution Company Using TOGAF. *International Journal of Advanced Trends in Computer Science and Engineering*, 9(5), 7149–7156. <https://doi.org/10.30534/ijatcse/2020/38952020>
- Madyatmadja, E. D., Liliana, L., Chakir, A., & Andry, J. F. (2021). Implementation of the Zachman Framework Using Capsicum Model for Electrical Equipment Trading Industry. *CIC Express Letters Part B: Applications*, 12(3), 207–213. <https://doi.org/10.24507/icicelb.12.03.207>
- Nouri Hussein, R., Nassreddine, G., & Joumana Younis. (2023). The Impact of Information Technology Integration on the Decision-Making Process. *Journal of Techniques*, 5(1), 144–155. <https://doi.org/10.51173/jt.v5i1.1262>
- Rathore, Dr. C., Kalita, Dr. J. P., Sharma, Dr. S. C., Tiwari, S., & Agarwal, Dr. P. (2023). Major Driving Forces for The Indian SME Pharmaceutical Industry: Using Porter's Five Forces Framework for A Comparative Analysis. *International Journal of Life Science and Pharma Research*, 13(6), L100–L108. <https://doi.org/10.22376/ijlpr.2023.13.4.sp6.l100-1108>
- Singgale, Y. A. (2023). Strategic Planning of Morotai Tourism Village Information System (SIDEWITA) Using Ward and Peppard Method. *Journal of Information Systems and Informatics*, 5(1), 134–149. <https://doi.org/10.51519/journalisi.v5i1.442>
- Singh, A. (2021). *Significance Of Research Process in Research Work*. <https://doi.org/10.2139/ssrn.3815032>
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>

- Sopian, A., Karlina, H., Saefurridjal, A., & Fatkhullah, F. K. (2023). Enterprise Architecture on Moral-based School Education Information Systems. *Sinkron*, 8(1), 178–187.
<https://doi.org/10.33395/sinkron.v8i1.11974>
- Talebi, H., & Khatibi Bardsiri, A. (2023). The Impact of Information Technology on Service Quality, Satisfaction, and Customer Relationship Management (Case Study: IT Organization Individuals). *Journal of Management Science and Engineering Research*, 6(2), 24–31.
<https://doi.org/10.30564/jmser.v6i2.5823>
- Tresna, S, I., & Hadiana, A. (2019). Development of Enterprise Architecture Planning for School Based Management in Public High School. *IOP Conference Series: Materials Science and Engineering*, 662(2), 022034.
<https://doi.org/10.1088/1757-899x/662/2/022034>
- Zahle, J. (2023). Reactivity and good data in qualitative data collection. *European Journal for Philosophy of Science*, 13(1), 10. <https://doi.org/10.1007/s13194-023-00514-z>