Research Article

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Design of a Payroll Information System Using Zachman Framework for Outsourcing Company

Faisyal Ali[1*]

[1] Student, Faculty of Computer Science, Universitas Brawijaya, Malang - Indonesia
Email: faisyalfa@gmail.com[1]

*Corresponding Author Email: faisyalfa@gmail.com

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Abstract

PT. Bhakti Karya Cemerlang is an enterprise specializing in providing outsourcing services. As of July 2017, the company managed approximately 700 outsourced employees. The management of personnel data, partner contracts, and payroll calculations currently relies on Microsoft Office, which often results in operational inefficiencies, slow reporting, and high vulnerability to errors during employee evaluations. To mitigate these issues, this study develops a payroll information system utilizing the Zachman Framework. The framework systematically maps the enterprise architecture across four key perspectives: Planner, Owner/Analyst, Designer, and Builder. The final deliverable of this research is a web-based payroll system prototype. System testing was conducted using Black-Box testing with 68 test cases, yielding a 100% validity rate. Compatibility testing via SortSite software identified two critical issues, specifically due to the inactivation of Secure Sockets Layer (SSL) during the test environment. Evaluation of the enterprise architecture using the Enterprise Architecture (EA) Scorecard showed a success rate of 77.60%, validating the model's structure.

Keyword: Zachman Framework, Outsourcing, Information System, Payroll.

1. Introduction

Outsourcing is a strategic mechanism employed by organizations to delegate a portion of their operational workload to external service providers (Clark et al., 1995; Momme et al., 2002). One corporation active in this industry is PT Bhakti Karya Cemerlang, which manages the placement of approximately 700 outsourced employees as of July 2017. In its daily operations, the company relies heavily on basic software—such as Microsoft Office—to manage employee profiles, partner company contracts, and monthly payroll calculations.

This reliance on semi-manual data handling creates significant challenges. Management—particularly the HR Manager and the finance department—frequently encounters major obstacles when compiling personnel reports and consolidating payroll slips for outsourced employees. The slow pace of data processing increases the risk of calculation errors (human error) during periodic evaluations. Consequently,

Email Corresponding: *faisyalfa@gmail.com*

establishing an integrated payroll information system infrastructure has become a critical necessity for the company.

The system architecture was developed using the Zachman Framework. This framework was selected for its ability to provide a comprehensive matrix that breaks down system complexity into various stakeholder perspectives (Lapalme et al., 2016). In this study, the application of the Zachman Framework is limited to the "Builder" perspective row (Mahayoga & Rahmayani, 2025; Sardjono et al., 2020). This scope is based on prior research demonstrating that while modeling up to the "Designer" row is sufficient for prototype design, incorporating the "Builder" perspective is essential to fully visualize the system from a software engineering standpoint prior to physical implementation (Isma et al., 2025). (Nikolaidou & Alexopoulou, 2008).

Based on the problem identification above, the research problem is formulated as follows:

1. How can a payroll information system be implemented using the Planner, Owner/Analyst, Designer, and Builder perspectives of the Zachman Framework?
2. How can the business process transformation from the current state (As-Is) to the proposed state (To-Be) at PT. Bhakti Karya Cemerlang be modeled using the Zachman Framework?
3. What is the quality of the functionality and compatibility of the resulting payroll information system prototype?

The scope of this research is limited to the following parameters:

- The research focuses on the design and development of a web-based prototype and does not include the full implementation phase within PT. Bhakti Karya Cemerlang's production infrastructure.
- Application of the Zachman Framework is limited to the Planner, Owner/Analyst, Designer, and Builder rows.
- Key features include self-service payslip printing for outsourced employees, payroll report summarization for managers, attendance recording, and employee master data management.

2. Literature Review

2.1 Review of Previous Literature

This research is supported by an analysis of several relevant prior studies. Research by Isma et al. (2025), titled "Enterprise Architecture Implementation for Regional Tax Information Systems Using the Zachman Framework," applied three focus columns (What, How, Where) and three perspective rows (Scope, Business Model, System Model). The study demonstrated that the Zachman Framework successfully produced holistic data, functional, and network architectures that facilitated budget estimation.

Furthermore, in their study "Evaluation of The Architecture of The Information System of Seblak Sibocah Kencur Sales In Malang City Based On The Zachman Framework," Tawana and Pamungkas (2025) utilized all six focus columns while covering the Planner and Owner perspectives. They drew the significant conclusion that, to fully visualize the system prototype, developers must design the architecture up to the Designer stage.

Regarding framework comparisons, comparative studies by Yunita et al. (2020) and Reiter (2024) evaluated the performance of the Zachman Framework, FEAF, and TOGAF, focusing on the representation of stakeholder viewpoints. The results indicated that the Zachman Framework is superior, as it presents a more detailed and representative mapping of stakeholder perspectives compared to other enterprise architecture frameworks.

2.2 Supporting Theory

a. Information System

An information system is defined as an integrated ecosystem—whether manually operated or automated—that combines elements of infrastructure, organizational structure, human resources, hardware, and organized methods (Hasselbring, 2000; Fang et al., 2015). The system exists to acquire, process, transmit, and distribute data representing high-value functional information to support decision-making (Stair et al., 2015). Information systems are characterized by their high complexity, as they encompass the full scope of tasks and responsibilities involved in managing a company's internal information operations (Alter, 2008). Theoretical perspectives proposed by Curtis and Cobham (2008) reveal that information systems are fundamentally built upon a foundation of structured data; this data dynamically reflects and describes the organization's various business processes through interconnected data flows.

b. Zachman Framework

The Zachman Framework is a generic classification scheme and formal taxonomy used to organize descriptive representations of an enterprise information system architecture under development (Sowa & Zachman, 1992). The framework's primary function is to focus the developer's attention on specific technical and functional dimensions of the system without compromising the enterprise's holistic perspective (Ningtyas et al., 2025). It is modeled as a 6x6 two-dimensional matrix, yielding a total of 36 cells for comprehensive enterprise architecture classification (Zachman, 1999). The column dimensions represent the system's descriptive focus, encompassing aspects such as data (what), function (how), network location (where), human resources (who), time (when), and business motivation (why). Meanwhile, the row dimensions map the unique perspectives of stakeholders, ranging from the roles of planner (contextual), owner (conceptual), designer (logical), builder (physical), and subcontractor (component) to the user (operational) (Zachman, 2006). Each cell within the matrix produces a unique, specific design artifact while maintaining strong structural and functional interrelationships with the others (Zachman, 2006).

c. Enterprise Architecture (EA) Scorecard

In this study, the quality of the enterprise architecture is comprehensively evaluated using the Enterprise Architecture Scorecard (EA Scorecard) methodology proposed by Jaap Schekkerman (Mirsalari & Ranjbarfard, 2020). This evaluation instrument is designed to assess the maturity level and validity of the enterprise architecture design across four key domains: business, data, applications, and technology. The assessment process employs a quantitative interval scale ranging from 0 to 2 to represent the completeness status of artifact documentation. A score of 0 indicates that the artifact is entirely undocumented; a score of 1 signifies that documentation is only partially complete; and a score of 2 indicates that the artifact has been fully documented. According to established interpretation standards, the architecture design is deemed invalid if the cumulative score falls below the 50% threshold, whereas a score exceeding 50% confirms that the enterprise architecture model is valid and effectively represents the organizational ecosystem of PT. Bhakti Karya Cemerlang.

3. Method

This research methodology adopts a structured sequential flow mapped according to Figure 1, namely:

1. The literature review conducted in this study serves to gather a theoretical foundation from books, journals, and academic documents.
2. The application of the Zachman Framework consists of several stages, including:
   a. The Planner role aims to identify the list of functional and non-functional requirements and perform an initial data mapping.
   b. The Owner/Analyst role involves designing basic inter-entity relationships via an Entity Relationship Diagram (ERD), modeling current business processes (As-Is), and mapping use case diagrams.

c. The Designer role entails transforming the model design into a Logical Data Model (LDM), formulating use case scenarios, and designing activity diagrams.
d. The Builder role focuses on constructing the physical database model (Physical Data Model), designing system workflow sequences (Sequence Diagrams), planning network topology, and modeling proposed business processes (To-Be).

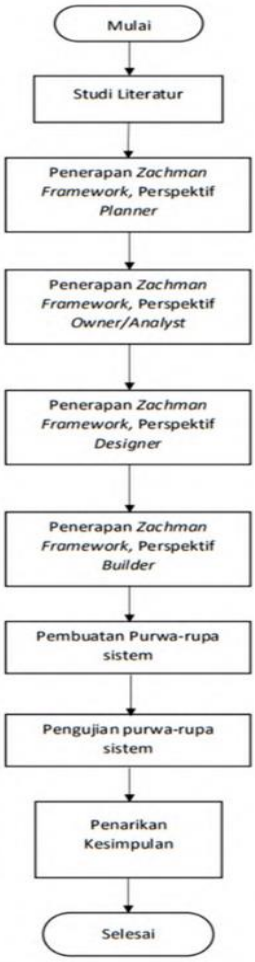

Figure 1. Research Sequential Flow Design

3. Prototype development in this context involves building a web application using a local Apache server (XAMPP), PHP, HTML, CSS, and a MySQL database.
4. Prototype testing will be conducted by evaluating application functionality using Black-Box Testing, browser compatibility with SortSite, and enterprise architecture validity with the EA Scorecard.

4. Results and Discussion

4.1 Implementation of the Zachman Framework

In this study, the implementation of the Zachman framework is carried out in stages according to perspectives, starting with the planner, owner/analyst, and designer perspectives, and concluding with the builder perspective (see Figure 2).

1. Planner Perspective (Executive Summary)
   • What (Data)
2. The core data managed includes employee personal details, payroll history, and partner company employment contracts.
   • How (Function)
3. Defining the system's primary functions:
   1. Managing employee data
   2. Managing partner contract data
   3. Automating payroll report summarization.

	What	How	Where	Who	When	Why
Executive Perspective (Context Planner)	Data	Kebutuhan Sistem	Area kerja perusahaan	Daftar pengguna sistem	daftar *event* yang dimiliki sistem	Visi & Misi
Business Management Perspective (Conceptual Owners)	Daftar entitas dan ERD	*Use Case Diagram & Business Process As Is*	Daftar pekerjaan di masing-masing area kerja perusahaan	Struktur organisasi	Ketentuan kapan masing-masing event dijalankan	*Corprate Value*
Architect Perspective (Business Logic Designer)	*Conceptual Data Model*	*Use Case Scenario*	Desain Infrastruktur Sistem	Rancangan tampilan antarmuka sistem (sketch)	*Activity Diagram*	*Business rule*
Engineer Perspective (Business Physics Builder)	*Database Design (Physical Data Model)*	*Business Process Model (To Be)*	*Network topology*	Tampilan antarmuka sistem (html/php)	*Sequence diagram*	*Design rule*

Figure 2. Proposed Implementation of the Zachman Framework

4. Where (Network)
   - The system is accessed from PT. Bhakti Karya Cemerlang's two main operational offices: the Tangerang City Office and the Karawang City Office.
   - Who (People)
     System users are defined as four actors: Outsourced Employees, Finance Staff (Tangerang Office), Operations Staff (Karawang Office), and the HR Manager (see Figure 3).

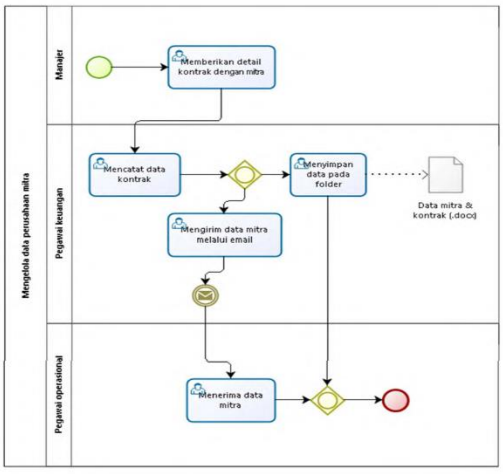

Figure 3. "As-Is" Business Process for Managing Partner Company Data

4. Owner/Analyst Perspective (Business Concept)
   - What (Data - ERD)
     Database relationships are designed using one-to-many cardinality. A single office employee can manage multiple partners; a single partner can accommodate multiple outsourced employees; and a single outsourced employee can receive multiple historical payslips.

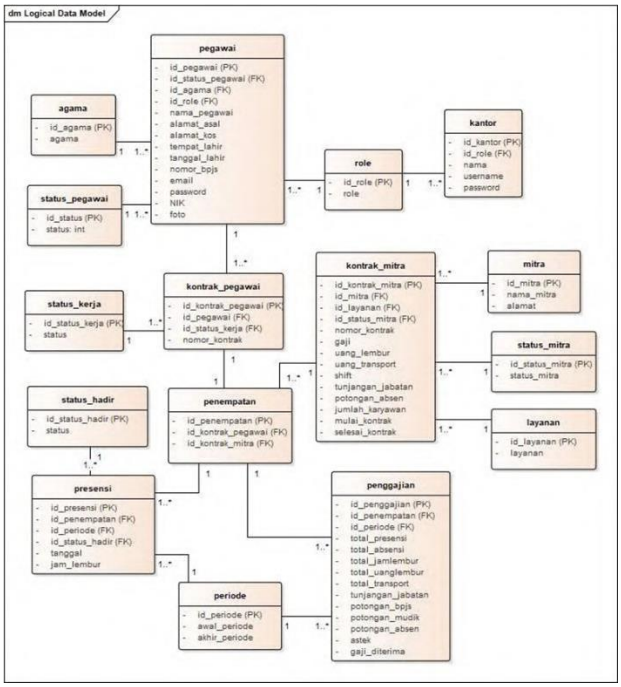

Figure 4. Logical Design of Research Data

   - How (Process - Use Case Diagram)
     Developing a Use Case Diagram that maps the operational activities of actors, such as attendance logging by Karawang operational staff and payroll approval by HR (see Figure 4).

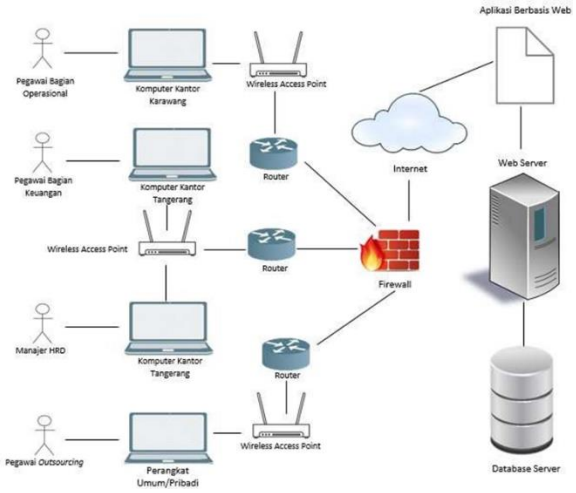

Figure 5. Network Topology Design

Figure 6. UI Design of the Outsourced Employee Dashboard Page

5. Designer Perspective (System Model)
    - What (Logical Data Model)
      Decomposing and normalizing the base entities into 16 relational tables. These tables include: employee_status, religion, employee, role, office, partner, partner_status, partner_contract, service, employee_contract, work_status, placement, period, attendance, attendance_status, and payroll.
    - Where (Infrastruktur)
      Designing a simple client-server web server topology.
6. Builder's Perspective (Technology Model)
    - What (Physical Data Model)
    - Transforming 16 logical tables into a physical MySQL database schema with precise data types (such as int(11), varchar, date, and float).
    - How (To-Be Business Process) network topology design.
      The business process design differs from the system infrastructure design—from the designer's perspective (see Figure 5)—by the inclusion of a firewall to secure incoming and outgoing data traffic. Additionally, the inclusion of wireless access points indicates that the offices in Tangerang and Karawang utilize Wi-Fi rather than LAN cables for connectivity.

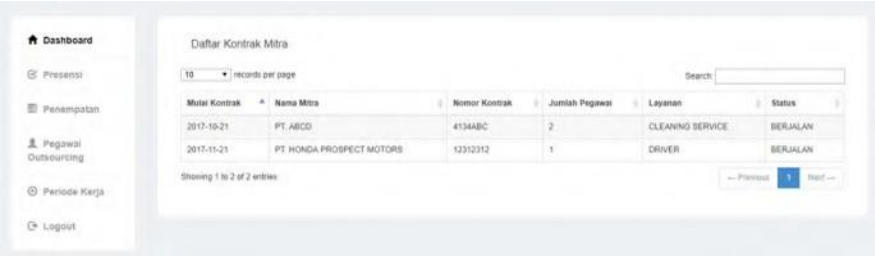

Figure 7. UI Design for Operations Staff (Karawang)

4.2 Results of the UI/UX Design Implementation

The system is implemented using a native web architecture based on PHP and MySQL, managed via phpMyAdmin. The user interface is segmented according to the functional access rights of each user, including:

- Outsourced Employee Dashboard Page
  Displays the complete profile, partner placement history, employment contract history, and work attendance history by period (see Figure 6).

Figure 8. UI Design for Finance Staff (Tangerang)

- Operations Staff Page (Karawang)
  Provides a form for entering daily attendance data, adding insurance (BPJS), updating employee contracts, and assigning work placements for new employees (see Figure 7).
- Finance Staff Page (Tangerang)
  Provides menus for managing partner contracts, viewing remaining contract duration and remaining employee quota, and visualizing the total monthly payroll expenditure (see Figure 8).

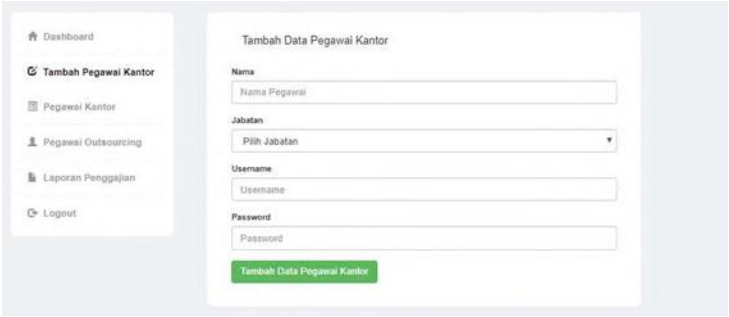

Figure 9. HR Manager UI Design

- HR Manager Page
  Displays the menu for managing office staff data, adding new staff, and printing monthly salary expenditure summary reports (see Figure 9).

4.3 Discussion of Test Results

1. Functional Testing (Black-Box Testing)

System functionality testing was executed using 68 test cases. Key scenarios yielded the following results:

- Login Validation
  The system successfully verified unique credentials. Incorrect password input triggered an error notification, and unregistered emails were rejected by the system.
- Master Data Validation
  New employee form entries that duplicated a National Identity Number (NIK) or an email address already in the database were automatically rejected by the system, displaying a warning message.
- Blank Form Validation
  The system refused to save data if mandatory input fields were left blank by the user.
- Test results indicate that 100% of the system's functionality operates correctly and aligns with the initial requirements.

2. Browser Compatibility Testing

Testing was conducted using SortSite software to evaluate the application's performance across various web browsers. The test results identified two critical issues in Firefox 56 and Chrome 61. Further

investigation revealed that these critical issues were solely due to the SSL or HTTPS feature not being enabled in the local testing environment, rather than a failure in rendering interface elements.

3. Enterprise Architecture Testing (EA Scorecard Evaluation)

The payroll enterprise architecture design was evaluated using Jaap Schekkerman's EA Scorecard methodology. The model's performance was assessed based on four dimensions, as shown in Table 1 below:

Table 1. Performance Test Results of the Research Design Model

Architectural Dimensions	Total Skor	Success Rate	Status
Business	53	75,71%	Valid
Data	55	78,57%	Valid
Application	55	78,57%	Valid
Technology	54	77,14%	Valid
Cumulative Average	-	77,60%	Valid

Given that the cumulative average success rate stands at 77.60% (above the 50% threshold), the enterprise architecture design developed using the Zachman Framework is deemed valid and representative of PT. Bhakti Karya Cemerlang's business ecosystem

5. Conclusion

This study successfully developed a web-based payroll information system prototype for PT. Bhakti Karya Cemerlang using the Zachman Framework. Systematic documentation—spanning the Planner, Owner, Designer, and Builder perspectives—proved capable of providing a comprehensive mapping of functional requirements. The implementation of the new business process ("To-Be") successfully eliminated manual calculation tasks within the finance department by automating them through the system. This not only minimized the risk of calculation errors but also accelerated data recapitulation. Testing via Black-Box methods (100% valid) and the EA Scorecard (77.60% valid) confirmed that the system prototype is reliable and ready for implementation.

Despite satisfactory testing results, this study has several technical limitations, namely: First, the system design and documentation phase was limited to the "Builder" perspective, meaning it did not extend to the highly detailed subcontractor representation stage. Second, compatibility testing revealed critical issues due to the absence of SSL/HTTPS certificates to secure data exchange channels. Third, the system lacks features for calculating partner company profitability margins and generating comprehensive business profit-and-loss reports.

Based on the identified limitations, several key recommendations are proposed for the system's further development: 1) Enabling SSL/HTTPS security protocols on the production server to mitigate browser compatibility issues and ensure the encryption of user credentials. 2) Integrating advanced financial modules, specifically features for summarizing operational profit and loss and calculating the company's net profit margin for each partner contract. 3) Adopting an API-based architectural pattern to decouple direct database access and utilizing modern programming frameworks to ensure more structured long-term maintenance.

Acknowledgments

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References

1. Alter, S. (2008). Defining information systems as work systems: implications for the IS field. European journal of information systems, 17(5), 448-469.
2. Clark Jr, T. D., Zmud, R. W., & McCray, G. E. (1995). The outsourcing of information services: transforming the nature of business in the information industry. Journal of Information Technology, 10(4), 221-237.
3. Curtis, G., & Cobham, D. (2008). Business information systems: Analysis, design and practice. Pearson Education.
4. Fang, S., Xu, L., Zhu, Y., Liu, Y., Liu, Z., Pei, H., ... & Zhang, H. (2015). An integrated information system for snowmelt flood early-warning based on internet of things. Information Systems Frontiers, 17(2), 321-335.
5. Isma, A., Dewantara, H., & Diarra, S. (2025). Enterprise Architecture Implementation for Regional Tax Information Systems Using the Zachman Framework. Indonesian Journal of Enterprise Architecture, 2(2), 71-82.
6. Lapalme, J., Gerber, A., Van der Merwe, A., Zachman, J., De Vries, M., & Hinkelmann, K. (2016). Exploring the future of enterprise architecture: A Zachman perspective. Computers in Industry, 79, 103-113.
7. Hasselbring, W. (2000). Information system integration. Communications of the ACM, 43(6), 32-38.
8. Mahayoga, F., & Rahmayani, I. (2025). Enterprise Architecture Design For Creative Project Management Systems Kuy Studio Uses The Zachman Framework. International Journal of Information Systems and Technology, 1(04), 178-195.
9. Mirsalari, S. R., & Ranjbarfard, M. (2020). A model for evaluation of enterprise architecture quality. Evaluation and Program Planning, 83, 101853.
10. Momme, J. (2002). Framework for outsourcing manufacturing: strategic and operational implications. Computers in industry, 49(1), 59-75.
11. Nikolaidou, M., & Alexopoulou, N. (2008, January). Enterprise information system engineering: A model-based approach based on the zachman framework. In Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008) (pp. 399-399). IEEE.
12. Ningtyas, S. S., Alif, D. N., & Pakaja, F. (2025). Inventory System Design at Rajawali Motor Workshop Using Zachman Framework. International Journal of Information Systems and Technology, 1(03), 147-164.
13. Reiter, M. (2024, October). Comparative analysis of enterprise architecture frameworks: TOGAF, Zachman and FEAF. In Eurasia Business and Economics Society Conference (pp. 141-162). Cham: Springer Nature Switzerland.
14. Sardjono, W., Retnowardhani, A., & Azizah, R. (2020, August). Analysis of application of Zachman framework for knowledge management systems success optimization. In 2020 International Conference on Information Management and Technology (ICIMTech) (pp. 277-282). IEEE.
15. Sowa, J. F., & Zachman, J. A. (1992). Extending and formalizing the framework for information systems architecture. IBM systems journal, 31(3), 590-616.
16. Stair, R., Reynolds, G., Aldcorn, J., & Neufeld, D. (2015). Principles of information systems. Cengage Learning Canada Inc.

17. Tawana, D. K., & Pamungkas, B. (2025). Evaluation Of The Architecture Of The Information System Of Seblak Sibocah Kencur Sales In Malang City Based On The Zachman Framework. International Journal of Information Systems and Technology, 1(04), 165-177.
18. Yunita, Y., Zahra, D. F., & Takwim, A. (2020). A study of stakeholder perspectives of Enterprise Architecture methodology (togaf framework). Jurnal Riset Informatika, 2(4), 179-184.
19. Zachman, J. A. (2006). The zachman framework for enterprise architecture (pp. 1-15). Virginia: Zachman Framework Associates.
20. Zachman, J. A. (1999). A framework for information systems architecture. IBM systems journal, 38(2.3), 454-470.