IMPLEMENTATION OF THE ZACHMAN FRAMEWORK USING CAPSICUM MODEL FOR ELECTRICAL EQUIPMENT TRADING INDUSTRY

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Abstract. *Advances in information and communication technology currently realize how many companies update and utilize technology results. Almost all companies in this era of globalization are supported by the ease of obtaining information technology facilities, one of which is the electrical equipment trading industry. The development of the electrical equipment trading industry which is increasingly complex has resulted in an increasing need for information and data. To simplify and speed up work in producing accurate, automatic and reliable information that is integrated with one another, careful IT/IS planning is needed. In this study, the authors used the Zachman framework methodology to build an information system in the electrical equipment trading industry, and then combined it with the CAPSICUM model that facilitates strategic alignment of business architecture and technology. This study will describe the use of the CAPSICUM model which consists of 4 stages, namely the strategic purpose, business view, technical view and platform view. The 4 stages' results from the CAPSICUM model and the Zachman framework make it possible to obtain a complete framework for visualizing the electrical equipment trading industry, such as scope, objectives, business model, system design model, platform model and stakeholders involved in each stage of company formation and also produce a business side blueprint (SWOT) of the electrical equipment trading industry. For future research, wewill use the TOGAF ADM methodology combined with the CAPSICUM model to build information systems that are aligned with strategic business architecture and technology.*
Keywords: Enterprise architecture, Zachman framework, CAPSICUM model, TOGAF ADM

1. **Introduction.** Currently, information dissemination occurs very quickly and someone's access to information can also be done quickly, precisely and accurately [1], especially information technology (IT) [2]. The application of information technology in a company can determine the direction for the process of integrating data and information

[3]. Modeling and optimization of information technology and information systems are necessary to create innovation and improve service quality for customers [4,5]. Enterprise architecture is an approach to a company's technical system standards that determines how to create and use a company architecture to manage organizational change and reduce corporate risk [6-8]. One of the methods used is the Zachman framework which presents a two-dimensional matrix to realize the point of view of the parties involved in information system development [9-11]. In addition, the CAPSICUM model is the basic foundation for providing a structured model for a business plan strategy consisting of 4 stages, namely strategic purpose, business view, technical view and platform view [12].

Almost all companies are supported by the convenience of information technology, one of which is the electrical equipment trading industry. Currently, companies only apply a small part of IT/IS to supporting business processes, but there are still some business areas that have not used IT/IS optimally, such as the product input process which consists of various types. When you want to create a new product, a problem arises that results in the missing product data input process and the user has to start over from scratch. Therefore, some additional IT/IS planning is still needed to support business processes.

In this study the authors use the Zachman framework methodology which represents the perspective of the planner view (description of business objectives), owner view (business relationship model and business components), designer view (logic model design requirements and system boundaries), builder view (optimize design for needs), sub-contractor view (how components are operated, configured) and user view (user perspective and actual implementation results) to build information systems. The use of the Zachman framework method is then combined with the CAPSICUM model which consists of 4 stages, namely the strategic purpose (define a strategic business plan), business view (define a business architecture), technical view (define a system design model) and platform view (define a platform model). The output of this research is a combination of the Zachman framework and the CAPSICUM model which produces a complete framework for visualizing the electrical equipment trading industry, such as scope, objectives, business models, system design models, platform models and stakeholders involved in each stage of company formation and also produces a business side blueprint (SWOT) of the electrical equipment trading industry.

2. **Literature Review.** The CAPSICUM framework facilitates the strategic alignment of business architecture and technology. The implementation of the CAPSICUM model to build an enterprise architecture starts from a strategic purpose, business view, technical view and platform view [13,14]. The Zachman framework can be used to determine whether a methodology covers all aspects of an enterprise architecture or what aspects are covered by the methodology which consists of 6 columns and 6 rows [15-17], namely planner, owner, designer, builder, sub-contractor and user [18,19].

3. **Research Method.** The following will describe the stages of the research used in this study and can be seen in Figure 1 [20-22].
Based on Figure 1, the stages of the research carried out include [20-22]:
A) Literature study and collect data. Define problem formulations and collect data through interviews and observations.
B) Planning initiation. Define scope, purpose and vision.
C) Current conditions. Analyze the current SWOT and current systems and technology.
D) Architectural model design. The combination of the Zachman framework methodology with the CAPSICUM model which consists of 4 stages, namely the strategic purpose, business view, technical view and platform view.
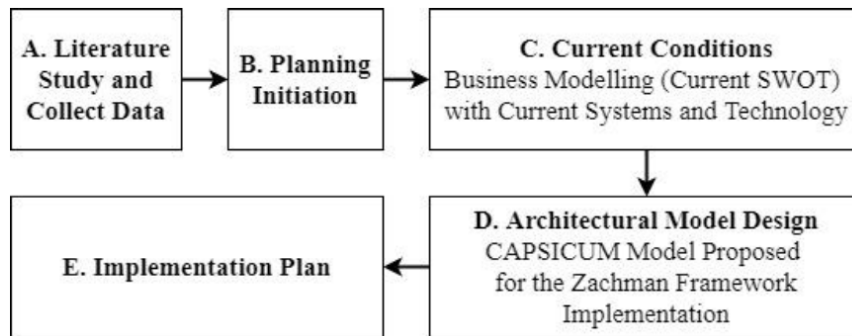E) Implementation Plan. Planned activities can achieve organizational goals.

FIGURE 1. Research stages [20-22]

4. Result and Analysis.

4.1. **Planning initiation.** The vision of the electrical equipment trading industry is to take advantage of global reach and local presence to complete client projects to the best of their ability. Its mission is to ensure reliable supply and best prices for clients with combined experience across site management and electrical capabilities.

4.2. **Current conditions.**

4.2.1. *Business modelling (Current SWOT).* The results of the SWOT analysis of the electrical equipment trading industry are: Strength, in the form of cooperation with the largest and global electricity suppliers, has loyal customers; Weakness, IT/IS implementation in the purchasing, sales, tracking and stock of goods is still minimal; Opportunity, in the form of a proven track record of success in key industries; Threat, the payment term for the competitor's goods has a longer period of time and there is fierce price and quality competition.

4.2.2. *Current systems and technology.* The current business processes in the electrical equipment trading industry are the sales division looking for customers by visiting the place directly. Customers make product requests. Sales division checks product availability to suppliers. The supplier provides a list of product prices and is given a sales division to the customer. Customers discuss with the sales division and the product request is approved. The customer makes a purchase order which is recorded by the finance company. Product orders from customers are made for information collection orders which are then given to inside sales who will make purchases to the supplier. The supplier delivers the product and when it arrives at the warehouse, it is sorted for packaging and then sent to the customer. Customers receive products and make payments. Payments are received by the finance company and an invoice is made to pay off and pay bills to the supplier.

4.3. **Architecture model design.**

4.3.1. *Strategic purpose.* It consists of 3 stages that need to be passed to identify the goals to be achieved from the enterprise architecture and how to achieve them:
1) Ends-Desired Results. Focusing on the objectives of the enterprise architecture and vision in What column, there are 8 proposed applications. Where column explains the location of the electrical equipment trading industry.
2) Means-Course of Action. Focus on how to implement the enterprise architecture that has been made in How column. When column describes the estimated design agenda, namely 4 years for the 8 proposed information systems.
3) Means-Directive. Focus on the parameters used to create the company architecture and fill in the Why column. Policy, the design of an enterprise architecture blueprint

is carried out using the Zachman framework with a combination of the CAPSICUM model.

4.3.2. *Business view.* It consists of 3 stages that need to be passed to identify future business architectures, namely:

1) Domain. Describe the placement of information systems and future business process flows in the form of
   a) Resources. Define the resources used to support in Who column, namely the Human Resource Development and IT Division. The Where column discusses the location of the company will be placed at Lippo St Moritz Office Tower, Kembangan.
   b) Roles. Define the role of each suggested human resource to manage the proposed information system. The mapping of roles will be filled into the Who column.
   c) Undertakings. Present a list of the current processes that are used as the main process in each proposed information system and is entered in the How column.
   d) Outcomes. Describe the proposed SWOT analysis. Strength, improved customer service, presentation of digital reports. Weakness, requires a stable Internet connection and a supported server. Opportunity, IT/IS implementation supports business processes, increases market share. Threat, increases in product prices. Strength-Opportunity, cooperate with new suppliers to increase market share. Weakness-Opportunity, increases promotion. Strength-Threat, IT developments that facilitate all aspects of activities. Weakness-Threat, establishes a quality and quality development strategy.

2) Behavior. Describe the changes that have occurred from the application of the proposed information system.
   a) Intent. Describe data result from the proposed information system into the What column.
   b) Evaluations. Define the comparisons obtained after the application of the proposed information system in the Why column.
   c) Activities. The results of the activities mapping will be entered in the How column. Admin uploads product information and articles to the company profile website. Clients can read information and then place an order for products to the sales application. Orders from clients are received by the sales division and will enter orders from the client to the tracking application, and then forward the order from the client to the finance department to create a sales invoice which will be inputted into the finance application. The inventory application will be checked by inside sales to place orders using the e-procurement application. The supplier then accesses the e-procurement application and if he agrees, he sends the goods. The warehouse staff will input the product stock into the inventory application. Products that have been checked will enter the packaging process which will then be sent directly by the driver to the client. The client can perform tracking through the tracking application, and then the client receives the product.
   d) Context. Describe the business architecture by analyzing current business conditions and build a new business architecture plan to be implemented in the future.

3) Governance. Control the domain and behavior stages, such as Entitlements, defining the rules for making suggested application designs will be included in the Why column. Conditions, when column will be filled with conditions in the form of a period of design phase. Assertions, describe the user's description in the Who column. Compliance, defines the rules in making application design to be included in the Why column.

4.3.3. *Technical view.* It consists of 4 stages of a model for the appropriate system design:

1) Enterprise Access. Describe the user interface of the user in the Who column.

2) Enterprise Process. Describe the workflow and time required for each proposed information system.
   a) The What column will be filled by the proposed information systems workflow.
   b) When column will be filled by the length of time for the proposed information system.
3) Enterprise Services. Describe the network map suggestion functionality of each proposed information system in Figure 2 to be included in the Where column.
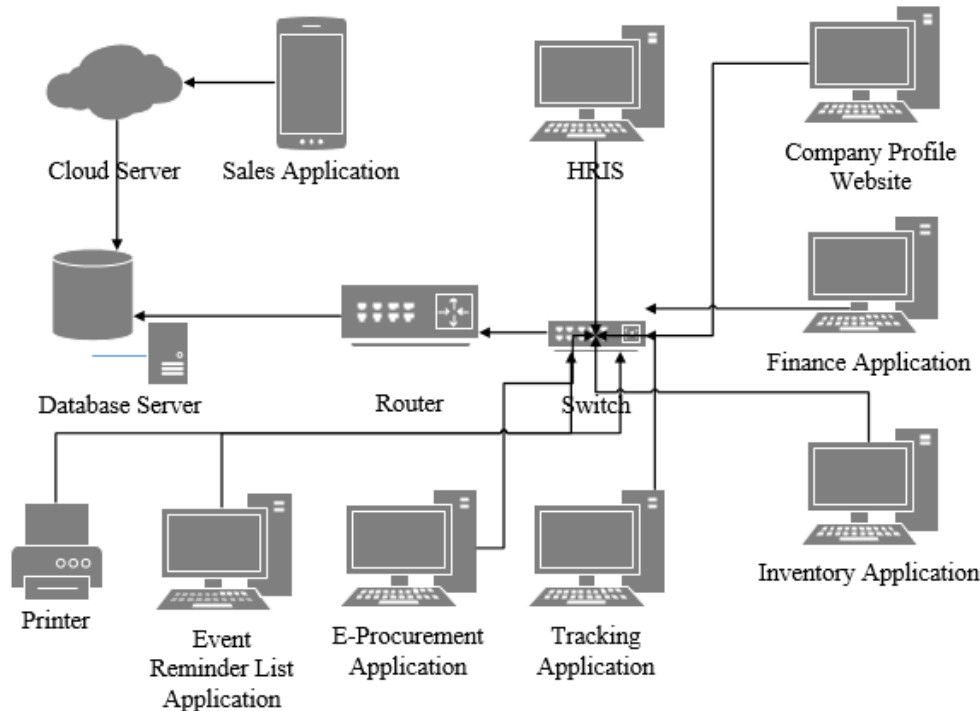

FIGURE 2. Proposed network topologies

4) Enterprise Information. The How column will be filled with reports generated from each proposed information system such as messages report, customer orders report, supplier orders report, salary report, attendance report, products report, tracking report, installments and events reports. Column Why describes the specification of the rules that must be considered with the program logic. The specification of these rules is passwords that must be stored in an encrypted and case-sensitive form.

4.3.4. *Platform view.* Stakeholder view needs to be done to assess the importance of stakeholder participation in every activity of the CAPSICUM model and will focus on each existing line of the Zachman framework implementation.

a) The What column of the Platform View will be filled in by a stakeholder analysis process in which there are 2 types of stakeholders, namely internal stakeholders and external stakeholders. Where column describes the recommended technology platform of the proposed information system, such as switch TP-Link, PC server, PC user, network cable, router, printer and load balance.
b) Who column describes application user access for each proposed information system. When column explains the time needed to design the proposed 8 information systems for 4 years. The Why column explains the proposed information system platform, which can be accessed via a laptop/PC or mobile phone.

4.4. **Enterprise architecture based on Zachman framework.** After mapping based on the CAPSICUM model, each cell of the Zachman framework is filled with the results of the mapping as shown in Figure 3 with the CAPSICUM model combination.

	What	How	Where	Who	When	Why
Strategic Purpose	Goals and Objectives	Current Business Process and SWOT	Location	Organizational Units	Gantt Charts	Policy and Rule
Business View	Data from the Proposed Information System	Proposed Business Process	Company Location for Information Systems	Proposed Human Resources and Infrastructure	Gantt Chart Design Phase	Comparison of Business Architectures and Rules for Making Application Design
Technical View	Proposed Information Systems Workflow	Reports from the Proposed Information Systems	Proposed Network Topologies	Who Sees What Proposed Information Systems	Gantt Chart Coding Phase	System Model Design Rules and Limits
Platform View	Stakeholder Analysis	List of Proposed Business Process Information Systems	Information System Hardware Specifications Proposed	Application User Access	Full Gantt Charts	Information System Platform Proposed

FIGURE 3. Electric equipment trading industry enterprise architecture based on Zachman framework and CAPSICUM model

Figure 3 shows the mapping results of the CAPSICUM model in the form of a strategic purpose, business view, technical view, platform view combined with the Zachman framework.

5. **Conclusions.** This study proposes the implementation of the Zachman framework combined with the CAPSICUM model that facilitates the strategic alignment of business architecture and technology. This study describes the use of CAPSICUM which consists of 4 stages, namely strategic purpose, business view, technical view and platform view. The results obtained from the strategic purpose, business view, technical view and platform view are used to fill the Zachman framework cells, namely the What, How, Where, Who, When and Why columns. In addition, a new SWOT proposal was produced after the implementation of IT/IS. Then, it also explains the strategic formulation of the electricity trading industry in the form of strengths-opportunities, namely developing strengths by optimizing opportunities, strengths and threats, explaining how to develop strengths by overcoming threats, weaknesses and opportunities, and explaining how to minimize weaknesses by taking advantage of opportunities and weaknesses. Threat describes how to minimize weaknesses to avoid the threat posed by the electrical equipment trading industry. The output of this research is a combination of the Zachman framework and the CAPSICUM model which produces a complete framework for visualizing the electrical equipment trading industry, such as scope, objectives, business models, system design models, platform models and stakeholders involved in every stage of company formation and also produces a business side blueprint (SWOT) of the electrical equipment trading industry. For further research, we will use the TOGAF ADM methodology combined with the CAPSICUM model to build information systems that are aligned with strategic business architecture and technology.

REFERENCES

[1] A. Khumaidi and E. Ridhawati, Development of information system strategies and information technology at private universities in Pringsewu by using methodology enterprise architecture planning (EAP), *Int. J. Inf. Syst. Comput. Sci.*, vol.1, no.2, pp.38-47, 2017.

[2] L. Larasati and W. A. Kusuma, Integrated information system development planning at Tropical Biopharmaca Research Center using enterprise architecture planning, *IOP Conf. Ser. Earth Environ. Sci.*, vol.299, no.1, pp.1-11, doi: 10.1088/1755-1315/299/1/012053, 2019.

[3] E. S. Soegoto, S. I. Fauzi and T. Valentina, Relationship between enterprise architectures planning and information system, *J. Phys. Conf. Ser.*, vol.1402, no.6, pp.1-8, doi: 10.1088/1742-6596/1402/6/066078, 2019.

[4] A. Samsudin and A. Hadiana, Enterprise architecture model using enterprise architecture planning for services in National Land Agency, *IOP Conf. Ser. Mater. Sci. Eng.*, vol.662, no.4, pp.2-7, doi: 10.1088/1757-899X/662/4/042018, 2019.

[5] S. Kotusev, The process view of enterprise architecture practice, *Br. Comput. Soc.*, pp.1-7, 2019.

[6] M. Langermeier and B. Bauer, Evaluating project compliance during EA planning, *Proc. of Int. Conf. Softw. Eng.*, pp.374-375, doi: 10.1145/3183440.3195016, 2018.

[7] H. Tannady, J. F. Andry, F. E. Gunawan and J. Mayseleste, Enterprise architecture artifacts enablers for IT strategy and business alignment in forwarding services, *Int. J. Adv. Trends Comput. Sci. Eng.*, vol.9, no.2, pp.1-9, doi: 10.30534/ijatcse/2020/85922020, 2020.

[8] M. Zuliansyah, M. I. Desa and S. B. Ahmad, A systematic literature review on enterprise architecture development in various industry domains, *J. Theor. Appl. Inf. Technol.*, vol.97, no.3, pp.897-917, 2019.

[9] B. G. Sudarsono, J. F. Andry and Nirwan, Design information system order fulfillment using archimate modelling, *Int. J. Adv. Trends Comput. Sci. Eng.*, vol.9, no.2, pp.1303-1310, doi: 10.30534/ijatcse/2020/61922020, 2020.

[10] K. Koo, K. Park and D. Kim, A study on iBiz.FS architecture design for establishing electronic finance system, *J. Theor. Appl. Inf. Technol.*, vol.96, no.4, pp.1071-1082, 2018.

[11] M. Jafari, P. Akhavan and E. Nouranipour, Developing an architecture model for enterprise knowledge: An empirical study in Iran, *Manag. Decis.*, vol.47, no.5, pp.730-759, doi: 10.1108/00251740910960097, 2016.

[12] T. Roach, G. Low and J. D'Ambra, CAPSICUM – A conceptual model for service oriented architecture, *Proc. of 2008 IEEE Congr. Serv. – Part I*, pp.415-422, doi: 10.1109/SERVICES-1.2008.48, 2008.

[13] R. Eshuis, Modeling decision-intensive processes with declarative business artifacts, in *Service Research and Innovation*, 2019.

[14] T. Roach, *CAPSICUM – A Semantic Framework for Strategically Aligned Business Architecture*, School of Information Systems and Technology Management, UNSW, 2011.

[15] M. Y. Nasrulloh and Y. H. Putra, Student data management information system using the Zachman framework, *IOP Conf. Ser. Mater. Sci. Eng.*, vol.662, no.2, pp.2-6, doi: 10.1088/1757-899X/662/2/022101, 2019.

[16] W. Gunawan and B. Liejaya, Formulating cloud based hospital information system (HIS) with Zachman framework, *IOP Conf. Ser. Mater. Sci. Eng.*, vol.725, no.1, pp.2-7, doi: 10.1088/1757-899X/725/1/012092, 2020.

[17] Hermawan and F. Hastarista, Colaborated architechture framework for composition UML 2.0 in Zachman framework, *IOP Conf. Ser. Mater. Sci. Eng.*, vol.105, no.1, pp.2-10, doi: 10.1088/1757-899X/105/1/012037, 2016.

[18] S. Bente, U. Bombosch and S. Langade, *Collaborative Enterprise Architecture*, 2012.

[19] H. Wijaya, M. I. Herdiansyah and A. H. Mirza, Information systems architecture online learning in school with the Zachman framework, *Int. Conf. Inf. Technol. Eng. Appl.*, vol.5, pp.1-7, 2016.

[20] E. Najafi and A. Baraani, CEA framework: A service oriented enterprise architecture framework (SOEAF), *J. Theor. Appl. Inf. Technol.*, vol.40, no.2, pp.162-171, 2017.

[21] A. F. Wijaya and M. W. Prasetyo, Strategic planning information systems enterprise architecture planning method case study of Semarang City Public Works Department, *J. Inf. Syst. Informatics*, vol.2, no.1, pp.114-122, doi: 10.33557/journalisi.v2i1.53, 2020.

[22] E. North, J. North and S. Benade, Information management and enterprise architecture planning – A juxtaposition, *Probl. Perspect. Manag.*, vol.2, no.4, pp.166-179, 2016.