



The Application of Information Technology Architectural Design Using TOGAF Architecture Framework in Restaurant Service Systems

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Abstract

This research aims to see how TOGAF ADM is applied to modeling information technology architecture in restaurants. In this research, the author used the TOGAF Architecture Development Method (ADM). In TOGAF ADM, there is a definition of architecture and its understanding, which is in the preliminary phase (the preparatory phase). In this modeling, it starts from zero, so a detailed architectural process is needed. This is needed to simplify the subsequent architectural development process. Detailed architectural processes can be obtained using the framework. In TOGAF ADM, there are stages that have been arranged in such a way that the details of the architecture can be seen in them. The modeling that the author will compile also requires support for architectural evolution. This is needed because, initially, the restaurant did not have technological architecture. In Phase F Migration Planning, the framework provides support for technology architecture evolution. Based on the research steps, there are 8 structured stages plus a preliminary stage. However, in this research, the author will only discuss up to stage F, namely migration planning. From the research conducted by the author, a model of information technology architecture for restaurants was obtained, which was implemented using TOGAF ADM. The information technology architecture model includes service processes, payment processes, and monitoring processes.

Keywords: Information Technology, Architecture, Restaurants, TOGAF.

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1. Introduction

The ordering process at a restaurant is one of the most important things in the restaurant business. Recording customer orders can usually be done using stationery or a computer, as found in some fast food restaurants. Ordering in this way can result in slower service and sloppy order data collection. This can be detrimental to restaurant managers ability to control sales activities properly. Explanations regarding this matter were obtained from interviews and observations [1]. The problems above involve many parts of the restaurant. This will give rise to several groups of information systems that are interrelated in the restaurant business process itself. When this restaurant grows more rapidly with increasing turnover, it will cause more and more data to accumulate. By accumulating data, other problems will arise besides ordering problems [2]. Among other problems that arise are the payment process and financial reporting at the cashier being hampered. This happens because the cashier has to select the data one by one when the consumer makes a payment, then the cashier also records the payments one by one [3]. Apart from problems with cashiers, manual business processes also make it difficult for branch leaders to monitor the services provided by their employees. This problem arises because branch leaders have to monitor their employees directly, using only their sense of sight, without clear monitoring data [4].

Design is a set of steps that convert a system's analysis findings into a programming language so that the implementation of the system's component parts may be explained in detail. Determining the procedures and information needed for a new system is known as system design. Design is the process of choosing the best alternative system in order to create a new system that can address the issues the firm is now facing [5]. Meanwhile, the act of developing a new system or, in the case of an existing system, replacing or repairing it in whole or in part is referred to as "building" or "building a system." The terms enterprise architecture (EA) and IT architecture are connected, although there is a little distinction between the two. While IT architecture describes application system architecture, data architecture, and information technology architecture in much more detail, enterprise architecture (EA) focuses more on building high-level business process communications and operational models of IT business demands [6]. Non-IT stakeholders do not need to be involved in discussing IT architecture; they just need to discuss the business processes and operational needs of the organization. Meanwhile, IT stakeholders

must be involved in discussing IT architecture in an effort to provide relevant information systems to support the organization's business processes and operational needs [7].

The operation of all organizational parts under the ownership or management of a single organization is referred to as enterprise. A business, service, or membership in an organization made up of one or more companies that are run in one or more locations can all be considered enterprises. a group of organizations with directives to accomplish certain objectives. According to the aforementioned definition, an enterprise is any connected organizational component that is managed by a single organization in order to deliver a good or service and meet organizational objectives [8]. The fundamental components of an organizational system are those that are linked to the system environment, have rules governing their design and assessment, and are related to one another. The organization of a system made up of hardware, software, and networks is known as its architecture. In a nutshell, architecture describes how a system is put together, how each component is organized, and how the interfaces and rules that connect the system's parts are utilized to integrate every component that already exists. The functions, descriptions of data formats, and protocols for communication between every node and workstation are also included in the design [9]. An architecture is a framework made up of interconnected networks, hardware, and software, together with guidelines for creating and assessing the architecture [10].

A portion of the concepts, procedures, and models utilized in the planning and execution of organizational structures, business procedures, information systems, and infrastructure are included in the definition of enterprise architecture (EA). Enterprise architecture can be a design for the management and administration of each component (such as policies, operations, infrastructure, and information) or it can be a definition of a business system that specifies what the business environment should be [11]. Understanding of all the different elements that support enterprise development and how these elements relate. A framework is an idea, thought, or concept that is used to create other, more specific thoughts about an object. The framework can also be used to group an organization that is important for the management of that organization and is also used in the development of future company systems. The enterprise architecture framework has several uses, including being able to identify the type of information that an organization needs to describe the enterprise architecture. An enterprise architecture framework can also group types of information into a logical structure and describe the relationships between these types of information [12]. Applying or creating an enterprise architecture framework is essential when creating an enterprise architecture since it can assist architects in taking pictures of the organization's architecture from different angles and perspectives, resulting in a comprehensive understanding of the structure of the organization. It will be easier and better to build an enterprise architecture if you adhere to a certain way of thinking. The enterprise architecture (EA) framework is the name given to this conceptual framework. One tool that may be used to create a variety of distinct designs is an architectural framework [13]. An architectural framework needs to outline an information systems design process in terms of a set of interconnected building blocks and demonstrate how these components interact together. Using an EA framework will guarantee full coverage of the design solution, expedite and streamline the architecture development process, and guarantee that the chosen architecture will support future development in response to changing business requirements [14].

There are a number of enterprise architecture frameworks available at the moment, such as the Open Group Architectural Framework (TOGAF), the Federal Enterprise Architecture Framework (FEAF), and the Zachman framework. A survey by the Institute for Enterprise Architecture Development indicates that, excluding self-made frameworks, these three frameworks are the most commonly utilized in businesses or government agencies. One framework used to create corporate architecture is the Zachman framework, which Zachman introduced in 1987. A system that unites two classifications that have been in use for millennia is called the Zachman framework [14]. The fundamentals of communication come first, and they are found in questions like what, how, when, who, where, and why. These inquiries combine explanations of intricate concepts with responses to lengthy queries. The second originates from reification, which is the process by which an abstract concept becomes an instantiated object. This theory was proposed by classical Greek philosophers and is referred to as identification, definition, representation, specification, configuration, and instantiation in the Zachman framework. A framework for business system modeling, assessment, optimization, management, and documentation is the Zachman idea [15].

Enterprise architecture is constructed using the TOGAF framework, which was created by The Open Group's Architecture Framework in 1995. The United States Department of Defense was the first to employ TOGAF, but as it developed, it was adopted by many other industries, including banking, education, and manufacturing. Enterprise architecture is developed using TOGAF, and specific tools and procedures are available for its implementation. Its distinguishing feature above other enterprise architecture frameworks is this [16]. This framework has the benefit of being open-source and versatile. One of the most often used techniques for creating enterprise architecture is TOGAF. The fact that there are technique steps for developing and managing enterprise architecture is proof positive that TOGAF is a useful, tangible framework. In order to represent many levels of abstraction in an architectural development process, TOGAF encapsulates the enterprise continuum idea. In this sense, TOGAF helps performers at all levels communicate and work together. When combined with TOGAF ADM, several frameworks, models, and architectural resources can be used inside the context of TOGAF [17].

Architects are encouraged to make use of any other pertinent architectural resources and assets when working with an enterprise continuum. In addition, TOGAF serves as the architectural foundation for an organization's information technology development.

2. Research Methods

In this research, the author used the TOGAF architecture development method (ADM). In TOGAF ADM, there is a definition of architecture and its understanding, which is in the preliminary phase (the preparatory phase). In this modeling, it starts from zero, so a detailed architectural process is needed. This is needed to simplify the subsequent architectural development process. Detailed architectural processes can be obtained using TOGAF ADM. In TOGAF ADM, there are stages that have been arranged in such a way that the details of the architecture can be seen in them. The modeling that the author will compile also requires support for architectural evolution. This is needed because, initially, the restaurant did not have technological architecture. In Phase F Migration Planning, TOGAF ADM provides support for technology architecture evolution. There are eight structured stages, plus a preliminary stage. However, in this research, the author will only discuss up to stage F, namely migration planning. From the stages that will be discussed, it becomes a research procedure, which can be explained as follows: The primary phase, at this stage, determines the framework and scope of the information technology architecture that will be used, as well as defining management elements.

Phase A: Architectural Vision, at this stage, determines the needs for designing information technology architecture, which includes the restaurant profile, vision, and mission. Business goals, business targets, employee management, problem identification, need identification, and a rich picture. Phase B: Business Architecture: In this phase, the present business architecture is outlined. A business process analysis is then conducted, leading to the creation of a business architecture proposal. Information System Architecture, Phase C: At this point, we will analyze the data architecture and application architecture that are now in use in addition to talking about them. Determining the application architecture and the suggested data architecture is the stage's outcome. Phase D: Technology Architecture Specifically, this stage will involve the following activities: creating a technology architecture perspective; choosing technologies based on technology categories; defining a technology platform; and determining the topology of the target technology architecture. Phase E: Possibilities and Remedies At this point, tasks include figuring out how to implement the application system, prioritizing its implementation, planning its aims, implementing it, and testing it. Phase F: Migration Planning: At this phase, user usage of the system will be understood through the implementation of migration planning. With the design at this stage, a strategy for conveying knowledge about the system being built will be produced.

3. Results and Discussion

Based on the results of observations and interviews, it shows that the number of employees is divided into 4 work units, namely branch leaders, cashiers, waiters, and chefs. Branch leaders, as leaders, have duties that include planning, organizing, directing, coordinating, and supervising all work units and activities in the restaurant. In addition to these tasks, branch leaders also carry out the function of managing human, material, financial, time, and environmental resources. The cashier is tasked with carrying out payment transactions with consumers. Other duties of the cashier include printing proof of payment, which is then given to consumers, and recording payments, which are then made into reports to be submitted to branch management. Waiters have the task of providing service to consumers. This service includes recording consumer orders, which are then given to the chef and cashier. Apart from that, it also serves orders to consumers. According to the waiter's notes, the chef must prepare the consumer's desired order. There are several problems that arise in the service process. The following problems arise: The service time is quite long. Manual order recording. The waiter has to go to the kitchen to give the order note. The waiter must go to the cashier to get the order note. The waiter must go to the kitchen to find out if the order is ready. The chef has to sort through piles of paper orders. The chef must call the waiter to see if the order is ready. The cashier must sort the stack of paper orders if a consumer makes a payment. The cashier must manually create proof of payment. The cashier must obtain a payment report from the consumer. Branch leaders must manually monitor the services provided by employees. The central leadership must sort through piles of reports from each branch. current service business processes. Service begins when consumers come to the restaurant. Consumers choose the seat they want, and after getting a seat, the waiter records the table number and order submitted by the consumer. When the order has been recorded, the waiter conveys the order note to the chef in the kitchen for processing and to the cashier for bill payment. The waiter takes the order and serves it to the customer after the chef has processed it and is ready to serve. If the consumer has finished enjoying the dish ordered, they make payment at the cashier. After the payment transaction, the cashier provides proof of payment to the consumer and records the payment to be made into a report, which is then submitted to the branch manager.

From the business processes depicted, there are several problems that arise. These problems arise among waiters, chefs, cashiers, and branch leaders. With these problems that arise, consumers can also receive impacts in various ways. The problem that arises for waiters is recording orders manually. The waiter has to go to the kitchen and go

to the cashier to provide a note of the order and has to check in the kitchen to ensure the readiness of the order to be served. These problems will affect the time needed to serve consumers. For chefs, there are two problems that arise, namely that the chef is required to sort piles of order paper to prepare the order and call the waiter when the order is ready. These two things result in delays in the smoothness of service, which requires more time and piles of paper order notes in the kitchen. Meanwhile, at the cashier, there are three problems that can be concluded from the current business processes. The three problems are that the cashier has to sort out a pile of paper order notes if a consumer wants to make a payment, the cashier has to manually create proof of payment, which is then handed over to the consumer, and the cashier has to manually write the payment on the consumer's payment report. All of these problems result in long service times, piles of paper order records, which are part of the service data, and inefficient reports required. The next problem arises for branch leaders. This problem is that branch leaders have to monitor the services carried out by employees manually. This results in an inefficient service monitoring process. Apart from monitoring problems, there is also the problem of reports that must be given to branches, which still have to be rearranged in file form.

There are 12 information technology strategy identification points that can be produced. The resulting improvement targets include simplifying business processes, minimizing paper service records, having incoming order information for chefs, having ready-to-pay order information for cashiers, having ready-to-serve order information for waiters, having system facilities for printing proof of payment, and having system facilities that automatically compile payment reports. There is also information for branch leaders regarding payment reports and services that occur, as well as branch reports for central leadership. There are nine solution patterns resulting from nine improvement targets. The solution pattern includes data exchange with the system, applications that are always connected to the database, incoming order database facilities, ready-to-pay order database facilities, ready-to-serve order database facilities, automation of making proof of payment, automation of making payment reports, payment and service report database facilities, and automation of branch report creation. Information technology solutions that can play a role in restaurant service business processes. In this information technology solution, all elements related to the service process are connected to the candidate system, except consumers. A candidate system is a system that will be proposed to overcome various existing problems. The candidate system consists of ordering facilities, payment facilities, monitoring facilities, branch information facilities, and data management facilities.

The ordering facility involves waiters, chefs, and cashiers. In this facility, the waiter inputs order data submitted by consumers and gets alerts or information that the order is ready to be served. The chef gets an alert or information that a new order has come in and inputs the order data, which is ready to be served. Meanwhile, the cashier gets order data and inputs order payment validation. Next, there are payment facilities. This facility is connected to the cashier. Where the cashier will input payment data and get proof of payment, which will be given to consumers. The third is the data management facility. This facility is useful for managing the basic data that will be used in every other facility. With this facility, the admin can process basic data, which includes user data, food and drink menus, and table data. The fourth facility is a monitoring facility. Get information from the three previous facilities, namely ordering facilities, payment facilities, and data management facilities. With this facility, branch leaders can monitor services that occur and print payment reports from consumers. The final facility is the branch information facility. This facility is useful for providing reporting information from each branch.

From the results of the observation and interview process, several conclusions were drawn regarding the current application architecture and the proposed architecture. Restaurants do not yet use certain applications to help carry out business processes. In current business processes, everything is still recorded manually on paper. The business processes in question include orders, payments, and reports. To help business processes run well, a tool is needed to reduce existing obstacles. The tool is an application, so application design is needed. Application architecture describes application systems and their role in supporting business processes. There are four application solutions that can help business processes. These application solutions include ordering applications, payment applications, monitoring applications, and branch information applications. Of the four application solutions mentioned, one additional application solution is needed to carry out basic data management, which will be required by the four application solutions mentioned. Thus, we added one more application solution called a data management application. In the application landscape, it can be seen that there are five interconnected applications, namely monitoring, payment, branch information, data management, and ordering. These four applications are within the scope of network security and user profile management. Apart from that, there is also a login portal. The login portal is used to access the five applications mentioned.

Login portal, used as access to enter web-based applications. These applications include ordering, payment, monitoring, cab information, and data management applications. Monitoring is one of the applications that is accessed via the login portal because it is web-based. Payment is one of the applications that is accessed via the login portal because it is web-based. Canang information is one of the applications that is accessed via the login portal because it is web-based. Data management is one of the applications that is accessed via the login portal because it is web-based. Ordering is an application that has several modules that require web and mobile displays

based on Android. Web-based ones will be accessed via a login portal, while mobile-based ones will require a service to access the application. The web client is found on the user's desktop, which will later be used to display the user interface for each web-based application. Web-based applications can be accessed using a browser. Network security and security services for all applications running on it. After the landscape is obtained, the author uses interoperability, which will describe the flow of information between applications. The interoperability map is in the form of a flow of information exchange across applications; each arrow defines the required information. The interoperability map shows a login portal and service application. The login portal is used to access every web-based application, from ordering, payment, monitoring, branch information, and data management. Meanwhile, the service application is used to connect the ordering application, in the form of an Android-based mobile application, with other applications. The service application here will be in the form of JSON using the PHP programming language.

From the previous explanation, it can be ascertained that the existing data architecture is currently running manually. This is because there is no application that is used to assist the service process. To carry out data architecture analysis, the author uses three types of diagrams. The three types of diagrams are sequence diagrams, object diagrams, and class diagrams. This analysis process is carried out on each case in each facility that appears in accordance with the previous discussion. In this facility, there are six cases that will be analyzed to obtain the required data architecture. The five cases include logging in, entering an order, entering an order ready to be served, entering an order ready to be paid, entering an order that has been paid, and logging out. Monitoring facility: in this facility, there are four cases that will be analyzed to obtain the required data architecture. The five cases include logging in, viewing and printing payment reports, viewing and printing order reports, and logging out. However, the login and logout cases are the same as for the ordering facility, so the author did not rewrite the explanation of the monitoring facility. Branch information facility: in this facility, there are three cases that will be analyzed to obtain the required data architecture. The three cases include logging in, viewing and printing branch reports, and logging out. However, for case analysis, login and logout are the same as ordering facilities. Meanwhile, to view and print branch reports, the required classes have been defined in previous facilities. These classes include the user class, menu class, table class, order class, and payment class. So, in the branch information facility, no further analytical explanation is needed because the necessary data requirements have been obtained from the previous facility explanation.

Data management facility: in this facility, there are five cases that will be analyzed to obtain the required data architecture. The five cases include login, user data management, food/drink menu data management, table data management, and logout. However, for case analysis, login and logout are the same as for the ordering facility. Meanwhile, for user data management, food/drink menu data management, and table data management, there is no relationship between classes where the required classes have been defined in the previous explanation. These classes include the user class, menu class, and table class. So, in the data management facility, no further analysis explanation is needed because the necessary data requirements have been obtained from the previous facility explanation. The Users class has a one-to-many cardinality for the leg, order, and payment classes. In this way, the Users class has a relationship with the leg, order, and payment classes, where in the Users class there is an ID attribute as a link to the leg, order, and payment classes. Apart from the log, payment, and order classes, the users class also has a many-to-one cardinality with the level class. In this way, the level class has a relationship with the user class, where there is an ID attribute in the level class as a link. The order class has a many-to-one cardinality for the menu, user, and table classes. In this way, the orders class has a relationship with the menu, users, and table classes, where in the menu, users, and table classes there is an ID attribute as a link to the orders class. The Payment class has a many-to-one cardinality with respect to the Users and Table classes. In this way, the payment class has a relationship with the users and table classes, where there is an ID attribute in the users and table classes as a link to the payment class. This class diagram is used to describe the static design of the system that will be built into the database. From the class diagram, you can illustrate the database schema, namely the tables that will be used in the database. Each class will be represented by a table; class attributes will be fields in the table, and methods will be functions that will be created when creating the program.

Phase D. Technology Architecture: in this phase, the results obtained from the previous phase are application architecture and data architecture. To realize the results of information system architecture design, it is necessary to design technology configurations to produce infrastructure solutions that meet needs. According to TOGAF ADM, this technology configuration activity is called technology architecture. In this research, the author chose a development method by developing the application independently. This method was chosen for all applications because all applications for restaurants are new, and this method will save on development costs. With the independent development method, the author will develop all applications because resource conditions do not allow for application development. Implementation can be divided into two phases, namely database implementation and system implementation. The database implementation consists of seven tables in accordance with the proposed design that has been prepared. Meanwhile, the system implementation, which also refers to the proposed design that has been prepared, consists of five applications, which include ordering applications, payment

applications, monitoring applications, branch information applications, and data management applications. However, in this implementation, the author only implemented four applications running on the branch. This is because the author only conducted research at one of the branches and not at the center. Database creation was implemented using MySQL database management system software. The name of each database table created is adjusted to the name that was previously designed. The implementation of this system consists of four application implementations that have been previously designed. The four applications are ordering applications, payment applications, monitoring applications, and data management applications.

Phase F. Migration Planning: In this phase, the author will discuss strategies for implementing the results of service information technology architecture with the aim of facilitating understanding of the use of each system implemented. For this purpose, the author will create a system user manual and conduct training on system use. The manual that the author will make is a book that contains instructions for using the system. This book will explain how to use the ordering system, payment system, monitoring system, and data management system. The explanation of each system will be structured so that users can understand it easily. This structured system explanation starts with how to open the application, log in to the application, and utilize the modules in it. With a structured manual, it is hoped that it will make it easier for users to understand the use of each existing module. The training that the author plans will only take one day. This is because there are not many users who need training; there are only a few employees. Apart from the fact that not many users need training, users can also read the user manual to understand better. Within one day, it is planned that training will be carried out one by one for users. This one-on-one training is carried out so as not to disrupt business processes. In this way, it is also hoped that the process of understanding the material presented will be faster.

4. Conclusion

From the research conducted by the author, a model of information technology architecture for restaurants was obtained, which was implemented using TOGAF ADM. The information technology architecture model includes service processes, payment processes, and monitoring processes. From the results of the information technology architecture design that the author has carried out, the author can provide several suggestions, as follows: The architecture that the author has developed has not touched on raw material stock calculations and profit calculations, so it can be developed further so that it can achieve the process of calculating raw material stock and profit calculations. The application design that the author developed from the results of this information technology architecture is still very unattractive, so it can be developed again to make it even better.

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