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Implementation of the Zachman Framework in the Digital Sales System in Selotapak Permai Trawas Small and Medium Industries

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ABSTRACT

Small and Medium Enterprise (SMEs) is a community of citizens bringing together entrepreneurs within the scope of small-scale businesses. In SMEs, internal management is spontaneous and generally does not have standardized procedures. The use and utilization of technology can accelerate the growth of procedures that occur in a small industry, but not all of them are successful. Human resource management factors and a culture that has existed for many years shape the uniqueness of its procedures and management. Using the Zachman Framework in the software development process helps analyze needs to obtain concrete requirements according to conditions in the field. Program development using the Software Development Life Cycle by designing, implementing, testing, and validating to users. From the testing and validation results conducting interviews and observations, 15% of community members joined and used the application. With the Zachman Framework, the results of the framework are more focused and have real guidance on every software development process.

Keywords: *E-Commerce, Information Technology, Management, Sales, Small and Medium Enterprises*

ABSTRACT

Industri Kecil Menengah (IKM) adalah sebuah komunitas dari warga dalam menghimpun wirausahawan dalam lingkup usaha lingkup kecil. Dalam usaha lingkup kecil, manajemen dalamnya bersifat spontan dan umumnya tidak memiliki prosedur yang standar. Penggunaan dan pemanfaatan teknologi bisa mempercepat pertumbuhan prosedur yang terjadi dalam sebuah industri kecil, namun tidak semuanya berhasil. Faktor-faktor sumber daya manusia yang memanajemen dan budaya yang sudah ada bertahun-tahun membentuk keunikan prosedur dan manajemen yang ada di dalamnya. Penggunaan Zachman Framework dalam proses pengembangan perangkat lunak membantu analisis kebutuhan sehingga mendapatkan kebutuhan kongkrit sesuai dengan kondisi di lapangan. Pengembangan program menggunakan *Software Development Life Cycle* dengan membuat rancangan, implementasi, ujicoba hingga validasi kepada pengguna. Dari hasil pengujian dan validasi dengan melakukan wawancara dan observasi, 15% anggota komunitas bergabung dan mempergunakan aplikasi tersebut. Dengan Zachman Framework, hasil kerangka berpikir lebih terarah dan memiliki panduan nyata pada setiap proses pengembangan perangkat lunak.

Keywords: *E-Commerce, Industri Kecil Menengah, Manajemen, Penjualan, Teknologi Informasi*

INTRODUCTION

IKM Selotapak Permai is an organization consisting of residents of Selotapak Village, Trawas sub-district, Mojokerto, East Java. IKM Selotapak Permai is engaged in selling processed products from the residents of Selotapak Village. IKM Selotapak Permai has a head office in Pondok Sawah Watu Tapak as a collection point for residents' products to be distributed to several sales locations. In addition, IKM Selotapak, which has been in business since 2019, entrusts products sold to several other marketers. The products they sell are raw products, namely samiler; finished products in the form of tempe chips, ginger ting-ting, carang mas, onion sticks, onde-onde pecah, rempeyek, banana chips, mbote chips, etawa goat's milk, mushroom chips, bitter melon chips; and clothing products in the form of t-shirts.

The IKM business process runs naturally by using notes on paper and short messages on the WhatsApp platform with partners. Obstacles considering the natural business form, namely paper notes and short messages, is the requirement for another recapitulating process. Purchase data and order delivery requests are not recorded on media. The recording structure of each partner has differences in billing times and billing procedures, so IKM managers need special efforts in managing Marketing Cooperation partners. Collaborating with these partners opens up opportunities to enlarge and improve existing branding. Still, IKM managers do not necessarily have the autonomy to determine sales directions and targets because they follow the policies of their partners.

In industrial management, IKM business is feasible to adapt technology. Many various research focus on the transaction in Small Medium Enterprise (SMEs) problems[1][2]. Maturity measurement is one of the research topics which focus on self-evaluation of management carried out in a business. The metric used is the Strategic Management Maturity Model (SMMM) proposed by Demir [3]. In the form of small industries, the dominance from the point of view of SMMM is an ad-hoc form of management where management is carried out according to needs and triggered by external conditions. Very minimal is the innovation and standard of a procedure. Another challenge in IKM is the lack of a financial sector, human resources, and technological approach [4]. These challenges also happened to Selotapak Permai IKM where they were gathered from several housewives with medium industrial skills from training conducted by community service programs from educational institutions or certain companies.

Seeing the potential, a more in-depth analysis is needed to maximize the use and application of technology in the marketing sector. Appropriate and appropriate technology in the design process will help people adapt to new things and technologies so that people's desire to try, use and manage these technologies becomes higher.

LITERATURE REVIEW

Strategic Management Maturity Model in Organizations in General

Maturity measurement needs to be done to see the self-evaluation of management in the industrial management business. The Strategic Management Maturity Model proposed by Demir [5] has five levels in which it has several quality parameters in the management science family, namely:

Ad-hoc and Static

Organizational characteristics at this level are that managers do not do strategic planning. They also do not formalize existing processes and procedures. They tend to think at a tactical or operational level according to their needs and are not monitored by other interested parties. Managers spend most of their time dealing with operational issues and solving problems that are visible today without looking at the long term.

Reactive

The organization's characteristics at this level are that ongoing planning and strategic performance management have been implemented inconsistently and produce less than optimal results. This organization has performance measurement or even uses it to report underperforming elements. Still, often these activities are carried out by individuals to meet routine policy needs and have no feedback.

Structured and Proactive

At this level, the organization's formal structures and processes engage comprehensively and proactively in tactical planning and management. These activities occur regularly and are subject to some degree of improvement over time. **Managed dan Focused,** Organizational characteristics at this level encourage more comprehensive focus and decision-making. Organization-wide standards and methods are widely applied to strategic management. Managers involve employees in the process, and work culture of measurement & accountability helps drive strategic success for the organization; **Have Continuous Improvement,** Organizational characteristics at this level of strategic planning and management excellence are constantly improved in the organizational culture. Organizations have clear steps to analyze how each individual performs against strategic goals and then learn how effective the outcomes are. Continuous strategic improvement encourages competitive advantage to achieve successful organizational performance. From the existing levels, quality parameters related to an organization's maturity are collected: strategy in leadership, culture and values, strategy in planning, managerial adjustment, performance measurement and management, process improvement, and design for long-term sustainability.

Quality Parameters of SMEs in Indonesia

Observers and researchers have observed the phenomenon of the development of small and medium industries in Indonesia since 2014 [4]. IKM is the backbone of Indonesia's economic growth, even during the pandemic. The IKM sector is strategic because it is pretty neutral with government regulations and often empowers the community in its management process. In general, SMEs' challenges are the lack of a financial sector, lack of human resources, and lack of a technological approach [4]. Anggadwita [4] suggests that four quality parameters measure the success and success of IKM. Aspects of the spirit of entrepreneurship become the main topic in quality parameters. First, managers must be motivated, enthusiasm, high optimism, and good self and group management in managing IKM. Second, the competencies and capabilities of individual IKM managers and members must be improved following existing business processes. Third, creativity in products and technology to support business processes are SMEs' unique and innovative values. The last is the level of sustainability and profits achieved from SMEs due to business processes.

Enterprise Architecture (EA) in Software Development Life Cycle (SDLC)

There are several stages and ways of assembling program components in software development. Traditionally, the waterfall process has been standard in software development. However, the software development process has gradually evolved with various points of view, such as iterative and derivatives, such as SCRUM. These developments adjust to the expectations and delivery times of a feature. All elements in the SDLC process have in common, namely the analysis process, the design process, the construction process, and the testing process of the features that have been constructed. In the needs analysis phase, there are many methodologies for exploring needs, one of which is interviews and observations. The needs data collected is then analyzed with several forms of Enterprise Architecture (EA) in the needs mapping process to a more comprehensive design. Following the findings, the designs that became the basic foundation of the program construction were issued. Zachman Framework [6] became the chosen framework because of the complexity of looking at organizational parameters, which also strengthens SMEs development parameters. Zachman Framework is also used in the application and application of information technology in online tickets [7] , Electrical Equipment Industries [8] and Strategic Information Systems [9]. Zachman Framework is suitable for the new purposed technologies [10] as a foundation of the software modelling.

There are several stages and ways of assembling program components in software development. Traditionally, the waterfall process has been typical in software development and can combined with Zachman Framework thinking process to guidance each process[11][12]. In this study, the waterfall methodology is still the focus, with the addition of the Zachman Framework as a framework. The stages of processing are as follows: identify current conditions from the Mature Level and SMEs point of view, define the data and process design, program construction, deploy and determine the maturity that occurs after use.

METHOD

There are several stages and ways of assembling program components in software development. Traditionally, the waterfall process has been typical in software development. In this study, the waterfall methodology is still the main focus, with the addition of the Zachman Framework as a framework. The stages of processing are as follows: identify current conditions from the Mature Level and SMEs point of view, define the data and process design, program construction, deploy and determine the maturity that occurs after use. Zachman Framework consists of 5W+1H questions considered in Enterprises and Industries architecture. Those questions are used to guide each stage of Waterfall methodologies thinking processes to achieve a descriptive and holistic representation of an enterprise[6][11] (Figure 1)

Figure 1. Waterfall Methodology with Zachman Framework

Waterfall	Zachman Framework					
	What	Where	Why	Who	When	How
Identify current conditions from the Mature Level and SMEs point of view	Context and Business Scope of Selotapak Permai Trawas Small and Medium Industries (Table 1,2 and 3)					
Define the data and process design	System Model of Selotapak Permai Trawas Small and Medium Industries (Table 4)					
Program construction	Technology Implementation of Selotapak Permai Trawas Small and Medium Industries (Table 5)					
Deploy and determine the maturity that occurs after use.	Deployment and Acquisition of Selotapak Permai Trawas Small and Medium Industries (Table 6 & 7)					

RESULTS AND DISCUSSION

In the results of interviews with the manager before implementing the system, Selotapak Permai IKM is still at level-1 Ad-hoc. High motivation can be seen from the high entrepreneurial spirit. Community members actively carry out community activities that support the entrepreneurial spirit. The culture and value of the increased community in the individuals of each IKM member are evident from helping each other, working together, and referencing each other's efforts in the IKM members. Unfortunately, they do not have managerial strategies such as planning, monitoring, and management of sustainability. The spirit and culture of values have not been contained in standardized procedures. Details and mapping of maturity levels with quality parameters are shown in Table 1.

The interview results show that the quality of SMEs from Selotapak Permai IKM focuses on the motivational aspect and matures the entrepreneurial spirit. However, the science supporting technical matters such as product quality, management, and marketing quality is minimal. Each member markets their products via WhatsApp and entrusts them to related partners through the IKM coordinator, as shown in Figure 2. Recording is done casually and discussed on an online text platform. Table 2 also shows that there is no management related to sustainability and profit levels that are planned and carried out sustainably. E is Entrepreneur value, V is Culture and Value, P is Strategic Planning, M is Management, A is Performance Accountable, and LN is Management & Risk for Long lasting Enterprise.

Table 1. Analysis of maturity quality level before implementation

Maturity Level	E	V	P	M	A	LN
[1] Ad-hoc	Motivated	*	-	-	-	-
[2] Reactive	Motivated	*	-	-	-	-
[3] Structured	-	-	-	-	-	-
[4] Well-managed	-	-	-	-	-	-
[5] Have Continuous Improvement	-	-	-	-	-	-

***)** have the value of togetherness and business culture

Table 2. Analysis of SMEs Before Implementation

Aspect	Level	Description
Entrepreneur	A	High motivation and entrepreneurial spirit
Human Resource Competence	B	Managers and members come from housewives with a range of education from high school to bachelor's degrees. Dominated by the high school level equivalent
Creativity	B	Creativity in product packaging. For marketing strategies and technology applications, they still use the WA platform.
Sustainability and Sustainable Profit Rate	C	There is no special monitoring and strategy yet

From the analysis of existing maturity and competencies, it is necessary to construct a marketing system that is easy to use for users who have intermediate technological literacy. Based on initial interviews, a platform was set up to manage existing sales. Therefore, the platform is formed like e-commerce, focusing on buying and selling IKM products. However, E-commerce is generally difficult for members because the features are complex, and the interface has too many icons. Therefore, SMEs need integration with familiar platforms such as WhatsApp. This integration makes it easier for experts to function with existing technologies. Critical Thinking and the results are explained in Table 3.

Table 3. Context and Business Scope of Selotapak Permai Trawas
Small and Medium Industries ased on Zachman Framework

5W 1H	Critical Thinking and Discussion Result
What	Customer Data, Products, Categories, and Purchase Transactions
How	Conduct interviews to obtain flow and data related to the selection and purchase of goods
Why	To analyze crucial business-related product marketing
Who	managers and buyers are important actors
Where	The activity was carried out face-to-face in Selotapak Village
When	In the early stages of development

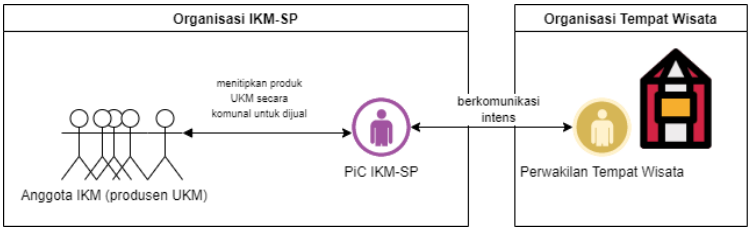


Figure 2. Initial block diagram and communication structure

From the activities and requirements above, the development and identification of data candidates are carried out, which will become the forerunner of the data structure in the system. The procedure for determining using 5W1H is as in Table 4. The data design that forms the basis of information technology solutions is described as an Entity Relationship Diagram (ERD)[13] . Related data structures still dominate the visualization of data descriptions in systems and information technology [3][4]. There are four main data tables: users, products, categories, and transactions. User data contains user data from both the manager and the buyer side. The difference occurs in the 'as' column. Purchase transactions show the recording of what goods are purchased, where one transaction is described in a note. Purchase receipts can have many kinds of product data, so the database design has a `many-to-many` relationship between products and transactions. From the manager's point of view, independence in product and category management is mandatory. Therefore, following the manager's needs, the right technology solution from the point of view of the database structure is formed

one-to-many between products and categories so that in one product, you can find what category is relevant. Details of the database design are shown in Figure 3.

Table 4. System Model of Selotapak Permai Trawas
Small and Medium Industries based on Zachman Framework

5W 1H	Critical Thinking
What	Data Structure Planning and Process Flow
How	Diagram Entity Relationship Diagram and Business Process Modeling Notation
Why	Mapping processes and data structures on the carried system
Who	Activities managed by managers and buyers
Where	The system placed on cloud hosting with OpenSource based Linux Server
When	Performed during initial system development



Figure 3. Data Structure of the System

To describe and visualize the process flow between various roles, this study uses Business Process Modeling Notation (BPMN), where designers can describe various activities from multiple parts or points of view. In this IKM case study, management is carried out by two people, namely: the buyer and the manager. With the stage of resource knowledge on literacy and the use of information technology that is still lacking, the management scenario is still in centralized coordination with several IKM managers. This makes the transfer of information technology procedures and their acquisition easier for SMEs. However, with the existing information technology and information engineering, the IKM has direct authority in the existing purchase data. As seen in Figure 4, there are management processes that are carried out independently by IKM managers. The primary key is independence in managing catalogs and product categories. In Figure 5, there is independence in managing purchase transactions from the initial offer phase to the realization of the purchase.

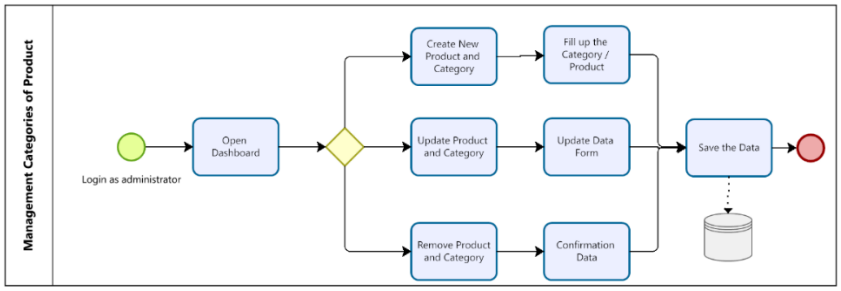


Figure 4. Process flow and management of IKM

The concept of purchasing transactions follows the standard of buying and selling communications in the scope of IKM [14] where management is still centralized. Another needed feature is certainty in the shipping price, which measures the distance from the seller's place to the buyer's place. Since 2020, many providers and vendors have provided cloud-based services for calculating shipping costs. In this case, RajaOngkir API is a suitable solution [15]. RajaOngkir implementation requires access to the API with the CURL module by entering the access code and API code, as shown in Figure 5, and the construction results in Figure 6. The framework for thinking in the implementation phase is shown in Table 5. The technology is a Web-based application considering the ease of user access from the point of view of managers and buyers (Table 6).

Table 5. Technology Implementation of Selotapak Permai Trawas
Small and Medium Industries based on Zachman Framework

5W 1H	Critical Thinking
What	Use web-based and Database MySQL Technology
How	Development is carried out using the waterfall methodology using a framework, css and jquery as well as the RajaOngkir API
Why	Use Open-Source technology to reduce production costs
Who	Construction is carried out by software engineering to map customer and administrator needs
Where	Software implemented at internal and cloud hosting.
When	Construction of Application was held after the requirement and design agreed

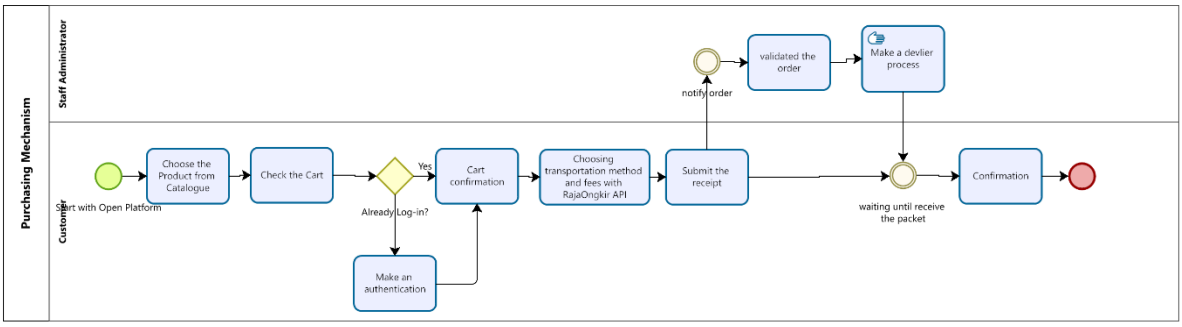


Figure 5. Business Process Modeling Purchasing

Table 6. Deployment and Acquisition Selotapak Permai Trawas Small and Medium Industries based on Zachman Framework

5W 1H	Critical Thinking
What	There is a deployment phase and an installation phase for non-functional features for security and access monitoring such as Re-captcha and Google Analytics
How	Deployment is done by using FTP technology to upload source code and using Google Console to enable Google Re-captcha and Google Analytics features
Why	Deployment become an important part so that access can be done easily on Search Engines while sharpening and increasing the quality and popularity of IKM
Who	Deployment is done by development team
Where	Done remotely
When	Done after the construction stage

Post-construction is the next critical phase. After the construction phase, the team ensures that the program's quality is maintained. The critical point is the authentication section and the registration form [16][17]. The entrance of a system requires checking whether the person accessing it is a human or not. This avoids things like Distributed Denial-Of-Service (DDOS) [18]. After application to the

system, an evaluation of the management maturity level of management by interviewing the management parties is carried out as shown in Table 7.

Table 7. Analysis of Maturity Quality Level Before and After Implementation

No.	Maturity Level	Before						After					
		E	V	P	M	A	LN	E	V	P	M	A	LN
1	Ad-hoc	✓	✓	-	-	-	-	✓	✓	✓	-	✓	-
2	Reactive	✓	✓	-	-	-	-	✓	✓	✓	-	-	-
3	Structured	-	-	-	-	-	-	✓	-	-	-	-	-
4	Well-managed	-	-	-	-	-	-	-	-	-	-	-	-
5	Have Continuous Improvement	-	-	-	-	-	-	-	-	-	-	-	-

CONCLUSION

With the development of the Zachman Framework, the analysis, design, implementation, and acquisition processes will be more focused, and every software development process will have more accurate direction. Each phase can become more mature and stable in order to prevent analysis, design, and technical problems. Consequently, this way of thinking can raise the maturity of management standards in these organizations since each phase of application development becomes holistic from both the user and the developer's perspectives. Analysis of Maturity Quality shows an improvement of Entrepreneurship, Value, and Performance after the implementation of Zachman Framework.

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