

Supporting Digital Transformation of MSMEs Through Enterprise Architecture Design Using the TOGAF ADM Framework

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ARTICLE INFO	ABSTRACT
Keywords: Digital Transformation, MSMEs, TOGAF ADM Framework Received: Dec 10, 2024 Accepted: Feb 18, 2025 Published: Feb 28, 2025	In today's highly connected and technology-driven environment, digital transformation has become a critical necessity for Micro, Small, and Medium Enterprises (MSMEs) to enhance their competitiveness and long-term sustainability. One strategic approach to facilitate this transformation is through the design of an enterprise architecture tailored to the specific needs of MSMEs. This study aims to develop a structured and adaptive enterprise architecture model for MSMEs by applying the TOGAF ADM (Architecture Development Method) framework. The methodology consists of several key phases: Preliminary, Architecture Vision, Business Architecture, Information Systems Architecture, and Technology Architecture. Each phase provides a systematic approach to assess business requirements, align digital strategies with business goals, and build supporting technological infrastructure. The output of this research is a Company-Specific Blueprint designed to reflect the actual conditions and operational needs of the targeted MSMEs. This blueprint serves as a comprehensive guide for MSMEs to plan, implement, and manage digital transformation initiatives effectively and progressively. By adopting the TOGAF ADM framework, this research contributes to the development of a responsive and sustainable enterprise architecture model, empowering MSMEs to navigate technological changes and improve their organizational performance. The proposed model is expected to support MSMEs in making informed decisions regarding digital investments, process optimization, and integration of digital tools that align with their strategic objectives.

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1. INTRODUCTION

Digital transformation has become an urgent need for Micro, Small and Medium Enterprises (MSMEs) in this increasingly connected and technology-driven era. MSMEs must continue to innovate and adopt the right information and communication technology to increase their competitiveness, market reach, and improve operational efficiency. One approach that can be used in the digital transformation of MSMEs is enterprise architecture design.

Enterprise architecture design helps MSMEs in planning and organizing systems, business processes, data and technology used in a structured manner. In designing enterprise architecture, The Open Group Architecture Framework (TOGAF) has become a widely accepted framework. TOGAF provides comprehensive guidelines and methods for planning, developing, and managing an effective and integrated enterprise architecture.

TOGAF is a way or method to create, manage, and implement enterprise architecture and information systems in an organization. This method is called the Architecture Development Method (ADM). ADM is a method used in developing enterprise architecture and consists of a series of activities.

From the Abramowics survey on Enterprise Architecture Management in organizations or MSMEs, the most important phase in TOGAF ADM is the Business Architecture Phase. In this phase, the main focus is on defining business objectives. This phase received 80% points in the study. Other phases such as Architecture Vision get 70% points. Therefore, using the TOGAF ADM method is the right way to design enterprise architecture that supports digital transformation in MSMEs.

The focus on business is key in digital transformation, and TOGAF ADM has the appropriate business architecture phase. In this research, there are several phases in TOGAF ADM that are used, including Preliminary, Architecture Vision, Business Architecture, Information System Architecture, and Technology Architecture. The output of this research is the Company Specific Blueprint, which serves as a guide for digital transformation. This “company specific blueprint” is compiled in accordance with the existing conditions in these MSMEs, so that it can be used practically and according to their needs.

2. METHOD

The research method used in this study includes two main approaches, namely document study and literature review. The document study was conducted by reading, reviewing, and understanding various books and references relevant to the topic of digital transformation and enterprise architecture. One of the main focuses in this study is the TOGAF ADM (The Open Group Architecture Framework - Architecture Development Method) framework, which is used as a reference in managing and developing enterprise architecture. In addition, we also reviewed various other enterprise architecture frameworks and literature that support enterprise architecture planning, especially those related to the development of information systems to support business processes.

In addition to the document study, a literature review was also an important part of this research method. The literature review was conducted by identifying, reviewing, and summarizing relevant previous research results, in order to avoid duplication of research and gain insights that can be used to improve this research. Through this step, researchers gain a deeper understanding of the theories and approaches that have been used previously in similar contexts. The literature review also provided a strong theoretical foundation for the development of the enterprise architecture model, especially in the context of its application to micro, small and medium enterprises (MSMEs).

The references used in this research are sourced from various media, including scientific journals, articles, books, and credible academic websites. Through a combination of document studies and literature reviews, it is hoped that this research can build a solid theoretical and conceptual foundation, as well as make a meaningful contribution to the development of enterprise architecture that is adaptive to the needs of digital transformation in MSMEs.

3. RESULTS AND DISCUSSION

In designing enterprise architecture, the first step that needs to be done is to collect data and study various information related to enterprise architecture and the TOGAF framework. The following are the stages or phases in the TOGAF Architecture Development Method (ADM) to support digital transformation:

3.1. Preliminary Phase

Preliminary Phase is the first step in designing enterprise architecture with TOGAF ADM. This step explains how to prepare or start planning with TOGAF ADM that supports the business requirements used in the target architecture. In this, the goal is to find out the appropriate architecture skills by creating a set of principles that support the design of enterprise architecture.

Table 1. Principles of Business Architecture Catalog

No	Architecture	Principle	Description
1	Business Architecture	Sustainable business	The continuity of business operations in MSMEs continues to run despite problems/disruptions.
		Product refinement	Product development continues to be carried out to increase interest in the products offered to consumers in accordance with market needs.
		Guarantee product quality	Improve product quality by using high-quality ingredients and processing them according to production standards.
		Compliance with government regulations	All existing processes must comply with government regulations related to MSMEs
2	Data Architecture	Data Assets	All information related to MSMEs is a valuable asset and therefore must be maintained and preserved.
		Data can be accessed	Information should be easily accessible to the appropriate user level for easy management.
		Accurate data	Data must be accountable for its authenticity.
		Data Security	All data must be securely protected to avoid the risk of attacks or exploitation of the data by unauthorized users.
		Data Integration	All MSME-related information can be linked between users to support their business and reduce data redundancy.
3	Application Architecture	Usability Aplikasi	The application is easy to use, user-friendly (usable) and has high functionality.
		Keamanan pada aplikasi	The application must be safe and protected from risks that occur both internally and externally.

		Fleksibilitas pada aplikasi	The application can work well depending on the platform, so there is no need for constant changes.
4	Technology Architecture	Keamanan Teknologi	Technology must be protected against risks that may arise both internally and externally.
		Teknologi disesuaikan dengan kebutuhan bisnis yang ada.	Technology adjustments must be made in accordance with existing needs to support the smooth operation of the company.
		Interoperabilitas	Technology's ability to support data exchange

Preliminary Phase with the principle of business catalog in designing enterprise architecture to support the digital transformation of MSMEs has significant benefits. In this phase, architecture designers will better understand the business goals and needs of MSMEs that want to carry out digital transformation. They will analyze business architecture, data architecture, application architecture, and technology architecture, and describe them in principles and complete descriptions.

With a comprehensive Preliminary Phase, architecture designers can deeply understand the business aspects of MSMEs. They will know the critical business processes, relationships between processes, and specific business needs. In addition, by considering the business catalog principle, architecture designers can design an efficient and consistent data structure. They will identify relevant data sources and connect different systems so that data can be integrated properly.

The Preliminary Phase also helps in designing the right technology solutions to support MSME business operations. The architecture designer will consider the business catalog principle to identify relevant applications and integrate them properly. Thus, MSMEs will gain better operational efficiency, reduce duplication of functions, and increase productivity.

In addition, the Preliminary Phase helps in designing a flexible and scalable technology architecture. The architecture designer will consider the business catalog principle in selecting technologies that enable adaptation to business changes and future growth of MSMEs. With a flexible and scalable architecture, MSMEs can avoid building isolated systems and smoothen future technological changes.

Finally, the Preliminary Phase with the business catalog principle allows architecture designers to develop a structured implementation plan. They will use the description of the business catalog principle to provide clear guidance to the development team and stakeholders regarding the implementation of digital transformation. This includes the steps to be taken, prioritization, and emphasis on critical business aspects.

Overall, the Preliminary Phase, which contains business catalog principles, is very important in designing an enterprise architecture that supports the digital transformation of MSMEs. It allows the architecture designer to better understand business needs, integrate systems and data, improve operational efficiency, create flexibility and scalability, and develop a structured implementation plan.

3.2. Business Architecture

Architecture Vision is the first step in the TOGAF ADM cycle. This step describes the enterprise values owned by the top level management level used in MSMEs to determine what the proposed enterprise architecture design should look like.

Fig 2. Value Chain Analysis

Creating Architecture Vision with value chain analysis (main and supporting activities) provides significant benefits in designing enterprise architecture to support the digital transformation of MSMEs. In value chain analysis, architectural designers clearly understand the business processes of MSMEs, identify opportunities to increase efficiency, improve system integration, conduct clear business process mapping and modeling, and determine priorities and effective resource allocation. By utilizing value chain analysis, MSMEs can optimize the use of digital technology to increase efficiency, reduce operational costs, and achieve successful digital transformation.

3.3. Why: Purpose

At this stage, the ongoing business processes in MSMEs are described and then the desired target architecture business processes are made. At this stage, there are catalog artifacts that explain the relationship between drivers, goals, and objectives in MSMEs.

Table 2. Catalog of drivers, goals, objectives

No	Driver	Goal	Objective
1	Improved efficiency and more optimal results in the use of raw materials.	Can ensure the availability of raw materials in a stable and sustainable manner.	Maintain raw material quality
		Improve management of product quality control.	Consistent and stable vendor selection
		Can ensure the availability of raw materials in a stable and sustainable manner.	Latest production technology and effective product quality control methods are required.

	Provide more income for MSMEs	Implement organized and structured financial records.	Implement financial applications in the financial recording process of MSMEs
		Able to standardize products	Achieve consistently met product standards.
		Expanded marketing reach	Sales media optimization
3	Improve product quality to compete with similar products in the market.	Can compete effectively with similar products	Improve product inventory management in the warehouse.
			There is sales data categorized by product type.

The creation of Business Architecture with catalog artifacts that explain the relationship between drivers, goals, and objectives in MSMEs has important benefits in designing enterprise architecture to support the digital transformation of MSMEs. With the Business Architecture, architecture designers can have a clear understanding of the business needs of MSMEs and the goals to be achieved. They can identify business priorities that need to be accommodated in the enterprise architecture.

In addition, Business Architecture also helps in making informed decisions. By understanding the relationship between drivers, goals, and objectives, architecture designers can design architecture solutions that suit specific business needs. This allows them to steer the digital transformation of MSMEs more effectively and efficiently. Business Architecture also ensures alignment between business strategy and technology architecture. By understanding the relationship between drivers, goals, and objectives with proposed technology solutions, architecture designers can design enterprise architecture that supports the achievement of MSME business goals. This ensures that the technology implemented actually contributes to improving business performance.

In addition, Business Architecture helps identify opportunities for innovation and improvement. By understanding the relationship between drivers, goals, and objectives, architecture designers can see how digital technology can be used to better achieve business objectives. This opens up opportunities to improve business processes, increase operational efficiency, and utilize innovative digital solutions.

Lastly, Business Architecture also supports better communication and shared understanding between stakeholders in MSMEs. By having catalog artifacts that explain the relationship between drivers, goals, and objectives, architecture designers can interact with business owners, management, and technology teams more effectively. This ensures that all parties have a common understanding of the business objectives and how enterprise architecture supports the digital transformation of MSMEs.

3.4. Information System Architecture

This step explains how to develop a data system architecture that includes data architecture and application architecture used by MSMEs.

3.4.1. Architecture Data

Data architecture helps identify and define the various types of data that are important to support an organization's business. Like a blueprint, data architecture can also change as detailed design

specifications for implementing databases and applications are developed, thereby improving understanding of the underlying business concepts. In this phase, the required and currently used data is identified. The output of this phase is the Application/Data Matrix. This is shown in the tables below.

Table 3. Application/Data Matrix for Finance Section

Description	Data Entity	Data Type
Sales and finance management app	PO	Transactional Data
	Invoice	Transactional Data
	Customer	Master data
	Employee	Master data
	Sales	Transactional data
	Discount	Transactional data
	Reports	Transactional data
	Invoice	Transactional data
	User management	Master Data

Table 4. Application/Data Matrix for Production and Procurement Section

Description	Data Entity	Data Type
Warehouse and Vendor Management Application	Product	Master data
	Raw Materials	Master data
	Tools	Master data
	PO	
	Invoice	Transactional data
	Vendor	Master data
	Employee	Master data
	Consumer	Master data
	Product Details	Transactional data
	Invoice	Transactional data
	Sales	Transactional data
	User Management	master data
	Reports	Transactional data

Table 5. Application/Data Matrix for Marking and Distribution Section

Description	Data Entity	Data Type
Website	Product	Master data
	PO	Transactional data
	Invoice	Transactional data
	Discount	Transactional data
	Employee	Transactional data
	Consumer	Master data
	Product details	Transactional data
	Expedition	Transactional data
	Sales	Transactional data

The application of data architecture in enterprise architecture planning and design using the TOGAF ADM framework provides a number of important benefits that support the digital transformation process in micro, small and medium enterprises (MSMEs). One of the main benefits is the creation of better data integration and consistency across the organization. With a structured data architecture, every part of the organization can access and use the same data uniformly, thereby reducing redundancy and improving operational efficiency.

In addition, the implementation of data architecture also contributes to improving data quality through the implementation of well-defined standards and processes. These standards help ensure that the data used is accurate, current, and relevant, making it reliable for strategic decision-making. The ease of integrating different systems and applications is another important benefit, especially in the context of MSMEs that often use various technology platforms simultaneously.

Another benefit is the ability to analyze data more effectively. With a data architecture that supports information structuring, MSMEs can gain deeper business insights from their data. Equally important, data architecture also ensures that the security aspects and compliance with data regulations can be maintained properly. This is crucial in maintaining customer trust and avoiding legal risks that may arise due to negligence in data management.

Overall, the application of application architecture in enterprise architecture planning using TOGAF ADM brings significant benefits to MSMEs in supporting digital transformation. With more efficient application management, good integration, and the ability to easily adopt new technologies, MSMEs can improve operational efficiency, better cope with changes, and maintain their data security.

3.4.2. Application Architecture

Application architecture is an overview of the capabilities and benefits of all applications in supporting business activities, not a specific specification for one particular application. Application architecture also includes identification of the business functions supported by the applications, the data generated, transformed, or read by the applications, and their impact on existing applications. Like a blueprint, the application architecture may undergo changes during the implementation process with the development of more detailed design details for the specified applications. The purpose of the application architecture is to determine the applications that will provide data for the business functions so that the organization's goals can be achieved.

In this phase, the applications that are currently used and needed in the future in MSMEs are described. The output of this step is an application portfolio catalog. The following is presented in the table below:

Table 6. Application Portfolio Catalog

Physical Application Components	Description
Sales and financial management applications	Used to manage the financial and sales management process
Warehouse and vendor management application	Used to manage goods in the warehouse and manage vendors
Website	Used as a sales and marketing media

The application of application architecture in planning and designing enterprise architecture using TOGAF ADM provides important benefits in supporting the digital transformation of MSMEs. One of the main benefits is more efficient application management. With a clear understanding of the relationship between applications, MSMEs can identify redundant or inefficient applications, thereby reducing the associated costs and complexity. In addition, application architecture also ensures good integration between different applications, enabling seamless data exchange and increasing productivity. Furthermore, application architecture helps MSMEs in planning scalable and durable applications. By considering business growth and digital transformation needs, MSMEs can design applications that can evolve over time and can handle increasing workloads. This enables MSMEs to better cope with change and maintain the availability of applications that are critical to business operations.

In addition, application architecture also enables MSMEs to adopt the latest technologies more easily. By having a clear vision of the application architecture, MSMEs can identify opportunities to implement new technologies relevant to digital transformation, such as cloud computing, artificial intelligence, or the Internet of Things (IoT). This helps MSMEs stay competitive and innovative in an ever-evolving market. Furthermore, application architecture also helps MSMEs in managing risks and application security. In a digital age that is prone to security threats, application architecture helps MSMEs in designing the right security layers, such as sensitive data protection, encryption, user access management, and security threat monitoring. Thus, MSMEs can maintain data integrity and reduce security risks that may arise.

Overall, the application of application architecture in enterprise architecture planning using TOGAF ADM brings significant benefits to MSMEs in supporting digital transformation. With more efficient application management, good integration, and the ability to easily adopt new technologies, MSMEs can improve operational efficiency, better cope with changes, and maintain their data security.

3.5. Architecture Technology

In this phase, an artifact called the Technology Portfolio Catalog is created to identify and manage the hardware, software, and network infrastructure required by MSMEs. The following is an explanation in the following table:

Table 7. Technology Portfolio Catalog

Type	Product Name	Vendor	Description
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Laptop/PC	Client Application	-	Used by employees to help business processes in MSMEs
Printer	Canon PIXMA TR4570S	Canon	Used as a medium for printing, scanning, copying documents
Router	ISP Router	TP Link	Used as a connection tool between users and ISP providers
Aplikasi Server	Server (Intel Core i3 2nd generation 3.1 GHz)	Dell	Used as a connection tool between users and ISP providers
	OS Server (Windows Server)	Microsoft	Operating system used to run the device
	Database Server (MySQL)	Oracle	Server used to provide a database that is integrated with the application.
	Web Server (Apache)	Oracle	Server used to place web-based applications
Mail Server	Gmail	Google	Used for email / mail functions both internal / external.
Website Server	VPS (vCPU 2.0 GHz 4.0)	IdCloudshot	The most widely used hosting service to bring websites online
	Server OS	Linux	Operating system used to run software on a server.
	Database Server (MySQL)	Oracle	The server used to provide the database that is integrated with the application.
	Web Server (Nginx)	Igor Sysoev	The server used to host the web-based application
	Programming language (PHP)	PHP Dev. Team	Rules/syntax used to define a computer program
	Domain	IdCloudhost	A unique name used to identify an IP address.

Technology architecture and the use of the Technology Portfolio Catalog provide important benefits in supporting the digital transformation of MSMEs. First, MSMEs can evaluate and select technologies that suit their digital transformation needs. By utilizing the Technology Portfolio Catalog, MSMEs can understand the features, advantages, and disadvantages of various available technologies, so they can make better decisions in choosing the right technology solutions. In addition, technology architecture enables better integration and interoperability between different technology components.

By carefully planning and designing the technology architecture, MSMEs can integrate applications, systems, and infrastructure effectively. This enables seamless data flow between different systems, improves operational efficiency, and supports comprehensive digital transformation. Technology architecture also considers scalability and resilience. MSMEs can plan a technology infrastructure that can grow along with business growth and digital transformation needs.

As such, they can cope with workload spikes, meet increasing data requirements, and maintain the availability of systems critical to business operations. Data security and protection is also a concern in technology architecture. By designing the right security layers, MSMEs can protect sensitive data from security threats, maintain data integrity, and meet applicable compliance requirements. This gives customers and stakeholders confidence that their data is safe in a digital environment.

Finally, technology architecture enables MSMEs to adopt technological innovations easily. By monitoring technological developments and integrating relevant innovations, MSMEs can remain competitive and meet evolving market demands. The application of technologies such as artificial intelligence, data analytics, or cloud computing helps MSMEs improve business performance, improve decision-making, and create added value for their customers. Overall, the technology architecture and Technology Portfolio Catalog help MSMEs to plan, select, and integrate the right technologies to support digital transformation. This provides the competitive advantage, operational efficiency, data security, and flexibility needed to thrive in the ever-changing digital era.

3.6. TOGAF Supports Digital Transformation of MSMEs

In supporting the digital transformation of MSMEs, TOGAF (The Open Group Architecture Framework) can act as a very useful guide in designing enterprise architecture. TOGAF provides a structured and comprehensive framework to help MSMEs plan and implement digital transformation successfully.

TOGAF ADM (Architecture Development Method) is a method used in TOGAF to develop an architecture blueprint tailored to the needs of MSMEs. This blueprint contains clear steps and guidelines on how to design an effective enterprise architecture in the context of digital transformation. By following the TOGAF ADM process, MSMEs can gain a deep understanding of their business needs, identify relevant technologies, design appropriate applications, and determine the scale of the technology infrastructure needed.

Enterprise architecture design using TOGAF helps MSMEs in optimizing their business processes. MSMEs can utilize TOGAF principles to evaluate and refine existing business processes to better suit digital transformation goals. For example, by using a warehouse management application recommended by TOGAF, MSMEs can manage their inventory and warehouse more efficiently. This helps reduce stock management errors, improve the accuracy of inventory information, and optimize product availability to customers.

In addition, TOGAF also pays attention to the aspects of brand image and online presence in digital transformation. Through the acquisition of a website supported by TOGAF, MSMEs can build a strong online presence to expand their market reach and introduce their products or services to potential customers. TOGAF provides guidelines on how to integrate online presence with business strategies and manage relevant data to support the success of digital transformation.

By implementing enterprise architecture design using TOGAF, MSMEs can significantly benefit from digital transformation. They can improve operational efficiency, optimize inventory and warehouse management, and strengthen customer engagement through a strong online presence. The positive impacts of this digital transformation include increased revenue, business growth, and long-term sustainability of MSMEs in the face of competition in an increasingly advanced digital era. Thus, designing enterprise architecture using TOGAF is a very useful tool for MSMEs in planning, implementing, and managing their digital transformation with a systematic and structured approach.

4. CONCLUSIONS

In supporting the digital transformation of MSMEs, TOGAF ADM design provides results in the form of a "Company Specific Blueprint" which contains what is needed in carrying out digital transformation. And also, the addition and refinement of business stages is carried out according to the needs of MSMEs, technology, applications and data used, as well as the scale of technology infrastructure. The existence of digital transformation improves business quality. Acquisition of a website to create a brand image and additional vendor and warehouse management applications, as well as sales and financial management applications in increasing the effectiveness and efficiency of the MSMEs themselves. Therefore, the use of TOGAF as a framework in designing a comprehensive organizational structure is very beneficial for Micro, Small and Medium Enterprises (MSMEs) in planning, implementing and managing their digital change in a structured and systematic way.

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