ENTERPRISE ARCHITECTURE FOR EDUCATION: A TOGAF APPROACH TO ACHIEVE DIGITAL TRANSFORMATION AND OPTIMAL PERFORMANCE (A CASE STUDY OF SHARED SERVICE FUNCTION)

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Abstract

In today's fast-paced digital world, educational institutions must keep up with technological advancements to stay competitive and effective. This study focuses on designing Enterprise Architecture (EA) for an educational foundation, specifically its Shared Service Department, using the TOGAF ADM 9.2 framework. The aim is to enhance the foundation's IT cybersecurity maturity as part of its digital transformation efforts. Through a detailed analysis, challenges such as inadequate business process mapping, documentation procedures, human resource management, and information system organization were identified, highlighting the need for systematic IT governance and architecture. The research culminates in a tailored EA blueprint covering areas like business processes, data management, and applications. This blueprint acts as a strategic guide for improving operations, optimizing resources, and fostering innovation within the foundation. By integrating existing applications and developing targeted solutions, the design aims to enhance service delivery and move the foundation towards international educational excellence standards. The findings emphasize the importance of continuous adaptation to evolving technology and the need for ongoing refinement in areas like infrastructure and migration planning. Overall, this research provides valuable insights and practical Enterprise blueprint recommendations for improving operational efficiency and achieving strategic goals in today's digitalized educational landscape.

Keyword: *Enterprise Architecture, TOGAF ADM 9.2, Educational Foundation, Digital Transformation, IT Cybersecurity Maturity.*

Introduction

The evolution of technology over time has brought significant changes in how humans carry out various functions and tasks in their lives (Susskind & Susskind, 2015). From the era of agricultural technology to the current era of information and communication technology, technology has had a wide-ranging impact on various aspects of life (Castellanos, 2020). Amidst this dynamism, companies, including educational institutions, are faced with the need to align their business goals or strategies with IT strategies as effective and efficient enablers. However, in practice, there are challenges to be overcome, especially in enhancing IT cybersecurity maturity, which is an integral part of effective corporate governance. These challenges are related to the misalignment

between business processes and resources with societal needs and the lack of cooperation between IT and business (Njanka et al., 2021). In the context of the educational institution under study, it has been found that there is an urgent need to develop enterprise architecture as an effort to enhance IT cybersecurity elements to achieve desired goals (Bokan & Santos, 2022; Georgiadis & Poels, 2021). By employing the TOGAF ADM 9.2 approach, this research aims to design a bespoke Enterprise Architecture blueprint, particularly for the Shared Service Department, to assist the target educational institution in achieving its objectives in strengthening operational capabilities and performance through enhanced IT cybersecurity maturity. Thus, this study will not only benefit the respective educational institution but also serve as a reference for other researchers in analysing and designing Enterprise Architecture for educational institutions. The research methodology will involve the use of the TOGAF ADM 9.2 framework in designing the Enterprise Architecture blueprint with a focus on the Shared Service Department and considering the target IT cybersecurity maturity within the Digital Transformation programme (Alhari & Fajrillah, 2022). It is expected that the findings of this research will provide valuable guidance for educational institutions in enhancing operational effectiveness and achieving their strategic goals in an increasingly digitalised educational landscape.

Enterprise architecture, as defined by Hazen, et al. (2017), encompasses the principles, methods, and models utilized in structuring and implementing an organization, spanning its organizational structure, business processes, information systems, and infrastructure. This strategic approach aids companies in fostering adaptability and flexibility, crucial for navigating dynamic business environments. By establishing frameworks for structure, personnel, technology, and business operations, enterprise architecture offers a detailed overview of organizational functions, facilitating efficient planning and development to optimize business performance. Moreover, it provides a comprehensive perspective on regulations, services, standards, and company guidelines, aligning disparate components to support overarching business objectives (Enterprise Architecture Center of Excellence (EACOE), n.d.). It has been emphasizing the pivotal role of enterprise architecture in preserving core business essence and enhancing organizational agility, highlighting its significance in achieving business success and alignment with company goals. The application of enterprise architecture involves integrating business processes with information technology, aiming to address organizational challenges and enhance operational efficiency. Rahayu and Hadiana (2017) underscore the importance of selecting a suitable framework for enterprise architecture development, outlining criteria such as taxonomy completeness, process guidance, maturity models, governance, and vendor neutrality. Ultimately, enterprise architecture serves as a strategic blueprint for organizations, facilitating business process optimization, goal attainment, and adaptability in an ever-evolving landscape.

The Open Group Architecture Framework (TOGAF)

TOGAF, or The Open Group Architecture Framework, stands as a comprehensive implementation of an Enterprise Architecture (EA) framework, catering to the needs of technology management with a focus on research facilitation (Buckl et al., 2009). Developed from the collaborative efforts of the United States Department of Defence and later released officially in 1995, TOGAF offers a systematic approach to the entire lifecycle of technology transformation, proving instrumental in formulating strategic steps essential for product and solution development and management within

organizations (Mahrin, 2015). At its core lies the TOGAF Architecture Development Method (ADM), a structured process comprising eight distinct phases.
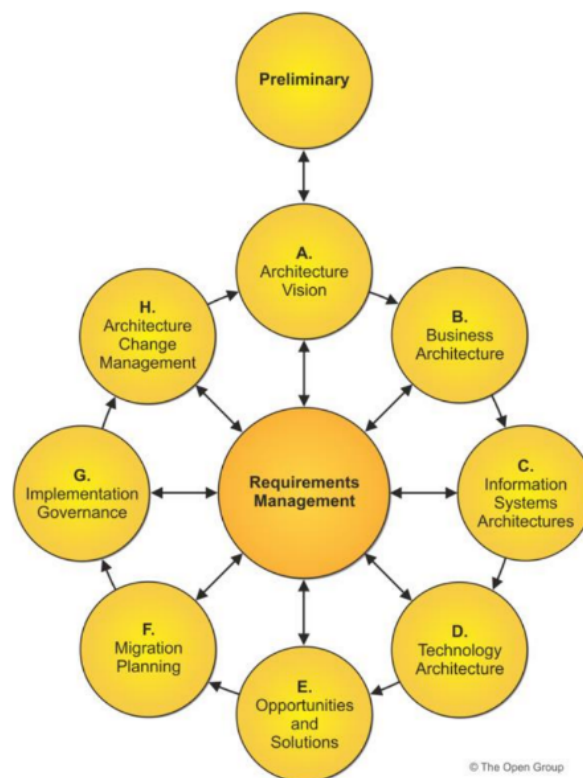

Figure 1. TOGAF ADM Phases (The Open Group, 2019)

The initial phase, Preliminary Phase, sets the groundwork by defining frameworks, principles, and stakeholder responsibilities. Subsequent phases, including Architecture Vision (Phase A) and Business Architecture (Phase B), focus on aligning business objectives, validating principles, and understanding enterprise architecture. Following these, Information System Architectures (Phase C) and Technology Architecture (Phase D) delve into specific technology domains, delineating information and application architectures crucial for business support and data processing. Phase E, Opportunities and Solutions, transitions into the evaluation and selection of implementation strategies, while Migration Planning (Phase F) prioritizes projects and formulates detailed implementation plans. Implementation Governance (Phase G) ensures alignment with established architecture, while Architecture Change Management (Phase H) oversees the blueprint for managing architectural processes within the organization. Furthermore, Requirements Management spans across all phases, emphasizing the importance of identifying and managing business requirements throughout the ADM cycle. In essence, TOGAF and its ADM methodology provide organizations with a comprehensive framework for managing technology transformation, aligning business objectives, and fostering strategic decision-making processes essential for achieving architectural excellence and driving organizational success.

The aim is to enhance the foundation's IT cybersecurity maturity as part of its digital transformation efforts. Through a detailed analysis, challenges such as inadequate business process mapping, documentation procedures, human resource management, and

information system organization were identified, highlighting the need for systematic IT governance and architecture.

Research Methods

A conceptual model serves as a structured framework, often represented through diagrams, designed to encapsulate various facets of research endeavors from inception to conclusion. As elucidated, it encompasses implementation methods, results, evaluations, and influential factors, offering researchers a comprehensive overview of their study (Spewak & Tiemann, 2006). The primary aim of such a model is to furnish guidelines for research implementation and facilitate the identification of research objectives. In this context, the conceptual model diagram adheres to the Design Science Research Cycles paradigm, which centers on three fundamental elements: the environment, design science research, and knowledge base. Within this framework, the environment encompasses factors such as stakeholders, organizational context, and technological tools relevant to the research. The design science research aspect delineates the development and evaluation phases, focusing on the creation of artifacts and subsequent validation processes. Lastly, the knowledge base dimension encompasses foundational theories and methodologies that inform and guide the research process. Overall, a conceptual model provides researchers with a structured approach to conceptualize, execute, and evaluate research endeavors effectively.
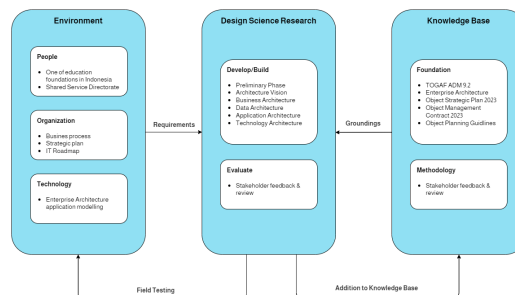

Figure 2. Conceptual Model

The conceptual model comprises three key elements: Environment, Design Science Research, and Knowledge Base. Within the Environment, three components—People, Organization, and Technology—are essential. People represent stakeholders, Organization elucidates the research's focus, and Technology denotes supportive tools. The Design Science Research aspect consists of Develop/Build and Evaluate phases. Develop outlines artifact creation in the architectural design of the Education Foundation, while Evaluate explains the validation process. Finally, the Knowledge Base comprises Foundation, representing core theories, and Methodology, serving as the research technique.

Result and Analysis
Preliminary Phase

The preliminary phase of enterprise architecture design serves as a crucial initial step, focusing on identifying and defining the guiding architecture principles (Supriyadi & Amalia, 2019). This phase requires a comprehensive understanding of the organization's business needs to align principles with overarching goals. The outcome is

a Principles Catalog, acting as the primary guide for subsequent steps. By anchoring the architecture in established values and principles, this phase ensures alignment with the organization's vision and mission. As such, it forms a foundational cornerstone, ensuring that the resulting architecture effectively meets business needs and objectives.

Table 1. Principles Catalog

Domain	Principle
Business	Maximize Benefit to the Enterprise
	Information Management is Everybody's Business
	Common Use Applications
	Service Orientation
	Compliance with Law
Data	Data is an Asset
	Data is Shared
	Data is Accessible
	Common Vocabulary and Data Definitions
	Data Security
	Data Integration
Application	Technology Independence
	Ease-of-Use
	Application Integration

Architecture Vision

The Architecture Vision phase serves as a pivotal stage in the enterprise architecture process, offering a comprehensive elucidation of the design scope (Mahrin, 2015). It encompasses the identification and presentation of all pertinent stakeholders involved in the architectural endeavor, ensuring that their perspectives and requirements are duly considered. Moreover, this phase delves into elucidating the core business values intrinsic to the organization, aligning the architectural vision with overarching strategic objectives. The artifact outcomes of this phase, notably the value chain diagram and solution concept diagram, play a crucial role in visualizing and articulating the proposed architectural vision. These diagrams serve as valuable tools for communication and alignment, facilitating a shared understanding among stakeholders regarding the intended direction and objectives of the architecture. By delineating the scope, stakeholders, and business values, the Architecture Vision phase lays a solid foundation for subsequent architectural endeavors, ensuring coherence and alignment with organizational goals and aspirations.
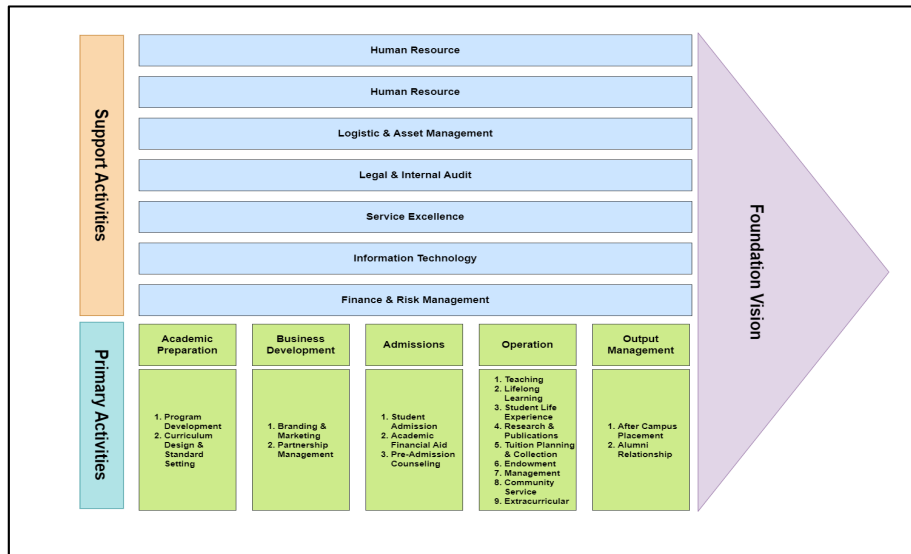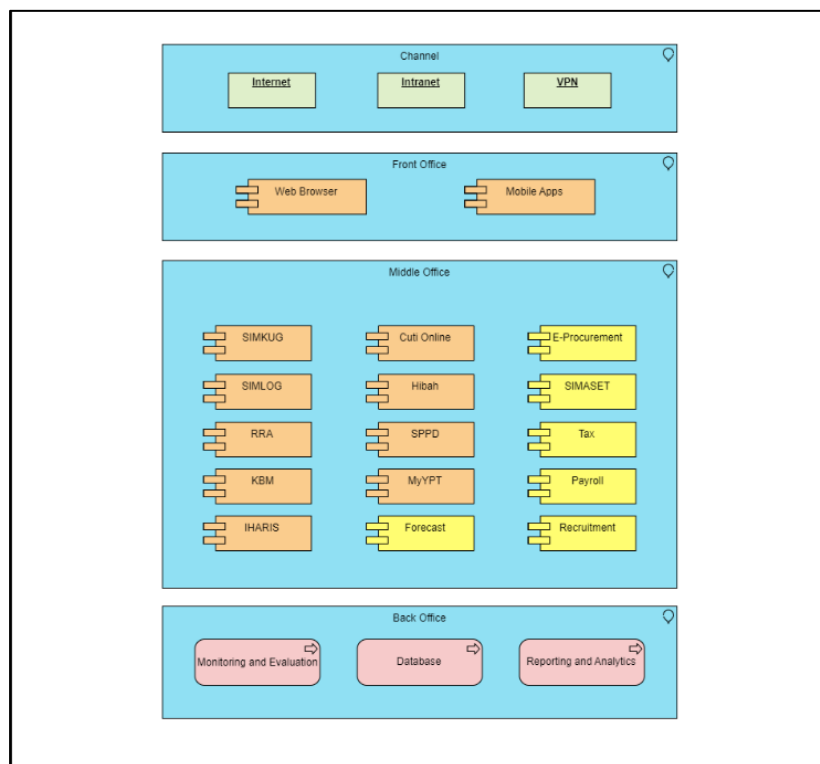
Figure 3. Value Chain Diagram

Figure 4. Solution Concept Diagram

Business Architecture

The Business Process Architecture phase in the design of an educational foundation is crucial for understanding organizational needs and achieving goals effectively (Bourmpoulias & Tarabanis, 2020). It involves defining both existing and desired business processes to provide strategic recommendations. Key steps include identifying current processes, defining the target architecture, and conducting gap analysis. A central outcome is the creation of a Business Process Map, offering a visual overview of operational workflows. Accompanying artifacts such as the business requirements catalog and organizational process diagram support the refinement of business architecture. Gap

analysis ensures alignment with organizational objectives, fostering efficiency within the educational foundation.
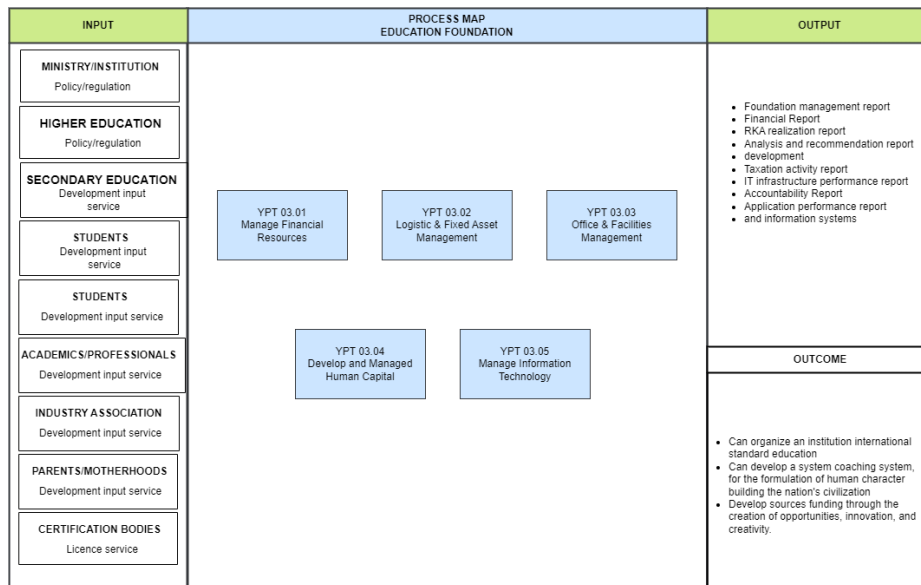

Figure 5. Business Process Map of Shared Service Directorate

Data and Information Architecture Phase

The Data and Information Architecture phase, the third stage in TOGAF ADM, builds upon Architecture Vision and Business Process Architecture (Caruso, 2019). Here, the organization's data needs are identified and a tailored data model is designed. Gap analysis ensures alignment with objectives. This phase is pivotal for efficient data management and informed decision-making. The result from this phase is a data dissemination diagram.
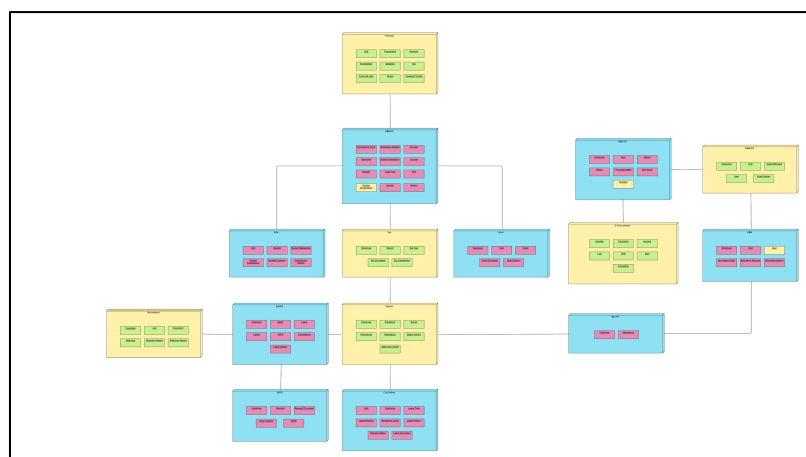

Figure 6. Data Dissemination Diagram

Application Architecture Phase

The Application Architecture Requirements, meticulously derived from a comprehensive analysis of the Education Foundation's specific design needs and meticulously aligned with the Principles Catalog, serve as a foundational blueprint for its evolving digital ecosystem (Alamri et al., 2018). These requirements serve as the

cornerstone for developing, integrating, and maintaining essential software applications crucial for the organization's day-to-day operations. By encapsulating essential criteria and specifications, they provide a clear roadmap for the development and enhancement of digital solutions. Through rigorous analysis and meticulous alignment with architectural principles, these requirements ensure that the foundation's digital infrastructure is not only robust and scalable but also meticulously aligned with strategic objectives and organizational priorities. This strategic alignment fosters agility, adaptability, and resilience, empowering the Education Foundation to effectively navigate the complexities of the digital landscape and drive sustainable growth and innovation.
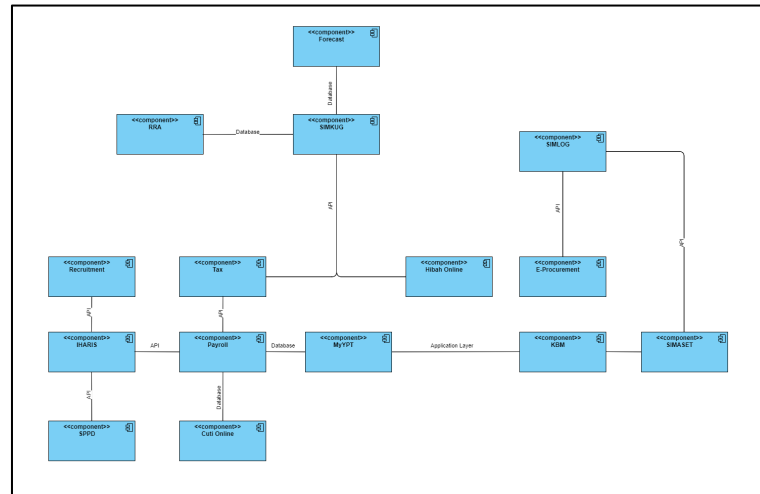

Figure 7. Application Communication Diagram

Blueprint Enterprise Architecture

Table 2. Blueprint Enterprise Architecture

BLUEPRINT ENTERPRISE ARCHITECTURE IN SHARED SERVICE DIRECTORATE OF EDUCATION FOUNDATION	
SCOPE	**STRATEGIC INITIATIVE**
SHARED SERVICE DIRECTORATE	Vision: To become a quality educational foundation with international standards, to form people with superior character, in building the nation's civilization
BASIC GUIDANCE DOCUMENT	
• Education Foundation Strategic Document of 2023 • YAM Document • *Undang-Undang Nomor 27 Tahun 2022 tentang Pelindungan Data Pribadi*	Mission: • Organizing international standard education • Developing a coaching system, for the formation of human beings with superior character, in building the nation's civilization. • Developing sources of funding, through opportunity creation, innovation, and creativity.
Business Process Architecture Domain	

- Mapping business processes within the shared service directorate.
- Redesigning the business process YPT 03.01.01.02 on Budget Reporting.
- Redesigning the business process YPT 03.01.03.01 on Tax Calculation and Payment.
- Redesigning the business process YPT 03.01.03.02 on Tax Reporting.
- Establishing the business process YPT 03.01.02.02 on Cash Flow Recording.
- Redesigning the business process YPT 03.01.04.03 on Financial Projection.
- Redesigning the business process YPT 03.02.01.01 on Procurement of Goods through Direct Selection & Tender.

Data and Information Architecture Domain

- Mapping data entities in SIMKUG, SIMLOG, SIMASET, RRA, KBM, E-Procurement, IHARIS, ONLINE LEAVE, HIBAH, PAYROLL, MYYPT, KNOWLEDGE MANAGEMENT, TRAVEL ORDER, and KBM applications.
- Adding several data entities such as reports, journals, budget amendments, and item stock to the existing company data.

Application Architecture Domain

- Developing E-procurement, payroll, tax, forecast, and simaset applications to optimize finance and logistics performance in service operations.
- Developing integration between applications using APIs to enable effective and real-time data sharing systems.

Solution Concept Diagram
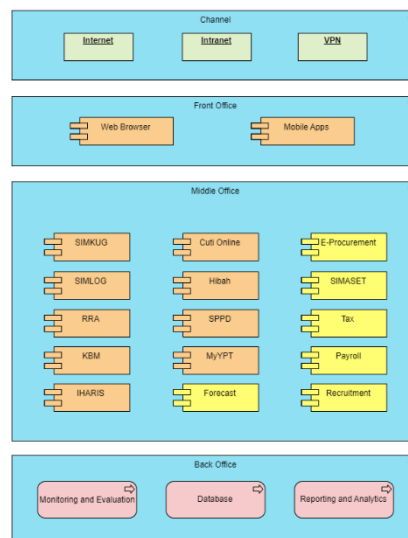
Conclusion

The research on enterprise architecture design within the Education Foundation has yielded significant insights and outcomes. Utilizing the TOGAF ADM 9.2 framework as a best practice and referencing relevant regulations, the study has successfully crafted a comprehensive EA blueprint tailored to the organization's needs and aligned with education standards. The resulting artifacts, including catalogs, matrices, and diagrams, are structured around three main domains: Business Process Architecture, Data Architecture, and Application Architecture. Within the Business Process Architecture domain, organizational capabilities were mapped, and business process maps were updated to conform to BPMN standards, enhancing integration and service delivery.

Moreover, the Data Architecture domain focused on identifying data entities and integrating them with supporting applications, while the Application Architecture domain emphasized mapping applications to support regional employee programs and enhancing service provision. Overall, these findings underscore the pivotal role of enterprise architecture in promoting organizational alignment, integration, and operational efficiency within the Education Foundation, laying a solid groundwork for future strategic endeavours.

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