

Enterprise Architecture to Optimize the Sales Process Using the TOGAF ADM Cycle in Companies in the Retail Sector

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Keywords: Process Optimization, Enterprise Architecture, TOGAF, ADM, Framework.

Abstract: This study explored the application of enterprise architecture, specifically utilizing the TOGAF ADM cycle, to optimize the sales process in retail enterprises. In the context of digital transformation, it was crucial for retail operations to strategically adapt. The objective was to demonstrate how a structured approach based on TOGAF could enhance operational efficiency, decision-making, and competitiveness in the dynamic retail market. The methodology included several phases of the TOGAF ADM cycle: the Preliminary Phase involved designing the research framework, organizational analysis, gathering business information, establishing architectural principles, and identifying stakeholders and scope; the Architecture Vision phase defined the baseline and target architecture, identified gaps, and key resources; the Business Architecture phase provided a detailed analysis of the business model, strategies, operations, innovation, enterprise capabilities, and a SWOT analysis; the Information Systems Architecture phase assessed the technology to be used, required human resources, business evolution, and technological adaptability; the Technology Architecture phase focused on technological infrastructure, security, customer loyalty, market knowledge, and customer service. The main conclusion is that the enterprise architecture based on the TOGAF ADM cycle allowed us to optimize the sales processes in the retail sector by 63%, improving operational efficiency and adaptation to market demands, resulting in more satisfying shopping experiences.

1 INTRODUCTION

Digital transformation is putting significant pressure on the retail sector. During the COVID-19 crisis, many companies suffered losses due to the lack of adequate solutions (Gerber et al., 2020). Furthermore, resistance to technological adaptation is observed according to (Liao & Wang, 2021), which has had an impact on industries such as chemistry. Likewise, the discrepancy between the business mission and vision and operational processes makes it difficult to achieve strategic objectives (Mutakin, 2020). On the other hand, insufficient implementation of frameworks and inadequate documentation represent additional challenges, as noted in (Gerber et al., 2020; Gitelman and Kozhevnikov, 2023), which directly affect sales and the sector's competitiveness. This has been reflected in the reduction in profits for March 2023, mainly affecting hardware stores, department stores

and home furnishing businesses by 11.1%, 6.9% and 9.1% respectively according to (Diario El Peruano, 2023).

Given the multiple challenges, cases have been recorded that show how to face these situations. In (Liao & Wang, 2021), a company in the chemical sector implemented a business architecture based on TOGAF ADM, achieving the optimization of its processes and cost reduction. Furthermore, in (Lamey et al., 2023), a business architecture was proposed together with an ERP, which integrated processes and improved competitiveness. It has also been observed that the integration of new technologies increases productivity, as evidenced in (Yang et al., 2023), where 20 companies were analyzed and an operational improvement of 57.8% was recorded, however, in the reviewed articles they do not consider the retail sector in the new proposals for business architectures based on TOGAF and not in the digital

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transformation stage. This paper aims to cover the after mentioned sector, focusing on small and medium-sized companies presenting a business architecture based on the ADM cycle.

Therefore, our proposal consists of developing 5 phases of the TOGAF ADM, (1) preliminary phase, (2) architectural vision, (3) business architecture, (4) information systems architecture and (5) architecture of technology.

The work consists of five sections: the second section is related articles, the third is the contribution, the fourth section is the validation, the fifth is results and discussion, and finally, the conclusions and future work.

2 RELATED WORKS

In the competitive world of retail, optimizing the sales process is essential. Using TOGAF's ADM cycle-based enterprise architecture, companies can address these challenges in a structured way. This approach not only improves operational efficiency, but also enables agile adaptation to changing market demands, delivering more satisfying shopping experiences for customers. In this context, we will explore how this methodology can be a strategic tool for business success.

In (Hardi & Legowo, 2023), the authors present an analysis that seeks to find the solution to the disorganization and slowness of their processes, for which they conclude in the implementation of a business architecture through the use of TOGAF whose focus is on the 9 phases of the ADM cycle. . Although this article is very relevant to our proposal, it has a focus on the medical area, for which the analysis is very different. However, the phases or the way in which it is carried out is partly useful for research.

In (Bastidas et al., 2022), the authors propose a specific enterprise architecture for smart cities, using an analysis based on certain phases of the TOGAF ADM cycle. To represent this architecture in a more understandable way, the ARCHI tool is used, which facilitates the visualization and understanding of the proposal. Although ARCHI is not used universally, its application in our context is justified because it is a tool commonly associated with the use of the TOGAF Framework and also because our objective is to provide a more accurate vision.

In (Girsang & Abimanyu, 2021), the authors employ the TOGAF ADM cycle to model business strategy to address desynchronization between business and technology strategy, poor awareness of

the usefulness of Information Technology (IT) assets. These establish 5 steps for the research methodology, where they carry out the nine phases of the ADM cycle and apply it to a case study called Dharmais. This contributes greatly to us, since the authors carry out each phase in detail, focusing on a case study, which demonstrates how to apply the business architecture based on TOGAF for a specific company

In (Gallegos-Baeza et al., 2021), they describe the application of the TOGAF ADM cycle to develop an Enterprise Architecture at the municipal level, focusing on the Preliminary, Business Architecture, Information Systems Architecture and Technological Architecture phases; which allowed us to establish a framework for the implementation of electronic services and improve the provision of municipal services. This proposal is very similar from the point of view of the focus phases, although it differs due to the implementation they propose in municipal services, since we focus on sales in the retail sector.

3 ENTERPRISE ARCHITECTURE PROPOSAL

TOGAF's ADM cycle optimization process to optimize sales involves assessment, goal setting, technology selection, infrastructure design, strategy development, training, implementation, continuous evaluation and adjustments.

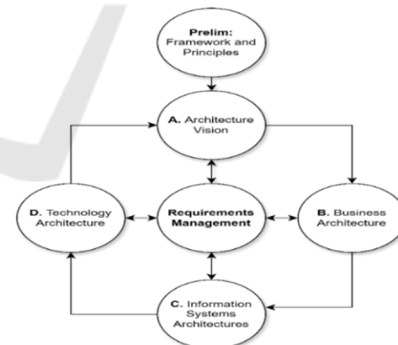


Figure 1: Phases of an enterprise architecture, according to TOGAF ADM.

The TOGAF ADM cycle is used for its flexibility, allowing the introduction of new measures at each phase. This approach includes the proposed integration of the Odoo ERP, along with security enhancements such as the Windows Defender firewall and cloud storage. Additionally, an inventory prediction module within Odoo is suggested,

enabling SMEs to forecast the necessary stock levels for future dates.

3.1 Preliminar Phase

The objective of the preliminary phase is to design the research framework, analyze the organization where the case study will be applied. To do this (1) we obtain information about the company, (2) we establish the principles of the architecture as a solution proposal, (3) we identify those responsible for carrying out the architecture and (4) we establish the scope of the work.

Table 1: The table shows details all the deliverables to be carried out to complete the preliminary phase.

Phase deliverable	Content
Business Model	Business History Business Sector Points of sale
Analysis of the Business Problem	Problem to optimize Security
Proposed Solution	Technology to use Human resources to consider
Business Evolution	Vision and Strategy Operations Innovation and development
Analysis of Business Capabilities	Loyalty Market Knowledge Technological Adaptability Customer Support Vision and Objectivess
Business diagnosis	SWOT PESTEL Areas involved in the process to optimize

3.2 Vision of Architecture

The objective of the architecture vision is to analyze the strategic requirements and effectiveness and needs of business processes to achieve organizational objectives. Likewise, based on what was obtained, offer a concrete solution. To do this (1) we identify the situation and goals of the company, (2) we review the principles of the architecture and (3) we define the key requirements.

Table 2: The table shows details all the deliverables to be carried out to complete the vision phase.

Phase deliverable	Content
Architecture Overview	Explanation of difficulties in the company, explanation of the proposal and how to approach it.
Requirements Assessment	List functional requirements based on architectures (business, data, applications and technologies). List non-functional requirements based on architectures (business, data, applications and technologies).
Goals for sales improvement	Establish success indicators to validate the effectiveness of the proposed solution.

Table 3: The table shows details the aspects to be described as requirements, this through a table with a list according to architecture and type of requirement.

Type of architecture	Requirements	
	Functional Requirements	Non-functional requirements
Business architecture	<ul style="list-style-type: none"> Processes and workflows. Interactions with clients. 	<ul style="list-style-type: none"> Scalability. Security. Availability. Performance.
Application architecture	<ul style="list-style-type: none"> Features. Integration with external systems. User interface. 	<ul style="list-style-type: none"> Usability. Efficiency. Adaptability. Maintainability.
Data architecture	<ul style="list-style-type: none"> Data structure. Data models. Access/storage requirements. 	<ul style="list-style-type: none"> Scalability. Security. Availability. Performance.
Technology Architecture	<ul style="list-style-type: none"> Hardware platform and operating systems. Network infrastructure. Security and interoperability requirements. 	<ul style="list-style-type: none"> Usability. Efficiency. Adaptability. Maintainability.

3.3 Business Architecture

The objective of business architecture is to design the target architecture, in relation to the organization's sales process. To do this (1) we identify the gaps in the base architecture, (2) we propose the target architecture, (3) we define the key resources presented by the company and the one we propose and (4) we select the relevant points of view of the architecture. and the associated tools and techniques from a business point of view.

Table 4: The table shows details all the deliverables to be carried out to complete the business architecture phase.

Phase deliverable	Content
Analysis of the current situation of business architecture	In Archimate, the current situation of the company's sales process is designed, where the relationship of each process with the area is seen.
Design of the desired situation of business architecture	In Archimate, based on the deficiencies found, an improvement proposal is made with the solution proposals integrated within the analyzed process.
Definition of key resources	List the problems detected in the current situation. Explain the solution options and the reason for their solution.
Business architecture models, and artifacts	Design of the sales volume diagram of the products marketed per year. Design of the sales process use case diagram.

3.4 Information Systems Architecture

The objective of information systems architecture is to realize the data architecture and application architecture of the organization. To do this (1) we identify the gaps in the base architecture, (2) we propose the target architecture, (3) we define the key resources presented by the company and the one we propose and (4) we select the relevant points of view of the architecture and the associated tools and techniques from the application point of view.

Table 5: The table shows details all the deliverables to be carried out to complete the information systems architecture phase.

Phase deliverable	Content
Analysis of the current situation of data and application architecture	At Archimate, design of the current situation of application architecture. At Archimate, design of the current situation of data architecture.
Design the desired situation of data and application architecture	In Archimate, based on the deficiencies found, design the desired situation with the solution tools for each architecture.
Definition of resources	In the application architecture, the security framework of the computer network and the implementation of security measures are established. In the data architecture, the incidents present in the company and solutions are analyzed.
Application Architecture Views, Models, and Artifacts	In the application architecture, the application portfolio catalog is established. In the data architecture, the principles of data, entity and components, ERP data security and data migration are established.

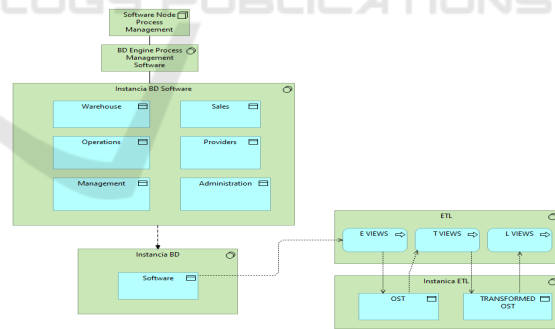


Figure 2: The image details the current situation of the application architecture with reference to the retail sector.

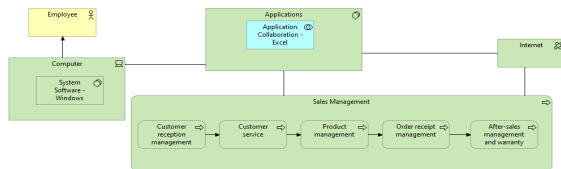


Figure 3: The image details the current situation of the data architecture with reference to the retail sector.

3.5 Technology Architecture

The objective of technology architecture is to deploy the target architecture proposed for the organization. With this established objective we begin (1) analysis of the current situation of the business, (2) design of the desired situation, (3) security of the technology architecture and design of the technological infrastructure and (4) design of the the network, deployment of the components necessary for the network, physical distribution and analysis of the environment diagram and physical locations.

Table 6: The table shows details all the deliverables to be carried out to complete the technology architecture phase.

Phase deliverable	Content
Analysis of the current situation of technology architecture	In Archimate, the current situation of the technologies used in the company is designed and how these relate to the sales process.
Design of the desired situation of technology architecture	In Archimate, based on the deficiencies found, the desired situation is designed, implementing the solution proposals and integrating it into the company.
Definition of resources	Define the implementation of security measures for the business and applications, for the data and design the desired technological infrastructure with the aforementioned measures.
Application Architecture Views, Models, and Artifacts	Design the network and communications architecture in Packet Tracer. Carry out the characterization of the nodes and design the deployment diagram and components on the connections between the servers. Establish business systems, physical components, server address and IP address. Design the diagram of physical locations. Establish a sales strategy based on the proposed solution implemented.

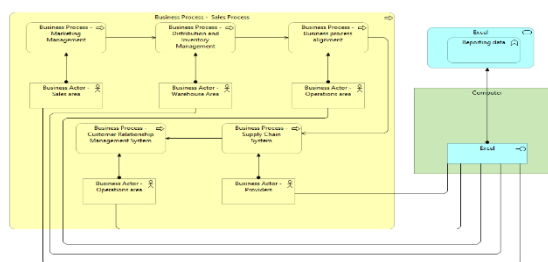


Figure 4: The image details the technology architecture with reference to the retail sector.

Table 7: The table shows the detailed deliverables to be carried out for the technology architecture.

Technology architecture	Description
Technology Architecture Security	For business and applications. For the data. Network and communications architecture. Node Characterization / Deployment Diagram and Components.
Technology Architecture Views, Models, and Artifacts	Physical distribution. System/Technology Matrix. Diagram of environments and locations. Sales strategy.

4 VALIDATION

The validation process will allow us to know the main aspects of improvement regarding the sales process when applying the proposal provided. This will be carried out in the company “LIMPIO BE”, “TOQUE BABY PERU” and in a simulation in a testing environment, the first business is dedicated to the sale of household cleaning products, located in Monsefú – Chiclayo in Peru. The second is dedicated to the sale of children's clothing and accessories and the third will be a simulation of a hardware store type business; located in Lima, Peru.

To validate the enterprise architecture, two experiments will be conducted, Experiment 1 will be the testing of the proposed technology within the architecture and Experiment 2 will be a survey. Experiment 1 involves a 10-day test of the Odoo ERP within the company, including specific modules such as Electronic Commerce, CRM, Sales, Billing, Accounting, Inventory, and Email Marketing. Additionally, based on security methods such as the

implementation of a firewall and security measures involved in the installation of the Odoo ERP, like cloud security, data encryption, and more, proposed at each phase of the ADM cycle. Experiment 2 consists of a survey, which will be proposed to evaluate the most important changes that have been obtained after Experiment 1.

In order to achieve a validation of the optimization of the sales process in the proposed enterprise architecture, a four-step validation is used.



Figure 5: The image details the four steps for validating the proposal.

4.1 Simulation

The business architecture and the developed system adapt to the current situation of the retail business. This business architecture is implemented with the aim of optimizing processes and sales, allowing for more efficient results and continuing with the validation process.

4.2 Data Collection

The data collection phase involves gathering information on the retail business's results 10 days after implementing the business architecture, which are response time from the arrival of a customer until the sale, accuracy of physical and virtual inventory, time from stock visibility to sale, and time from relevant information visibility. This will reveal how the architecture has been adapted and the changes compared to previous results. An online survey will also be conducted to assess user satisfaction and identify improvement opportunities, using a Likert scale for closed questions (1 = Totally disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Totally agree). This approach will help compile comprehensive results within the business.

The user satisfaction survey includes the following questions:

1. Was the system available when you needed it?
2. Has the system optimized your sales process?
3. How satisfied are you with the modules chosen for your business operations?

For validating accessibility:

1. Was the application intuitive to navigate and use the modules?
2. Do you agree with the speed of response time and accessibility?

3. Are the operating systems sufficient to manage your business?

For validating security:

1. Was the security level of your data adequate?
2. How satisfied are you with the access and authentication measures?
3. Is the implemented Firewall sufficient to block unauthorized access?

For validating functionality:

1. Was the website development faithful to your business objectives?
2. Was the stock prediction of inventory products adequate?
3. Was the visualization of stock graphs on a defined date adequate?
4. Was it easy to integrate your company into the system?

4.3 Results Comparison

In the results comparison phase, the performance of the proposal in improving processes will be analyzed after completing the simulation period. A survey will measure success indicators before implementing the business architecture. By comparing these indicators before and after the simulation, we can determine and measure each business's level of improvement.

4.4 Compliance with Success Indicators

The phase of compliance with success indicators focuses on analyzing the results obtained in the previous phase and relating them to the success indicators established for the business. This means that, in the design of the desired situation, they will be measured to measure their level of compliance in relation to the success indicators.

5 RESULTS

Having completed the architecture simulation phase, where the business architecture developed within retail companies was implemented, data collection continued by sending an online survey to determine user satisfaction, accessibility, security and functionality. In this way, the following results were obtained:



Figure 6: The image details the results by category of the survey carried out.

Figure 6 shows that the Security category has the highest rating at 4.5, indicating effective resolution of security issues. User satisfaction averages 4.1, reflecting positive reception of the business architecture by microentrepreneurs. Accessibility, with a score of 4.3, demonstrates that the ERP system is intuitive and user-friendly. Functionality also scores 4.3, showing that the designed processes and modules are well-suited to the company's needs and have optimized the sales process.

Next, in the results comparison phase, having carried out the survey prior to the simulation, the following results were obtained:

Table 8: The table shows the indicators before the simulation.

Indicators before simulation		
Nº	Indicator	Measure
1	Average time from the arrival of a customer to the closing of the sale.	210 (minutes)
2	Accuracy of inventory records compared to actual physical inventory.	64% (precisión)
3	Time in which the user reviews the stock of a requested product until its delivery and sale.	30 (minutes)
4	Time and ease with which employees can access relevant information.	60 (minutes)

Table 8 summarizes a survey conducted on various retail SMEs to measure the time and precision of key success indicators before implementing the architecture, determining the level of optimization of the sales process.

Then, to finish the comparison, ten sample data were obtained from each company evaluated in order to subsequently calculate compliance with the success indicators.

Table 9: The table shows the indicators after the simulation (average of 10 samples) for each company.

Success indicator	Company	
	Limpio Be	Toque Baby
Indicator 1	41	21
Indicator 2	86%	85%
Indicator 3	22.5	14
Indicator 4	3.9	3.6

Table 9 presents the success indicators for each validated enterprise, based on 10 samples per indicator. It assesses the time and precision of each indicator after implementing the architectural solution, specifically for "Toque Baby" and "Limpio Be," using the developed enterprise architecture and ERP system.

Finally, in the phase of compliance with success indicators, the comparison of the results will be analyzed in order to determine the level of optimization of all the success indicators based on the implementation of the business architecture solution for retail companies. To obtain the optimization percentage, the following mathematical formula is used:

$$Optimization (\%) = \left(\frac{Initial\ time - Final\ time}{Initial\ time} \right) \times 100$$

In this way, the results obtained are the following:

Table 10: The table shows the percentage of optimization of each indicator (average of 10 samples) by each company.

Optimization percentage		
Success indicator	Company	
	Limpio Be	Toque Baby
Indicator 1	80%	90%
Indicator 2	37%	33%
Indicator 3	25%	53%
Indicator 4	93%	94%
Total average	59%	68%

When observing the optimization result, we see that "Toque Baby" has an average total optimization of 68% based on its results prior to implementing the business architecture. The new architecture led to a 90% improvement in Indicator 1 for "Toque Baby" and 80% for "Limpio Be." For Indicator 3, "Toque Baby" improved by 53% and "Limpio Be" by 25%. This was achieved through the selected modules and the submodule developed to determine future product stock.

6 CONCLUSIONS

This study applied the business architecture based on the TOGAF ADM cycle that allowed us to optimize sales processes in the retail sector by 63%, improving operational efficiency and adaptation to market demands, resulting in more satisfactory purchasing experiences. The preliminary phase of the ADM cycle allowed us to design a solid research framework and establish the scope of work. The business architecture facilitated the identification of gaps, the design of a target architecture and the definition of key resources, contributing to effective strategic planning. Continuous evaluation through online surveys provided valuable information for improvements. For future work, it is suggested to carry out the validation for a greater number of days to obtain greater results that help determine whether the proposed solution is effective.

ACKNOWLEDGEMENTS

We thank the Peruvian University of Applied Sciences and the Faculty of Engineering for their support. Special thanks to our advisors for their guidance. We are grateful to our families, friends, and classmates for their support, and to the individuals and companies who participated in the project's validation. This achievement would not have been possible without you.

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